

HAWAII DISTRICT LAND OFFICE

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION
Honolulu, Hawaii

BOARD OF LAND AND NATURAL RESOURCES

Suzanne D. Case
Chairperson

CONTRACT SPECIFICATIONS AND PLANS

Job No. E00BH30A
HAWAII DISTRICT LAND OFFICE
RENOVATE SINGLE STORY OFFICE BUILDING
HILO, HAWAII

Architect:	Erskine Architects, Inc
Civil Engineer:	The Limtiaco Consulting Group
Landscape Architect:	KTL Design, LLC
Structural Engineer:	Iwamoto Engineering Consultants, INC
Electrical Engineer:	Albert Chong Associates, Inc
Mechanical Engineer:	Mechanical Enterprises, Inc
Environmental:	Enviroservices & Training Center, LLC
Surveyor:	Imata & Associates, Inc


November 2022

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION
Honolulu, Hawaii

CONTRACT SPECIFICATIONS AND PLANS

Job No. E00BH30A
Hawaii District Land Office
Hilo, Hawaii

Approved: 
RUSSELL Y. TSUJI
Administrator
Land Division

Approved: 
CARTY S. CHANG, P.E.
Chief Engineer
Engineering Division

November 2022

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PLANS (Bound Separately)

DEPARTMENT OF LAND AND NATURAL RESOURCES INTERIM GENERAL
CONDITIONS, DATED OCTOBER 1994 (Bound Separately)

NOTICE TO BIDDERS
(Chapter 103D, HRS)

COMPETITIVE BIDS for Job No. **E00BH30A, Hawaii District Land Office, Renovate Single Story Office Building**, Hilo, Hawaii shall be submitted to the Department of Land and Natural Resources, Engineering Division on the specified date and time through the Hawaii State e-Procurement (HiePRO). HiePRO is accessible through the State Procurement Office website at www.spo.hawaii.gov.

The Department of Land and Natural Resources Interim General Condition, dated October 1994, as amended, and the General Conditions –AG008, latest revision shall be made part of the specifications.

The project is located at 180 Kalanikoa Street, Hilo, Hawaii.

The work shall generally consist of sitework and demolition, landscape, work off-site or in the Public Right-of-way, building structure, enclosure and interior construction, interior finishes, abatement work, built-in casework and adjustable shelving, plumbing, HVAC, electrical, data/communications, and lighting.

To be eligible to submit a bid, the Bidder must possess a valid State of Hawaii Contractor's license classification "B".

All interested parties are invited to attend a State conducted site visit. The site visit will be held at the project site on 12/12/2022 at 9 am.

All interested parties are invited to attend a State conducted voluntary pre-bid conference call on 12/14/2022 at 10 am. Interested attendees shall send an email request for invitation to melissa.m.agbayani@hawaii.gov at least twenty-four (24) hours in advance of the meeting day. The email shall have "Job No. E00BH30A– Pre-Bid Conference" in the subject line and shall contain the following information: Name(s) attending, Company Name, Phone Number, and Email Address. Agenda and call-in information for Pre-Bid Conference shall be sent as part of response to requestor.

The estimated cost of construction is \$2,300,000.00

The award of the contract, if it be awarded, will be subject to the availability of funds.

This project is subject to preference to Hawaii Products established by Section 103D, Hawaii Revised Statutes. The Hawaii Product List may be examined at the State Procurement Office website.

Since the estimated cost of construction is \$250,000 or more, the apprenticeship agreement preference pursuant to Hawaii Revised Statutes §103-55.6 (ACT 17, SLH 2009) shall apply.

Should there be any questions, please refer to the HiePRO solicitation.

INFORMATION AND INSTRUCTIONS TO BIDDERS

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INFORMATION AND INSTRUCTIONS TO BIDDERS

- A. PROJECT LOCATION AND SCOPE OF WORK: The project location and scope of work shall be as generally described in the Notice to Bidders.
- B. PROPOSALS: Bidders shall submit their bid, including the completed proposal form, bid bond, and any other documents required by the solicitation as part of their bid through the State of Hawaii e-Procurement System (HiePRO). See Item D, PROPOSAL FORM.
- C. GENERAL CONDITIONS: The Department of Land and Natural Resources Interim General Conditions dated October 1994, as amended, shall be made a part of these contract specifications and are referred to hereafter as the General Conditions.
- D. PROPOSAL FORM: **The Bidders shall fill out and upload the electronic copy of the proposal form to the HiePRO website when submitting the bid. Bid Proposals shall not be mailed, faxed or delivered to the State, unless requested to do so after the designated closing date. The successful Bidder shall fill out and print a hard copy of the proposal form, sign and submit the form with the contract award package.**
- E. OMISSIONS OR ERASURES: Any proposal which contains any omission or erasure or alteration not properly initialed, or conditional bid, or other irregularity may be rejected by the Board of Land and Natural Resources (Board).
- F. NOTICE OF INTENT TO BID AND QUESTIONNAIRE:
A Notice of Intent to Bid is not required for this project. In compliance with HRS Section 103D-310, the lowest responsive and responsible bidder may be required to complete a questionnaire. When requested by the State, the completed questionnaire shall be submitted to the Chief Engineer for evaluation. Failure to furnish the requested information within the time allowed may be grounds for a determination of non-responsibility, in accordance with HRS Section 103D-310 and HAR Section 3-122-108.
- G. BID SECURITY: A bid security will be furnished by each bidder as provided in sub-section 2.7 of the General Conditions. The successful bidder's bid security will be retained until Contract execution and furnished a performance and payment bond in an amount equal to one hundred percent (100%) of the total Contract price, including an amount estimated to be required for extra work, is furnished.

The Board reserves the right to hold the bid securities of the four lowest bidders until the successful bidder has entered into a contract and has furnished the required performance bond. All bid securities will be returned in accordance with sub-section 3.5 of the General Conditions.

Should the successful bidder fail to enter into a contract and furnish a satisfactory performance bond within the time stated in the proposal, the bid security shall be forfeited as required by law.

- H. CONTRACTOR'S LICENSE REQUIRED: The Board will reject all bids received from contractors who have not been licensed by the State Contractors License Board in accordance with Chapter 444, HRS; Title 16, Chapter 77, Hawaii Administrative Rules; and statutes amendatory thereto.
- I. IRREGULAR BIDS: No irregular bids or propositions for doing the work will be considered by the Board.
- J. WITHDRAWAL OF BIDS: No bidder may withdraw his bid between the time of the opening thereof and the award of contract.
- K. EVALUATION OF CRITERIA:
1. The total lump sum base bid price and additives will be adjusted to reflect the applicable preferences
 2. Evaluating Bids with Additive Bid Items:
 - a. After the solicitation ends, the State will announce the project control budget. All bids will be evaluated on the basis of the same additive item.
 - b. After adjusting for applicable preferences, the additives, in their precedence order, are added to the total lump sum base bid price. This (these) sum(s) are compared to the project control budget, and must be within the project control budget.
 - c. If adding another additive would make the aggregate amount exceed the project control budget for all bidders, that additive will be skipped and the next additive will be added, provided an award might be made within the project control budget. This procedure will continue, until adding any remaining additives will result in the aggregate total amount for all the bidders to exceed the project control budget, or until no additional additives remain.
 - d. The bidder with the lowest aggregate amount, within the project control budget (after application of the various preferences), for the total lump sum base bid plus the additives in their precedence order, is the "Low Bidder" for that project and is designated for award.
 - e. Additive Bid Example: The project control budget available is \$100,000. In the order of precedence, additive bid 1, 3, 4, 5 and 6 are additive bids. After applying the preferences, the bids are ranked lowest price to highest price and are "Bid A", "Bid B", "Bid C", "Bid D" and "Bid E". Bid A's total lump sum base bid price and three additive bids (in the precedence order) are \$80,000, \$16,000, \$10,000 and \$5,000 respectively. Bid B's total lump sum base bid price and three additive bids (in the precedence order) are \$82,000, \$10,000, \$9,000 and \$3,000 respectively. Bid C's total lump sum base bid price and three additive bids (in the precedence order) are \$85,000, \$10,000, \$8,000 and \$4,000 respectively.
 - (1) In adding the additives to the bids, bid 1 is under the project control

budget for all bids. The second bid 2 is initially skipped since it would cause the aggregate amount of all bids to exceed \$100,000. The third bid 3 is added and the aggregate amounts, including base bid price plus bids 1 and 3, of both Bid B and Bid C, are under the project control budget.

- (2) Bid A's aggregate total is \$101,000. Bid B's aggregate total is \$95,000. Bid C's aggregate total is \$99,000.
- (3) Bid B's price including bids A-1 and A-3 is the lowest bid price (over Bid C) and has an aggregate amount within the adjusted project control budget, and therefore is designated the "Low Bidder" for the project.

L. METHOD OF AWARD:

- 1. The contract will be awarded to the lowest responsive and responsible Bidder whose bid (including any additive which may be selected) meets the requirements and criteria set forth in the solicitation documents and as determined by the Comptroller.
- 2. In the event the Lump Sum Base Bid of all bidders exceeds the project control budget, the Department reserves the right to make an award to the bidder with the lowest total lump sum base bid, after application of the preferences is designated, if additional funds are available or by reducing the scope of work through negotiation.

M. SUCCESSFUL BIDDER TO FILE PERFORMANCE AND PAYMENT BONDS: The successful bidder will be required to file performance and payment bonds each; in the amount equal to the total contract price, including amounts estimated to be required for extra work, as provided in sub-section 3.6 of the General Conditions.

N. NUMBER OF EXECUTED ORIGINAL COUNTERPARTS OF CONTRACT DOCUMENTS: If requested by the Board, six copies of the Contract, performance and payment bonds shall be executed.

O. CHANGE ORDERS: No work of any kind in connection with the work covered by the plans and specifications shall be considered as change order work, or entitle the Contractor to extra compensation, except when the work has been ordered in writing by the Chief Engineer (Engineer) and in accordance with sub-section 4.2 of the General Conditions.

The Contractor shall clearly identify and inform the Engineer in writing of any deviations from the contract documents at the time of submission and shall obtain the Engineer's written approval to the specified deviation prior to proceeding with any work.

P. WAGES AND HOURS: In accordance with sub-sections 7.3 to 7.9 of the General Conditions relative to hours of labor, minimum wages and overtime pay, the current minimum wage rates promulgated by the Department of Labor and Industrial Relations (DLIR) shall be paid to the various classes of laborers and mechanics engaged in the performance of this contract on the job site. The minimum wages shall be increased during the performance of the contract in an amount equal to the increase in the prevailing wages for those kinds of work as periodically determined by the DLIR.

The Department of Land and Natural Resources will not recognize any claim for additional compensation because of the payment by the Contractor of any wage rate in excess of the said minimum wage rates. The possibility of wage increase is one of the elements to be considered by the Contractor in determining his bid, and will not, under any circumstances, be considered as the basis of a claim against the Department under this Contract.

No work shall be done on Saturdays, Sundays, legal State holidays, and/or in excess of eight (8) hours each day without the written consent of the Engineer. Should permission be granted to work at such times, the Contractor shall pay for all inspection administrative costs thereof. No work shall be done at night unless authorized by the Engineer.

- Q. PERMITS: The State will process permit applications whenever possible, and the Contractor shall procure the pre-processed permits and pay the required fees. If permit applications are not processed by the State, the Contractor shall process the permit applications, permits and licenses, and pay all charges and fees. In all cases, the Contractor shall give all notices necessary and incident to the due and lawful prosecution of the work.
- R. PROPERTY DAMAGE: It shall be the responsibility of the contractor to respect State property and to prevent damage to existing improvements. The Contractor will be responsible for damages resulting from construction operations. Immediately upon discovery, the Contractor shall repair such damage to the satisfaction of the Engineer.

All trees and shrubbery outside the excavation, embankment or construction limits shall be fully protected from injury.

- S. TIME: The time of completion is specified in the Proposal. It is the Board's intention to insist the Contractor diligently prosecute the work to completion within the specified time.

Prospective bidders are reminded that the State has the option to proceed with or abandon a project depending on whether the project can be completed for occupancy in the specified time.

It is the bidder's responsibility to check the availability of all materials before bidding. The bidder shall select sub-contractors and suppliers who can warrant availability and delivery of all specified or qualified materials to assure project completion within the specified time.

The successful bidder must assume all risks for completing the project by the specified date. There shall be no extension of time for any reason except for delays caused by acts of God, labor disputes involving unions, or actions of the State. If for any reason the project falls behind schedule, the Contractor shall at its own cost, take necessary remedial measures to get the project back on schedule, i.e., working overtime, air freighting all materials, etc. In addition, if the Contractor fails to fully complete the project by the completion date, Contractor will be required to make the facility usable at its own cost.

- T. BIDDER'S RESPONSIBILITY TO PROVIDE PROPER SUPERINTENDENCE: The successful low bidder shall designate in writing to the Engineer the name of its authorized superintendent (Superintendent), who will be present at the job site whenever any work is in progress. The Superintendent shall be responsible for all work, receiving and implementing instructions from the Engineer in a timely manner. The cost for superintendence shall be considered incidental to the project.

If the Superintendent is not present at the site of work, the Engineer shall have the right to suspend the work as described under sub-section 5.5 c. and 7.20 - Suspension of Work of the General Conditions.

- U. LIQUIDATED DAMAGES: Liquidated damages in the amount specified in the Proposal will be assessed for each and every calendar day from and after the expiration of the time period stated in the Contract for the completion of the project.

- V. HIRING OF HAWAII RESIDENTS: The Contractor shall comply with Act 68, SLH 2010, in the performance and for the duration of this contract. The Contractor shall ensure that Hawaii residents compose not less than eighty percent of the workforce employed to perform the contract work on the project. The eighty percent requirement shall be determined by dividing the total number of hours worked on the contract by Hawaii residents, by the total number of hours worked on the contract by all employees of the Contractor in the performance of the contract. The hours worked by any Subcontractor of the Contractor shall count towards the calculation for this section. The hours worked by employees with shortage trades, as determined by the Department of Labor and Industrial Relations (DLIR), shall not be included in the calculation for this section.

The requirements shall apply to any subcontract of \$50,000 or more in connection with the Contractor, that is, such Subcontractors must also ensure that Hawaii residents compose not less than eighty percent of the Subcontractor's workforce used to perform the subcontract.

- W. WATER AND ELECTRICITY: The Contractor shall make all necessary arrangements and pay all expenses for water and electricity used in the construction of this project.

- X. PUBLIC CONVENIENCE AND SAFETY: The Contractor shall conduct construction operations with due regard to the convenience and safety of the public at all times. No materials or equipment shall be stored where it will interfere with the safe passage of public traffic. The Contractor shall provide, install, and maintain in satisfactory condition, all necessary signs, flares and other protective facilities and shall take all necessary precautions for the protection of the work and the convenience and safety of the public. The Engineer shall have the right to suspend the performance of the work in accordance with sub-section 7.20 - Suspension of Work of the General Conditions.

- Y. WORK TO BE DONE WITHOUT DIRECT PAYMENT: Whenever the contract that the Contractor is to perform work or furnish materials of any kind for which no price is fixed in the contract, it shall be understood that the Contractor shall perform such work or furnish said materials without extra charge or allowance or direct payment of any sort. The cost of performing such work or furnishing said material is to be included by the Contractor in a unit price for the appropriate item unless it is expressly specified that such work or material is to be paid for as extra work.

- Z. AS-BUILT DRAWINGS: As-built drawings, the intent of which is to record the actual in-

place construction so that any future renovations or tie-ins can be anticipated accurately, shall be required. All authorizations given by the Engineer to deviate from the plans shall be drawn on the job site plans. All deviations from alignments, elevations and dimensions which are stipulated on the plans shall be recorded on the as-built drawings. Final as-built drawings shall be submitted to the Engineer for review and approval. After the Engineer approves the as-built drawings, the contractor shall submit an electronic copy in Adobe PDF format on CD ROM.

- AA. ASBESTOS CONTAINING MATERIALS: The use of asbestos containing materials or equipment is prohibited. The Contractor shall insure that all materials and equipment incorporated in the project are asbestos-free
- BB. WORKER SAFETY: The Contractor shall provide, install and maintain in satisfactory condition all necessary protective facilities and shall take all necessary precautions for the protection and safety of its workers in accordance with the Occupational Safety and Health Standards for the State of Hawaii. The Engineer shall have the right to suspend the performance of the work in accordance with sub-section 7.20 - Suspension of Work of the General Conditions.
- CC. TOILET FACILITIES: All toilet facilities constructed at the project site shall be in accordance with the Public Health Regulations of the State Department of Health (DOH). All necessary precautions shall be observed at the project site. The use of sanitary facilities shall be strictly enforced and workers violating these provisions shall be promptly discharged.
- DD. SIGNS: Whenever the project involves closing or obstructing any public thoroughfare, the Contractor shall provide traffic signs conforming to the applicable provisions of the current edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways", published by the Federal Highway Administration as directed by the Engineer for the purpose of diverting or warning traffic prior to the construction area. All traffic signs shall bear proper wording stating thereon the necessary information as to diverting or warning traffic.

When indicated in the Proposal, the Contractor shall provide a project sign, size 4'-0" x 7'-0" to be placed as directed by the Engineer. The sign shall be constructed in accordance with Section 01581 - Project Sign of these specifications and approved by the Engineer. All wording, type and size of lettering and color selection shall be as specified in these specifications or as approved by the Engineer.

All signs shall be kept neat and clean, and properly erected at all times.

- EE. FIELD OFFICE AREA FOR DEPARTMENT: When indicated in the Proposal, the Contractor shall provide a housed working area of at least 100 square feet adjacent to the Contractor's office for the Department's use. This area will be used by the Engineer to perform tests and to store equipment. As a minimum, the field office shall include the following: standard sized office desk and chair, lighting, ventilation, window-type air conditioning rated at 5,000 BTU, door and window with locking hardware, electrical outlets, and working communications facilities (a cellular telephone is acceptable). The Department will pay for all long distance toll charges made by the Engineer.
- FF. QUANTITIES: All bids will be compared on the basis of quantities of work to be done as shown in the Proposal; the quantities shown in the Unit Price items are estimated, being

given as a basis for comparison of bids. The Board reserves the right to increase or decrease the quantities given under the items or delete items entirely as may be required during the progress of the work.

GG. OTHER HEALTH MEASURES: Forms of work site exposure or conditions which may be detrimental to the health or welfare of workers or of the general public shall be eliminated or reduced to safe levels as required by the DOH codes, standards, and regulations. Suitable first aid kits and a person qualified to render first aid, as specified in the DOH regulations, shall be provided at all times when work is scheduled.

HH. HAWAII BUSINESS OR COMPLIANT NON-HAWAII BUSINESS REQUIREMENT: Bidders (Contractors) shall be incorporated or organized under the laws of the State or be registered to do business in the State as a separate branch or division that is capable of fully performing under the contract, as stipulated in §3-122-112 HAR.

II. COMPLIANCE WITH §3-122-112 HAR:

As a condition for award of the contract and as proof of compliance with the requirements of 103D-310(c) HRS, the apparent low bidder shall furnish the required documents to the Department. If the valid required certificates are not submitted on a timely basis for award of a contract, a bidder otherwise responsive and responsible may not receive the award. Bidder is responsible to apply for and submit the following documents to the Department.

- A. **TAX CLEARANCE REQUIREMENTS (HRS Chapter 237)**: Bidder shall obtain a tax clearance certificate from the Hawaii State Department of Taxation (DOTAX) and the Internal Revenue Service (IRS). The certificate is valid for six months from the most recently approved stamp date on the certificate; the certificate must be valid on the date received by the Department.
- B. Department of Labor (DLIR) **“Certificate of Compliance”**. (HRS Chapter 383 - Unemployment Insurance, Chapter 386 - Workers’ Compensation, Chapter 392 - Temporary Disability Insurance, and 393 – Prepaid Health Care): Bidder shall obtain a certificate of compliance from the Hawaii State Department of Labor and Industrial relations (DLIR). The certificate is valid for six months from the date of issue; certificates must be valid on the date received by the Department.
- C. Department of Commerce and Consumer Affairs (DCCA), Business Registration Division (BREG) **“Certificate of Good Standing”**. Bidder shall obtain a certificate of good standing issued by the Department of Commerce and Consumer Affairs (DCCA), Business Registration Division (BREG). The certificate of good standing is valid for six months from the date of issue; certificates must be valid on the date received by the Department.

Alternately, instead of separately applying for these certificates at the various state agencies, bidder may choose to use the Hawaii Compliance Express (HCE), which allows businesses to register online through a simple wizard interface at <http://vendors.ehawaii.gov> to acquire a “Certificate of Vendor Compliance” indicating the bidder’s status is compliant with the requirements of §103D-310(c), HRS, and shall be accepted for contracting and final payment purposes. Bidders that elect to use the new HCE services will be required to pay an annual fee of \$15.00 to the Hawaii Information Consortium, LLC (HIC). Bidders choosing not to participate in the HCE program will be required to provide the paper certificates as instructed in the previous paragraphs.

- JJ. BUILDER’S RISK INSURANCE:
Builder’s risk insurance is required for this project.

ALTERNATIVE BID ITEMS

The Bidder further proposes to incorporate in the work the Alternative Bid Items (Items 26-29) as described on the drawings and Specifications Section 01230 ADDITIVE AND DEDUCTIVE BID ITEMS for the following amounts:

For the purposes of bid evaluation, the additives are listed in the order of priority in which they will be added to the Lump Sum Base Bid.

Additive Bid No. 1:

_____ Dollars (\$) _____

Additive Bid No. 2:

_____ Dollars (\$) _____

Additive Bid No. 3:

_____ Dollars (\$) _____

The Bidder must completely fill in the dollar amounts for each Additive, where the work will be performed at no cost to the State, fill in "\$0.00" as the dollar amount. If additive dollar amounts are left blank, the proposal will be rejected as being an "irregular proposal".

Deductive Bid No. 1:

_____ Dollars (\$) _____

The Bidder must completely fill in the dollar amounts for each Deductive, where the work will be performed at no cost to the State, fill in "\$0.00" as the dollar amount. If deductive dollar amounts are left blank, the proposal will be rejected as being an "irregular proposal".

PROPOSAL

Item No.	Quantity	Unit	Description	Unit Price	Total
1.		LS	Temporary Erosion Control Measures, including installation, maintenance, and removal of BMPs including ingress/egress pads, filter socks, and all incidentals, in place complete.	LS	\$
2		LS	Temporary facilities including, but not limited to temporary utilities, staging areas, protection of existing construction, safety signage, barricades, fencing, etc. and all other incidentals in place complete.	LS	\$
3		LS	Select Demolition – Demolition of existing AC pavement, fencing, electrical equipment, receptacles, telecom cabling, conduits, wires, cables, conductors, including, but not limited to, all labor, trenching, hauling, disposal, materials, equipment and incidentals required to complete the work.	LS	\$
4		LS	Hazardous materials removal including, but not limited to, testing, all labor, hauling, disposal, materials, equipment and incidentals as required to complete the work.	LS	\$
5		LS	Termite Control & Wood Treatment, in place complete	LS	\$
6		LS	Earthwork (Grading, Trenching & Backfilling, Erosion Control, etc.), in place complete	LS	\$
7		LS	AC Paving & Parking Elements (Pavement Markings, Wheel Stops, & Site and Parking Signage, etc.), in place complete	LS	\$
8		LS	CRM Wall, In place complete.	LS	\$
9		LS	Concrete Work (Curbs, Sidewalks, Trenches, CLSM, Equipment Pads, etc.), in place complete	LS	\$
10		LS	Site Utility (Water, Sewer, Storm Drainage, clean outs, drain inlets, etc.), in place complete	LS	\$
11		LS	Site Electrical Infrastructure and other related work.	LS	\$

Item No.	Quantity	Unit	Description	Unit Price	Total
12		LS	Landscaping (Plants, Soil Treatment, Irrigation, Gravel Bed, etc.), in place complete	LS	\$
13		LS	Perimeter Enclosure & Security (Chainlink Fences, Chainlink Gates, CFM Wall, Electrical Chainlink Gate, Pipe Gates, Padlocks/Hardware, etc.), in place complete	LS	\$
14		LS	Select Demolition – Demolish carport, entry canopy, corrugated roof, suspended ceiling panels, suspended ceiling grid, light fixtures, select doors, partitions, and flooring, including, but not limited to, all labor, saw cutting, trenching, hauling, disposal, materials, equipment and incidentals required to complete the work.	LS	\$
15		LS	Renovation of Office Building, including but not limited to, roofing, gutters, downspouts, partitions, doors, finishes, structural work, in place complete.	LS	\$
16		LS	Thermal & Moisture Protection (Moisture Vapor & Alkalinity Testing, Sealants, etc.), in place complete	LS	\$
17		LS	Electrical Work – Light fixtures, cable and electrical outlets, and other related work.	LS	\$
18		LS	Mechanical Work – VRF split AC system, ducting, registers, exhausts, fire dampers, testing air balance, and other related work.	LS	\$
19		LS	Plumbing Work - fixtures, hose bibs, drains, cleanout, VTR, water heater, and other related work.	LS	\$
20		LS	Traffic Control	LS	\$
21		LS	Project Sign	LS	\$
22	Allowance		HELCO New Meter Fee		\$ 10,000.00
23	Allowance		Permit Fee		\$ 6,205.00
24	Allowance		Field Office		\$10,000.00
Subtotal Base Bid (Items 1-24)					\$
25		LS	Mobilization & Demobilization (not to exceed 10% of the Subtotal Base Bid Items 1-24)	LS	\$
Total Base Bid (Items 1-25)					\$

Item No.	Quantity	Unit	Description	Unit Price	Total
<u>ADDITIVE BID NO. 1</u>					
26	4	EA	Bollards at Utility Pole	\$	\$
Total Additive Bid No. 1 (Item 26)					\$

<u>ADDITIVE BID NO. 2</u>					
27		LS	High Density Storage System	LS	\$
Total Additive Bid No. 2 (Item 27)					\$

<u>ADDITIVE BID NO. 3</u>					
28		LS	Photovoltaic System*	LS	\$
Total Additive Bid No. 3 (Item 28)					\$

<u>DEDUCTIVE BID NO. 1</u>					
29	1	LS	Cesspool Closure	LS	\$
Total Deductive Bid No. 1 (Item 29)					\$

* Submit photovoltaic system concept drawings and specifications submissions as required in Section 16700 Photovoltaic System within 5 calendar days after bid opening.

HAWAII PRODUCTS PREFERENCE AND/OR USE OF HAWAII PRODUCTS

In accordance with Act 175, SLH 2009, the Hawaii products preference is applicable to this solicitation. Bidders offering a Hawaii product (“HP”) shall identify the HP in the table below.

Persons desiring to qualify their product(s) not currently on the Hawaii Product List, shall complete Form SPO-38, *Certification for Hawaii Product Preference*, and submit the completed form no later than the deadline specified in the procurement notice and solicitation. The responsibility for certification and qualification shall rest upon the person requesting the preference. One form shall be completed and submitted for each product. Form SPO-38 is available at <http://hawaii.gov/spo/>

For the purpose of selecting the low bid when a solicitation contains both HP and non-HP, the price offered for a HP item shall be decreased by subtracting 10% for the class I or 15% for the class II HP item(s) offered. The lowest total offer, taking the preference into consideration, shall be awarded the contract, unless the offer provides for additional award criteria. The contract amount of any contract awarded, however, shall be the amount of the price offered, exclusive of the preferences.

In the event of any change that materially alters the bidder’s ability to supply the Hawaii product(s), the bidder shall immediately notify the procurement officer in writing and the parties shall enter into discussions for the purpose of revising the contract or terminating the contract for convenience.

Item No.	Pre-Approved Hawaii Product Description & Manufacturer	Class (I or II)	Quantity	Unit Measure	Unit Price	Total Price
1.	<i>[Product Description, Manufacturer Name]</i>	(I)				
2.						
3.						
4.						

RECYCLED PRODUCTS PREFERENCE

This project allows a 10% price preference for recycled products in accordance with HRS 103D-1005. Please indicate your selection of recycled or non-recycled product by indicating its cost FOB jobsite unloaded in the schedule below, including applicable General Excise & Use Taxes.

<u>DESCRIPTION</u>	<u>RECYCLED PRODUCT COST</u>	<u>NONRECYCLED PRODUCT COST</u>
_____	\$ _____	\$ _____
_____	\$ _____	\$ _____
_____	\$ _____	\$ _____
_____	\$ _____	\$ _____

The bidder requesting a recycled product preference shall also complete and submit the form "CERTIFICATION OF RECYCLED CONTENT" as shown in the Interim General Conditions and provide all supporting information with this proposal. Additional information may be requested to qualify a product.

The following definitions are applicable to the CERTIFICATION OF RECYCLED CONTENT form:

"Post-consumer recovered material" means any product used by a consumer, including a business that purchases the material, that has served its intended end use, and that has been separated or diverted from the solid waste stream for the purpose of use, reuse, or recycling.

"Product" includes materials, manufactures, supplies, merchandise, goods, wares, and foodstuffs.

"Recovered material" means waste material and by-products that have been separated, diverted, or removed from the solid waste stream after a manufacturing process for the purpose of use, reuse, or recycling. Recovered material does not include those materials and by-products that are generated and normally reused on-site or within original manufacturing processes (such as mill broke, in the case of paper products).

"Recycled content" means the percentage of a product composed of recovered material, or post-consumer recovered material, or both.

"Recycled product" means a product containing recovered material, or post-consumer recovered material, or both.

The bidder agrees that preference for recycled products shall be taken into consideration to determine the low bidder in accordance with said Section and the rules promulgated, however, the award of contract will be in the amount of the bid offered exclusive any preference.

APPRENTICESHIP AGREEMENT PREFERENCE

1. If applicable to this project, any bidder seeking the preference must be a party to an apprenticeship agreement registered with the State Department of Labor and Industrial Relations (DLIR) at the time the bid is submitted for each apprenticeable trade the bidder will employ to construct the project. “Employ” means the employment of a person in an employer-employee relationship.
 - a. The apprenticeship agreement shall be registered with the DLIR and conform to the requirements of Hawaii Revised Statutes Chapter 372.
 - b. Subcontractors do not have to be a party to an apprenticeship agreement for the bidder to obtain preference.
 - c. The bidder is not required to have apprentices in its employ at the time the bid is submitted to qualify for the preference.
2. A bidder seeking the preference must state the apprenticeable trade the bidder will employ for each trade to be employed to perform the work by submitting a completed signed original Certification Form 1 verifying participation in an apprenticeship program registered with DLIR. “Apprenticeable trade” shall have the same meaning as “apprenticeable occupation” pursuant to Hawaii Administrative Rules (HAR) §12-30-5.
 - a. The *Certification Form 1* shall be authorized by an apprenticeship sponsor listed on the DLIR list of registered apprenticeship programs. “Sponsor” means an operator of an apprenticeship program and in whose name the program is approved and registered with the DLIR pursuant to HAR §12-30-1.
 - b. The authorization shall be an original signature by an authorized official of the apprenticeship sponsor.
 - c. The completed signed original Certification Form 1 for each trade must be submitted with the bid. Previous certifications shall not apply.
 - d. When filling out the *Certification Form 1*, the name of Apprenticeable Trade and Apprenticeship Sponsor must be the same as recorded in the List of Construction Trades in Registered Apprenticeship Programs that is posted on the DLIR website. “Registered apprenticeship program” means a construction trade program approved by the DLIR pursuant to HAR §12-301 and §12-30-4.
 - e. The *Certificate Form 1* and the List of Construction Trades in Registered Apprenticeship Programs is available on the DLIR website at: <http://hawaii.gov/labor/wdd>.
3. Upon receiving the *Certification Form 1*, the Procurement Officer will verify that the apprenticeship program is on the List of Construction Trades in Registered Apprenticeship Programs and that the form is signed by an authorized official of the Apprenticeship Program Sponsor. If the programs and signature are not confirmed by the DLIR, the bidder will not qualify for the preference.
4. If the bidder is certified to participate in an apprenticeship program for each trade which will be employed by the bidder for the project, a preference will be applied to decrease the bidder’s bid

amount by five percent (5%) for evaluation purposes.

5. Should the bidder qualify for other preferences (e.g. Hawaii Products), all applicable preferences shall be applied to the bid price.

CONTRIBUTIONS BY STATE AND COUNTY CONTRACTORS PROHIBITED

Contractors are hereby notified of the applicability of Section 11-355, HRS, which states that campaign contributions are prohibited from specified State or county government contractors during the term of the contract if the contractors are paid with funds appropriated by a legislative body.

CONDITION OF AWARD

It is understood that the award of the contract will be made on the basis of the lowest responsible Total Base Bid and Additive Bids in accordance with the "Information and Instruction to Bidders", Items K and L, and as selected by the Board of Land and Natural Resources.

It is understood and agreed that the Board of Land and Natural Resources reserves the right to reject any and/or all bids and waive any defects when, in the Board's opinion, such rejection or waiver will be for the best interest of the State of Hawaii.

In the event all bids exceed available funds certified by the appropriate fiscal officer, the head of the purchasing agency responsible for the procurement in question is authorized in situations where time or economic considerations preclude resolicitation of work of a reduced scope to negotiate an adjustment of the bid price, including changes in the bid requirements, with the low responsible and responsive bidder, in order to bring the bid within the amount of available funds. It is understood and agreed upon that the head of the purchasing agency may delete a portion or all of any item(s) in the proposal at the stated unit or lump sum price as necessary to stay within the available funding. The bidder is responsible to make an earnest effort to represent the actual cost of each item, including all materials, labor, equipment, overhead and profit in their bid proposal to preclude claims of anticipated profit or loss of profit because of an unbalanced bid proposal.

It is also understood that if a mutually agreeable cost for the reduced scope of work necessitated by a lack of available funds cannot be agreed upon between the bidder and the head of the purchasing agency within 14 calendar days after the bid opening, then the bid may be rejected in the best interest of the purchasing agency, and the head of the purchasing agency may negotiate in progressive order (lowest to highest) with the next lowest responsible and responsive bidder.

It is also understood and agreed that the award of the contract shall be conditioned upon funds being made available for this project and further upon the right of the Board of Land and Natural Resources to hold all bids received for a period of one hundred eighty (180) days from the date of the opening thereof, unless otherwise required by law, during which time no bid may be withdrawn.

It is also understood that Notice to Proceed may be delayed up to one (1) year after the bid opening date, and that no additional compensation will be provided for any claim for escalation or delay for issuance of Notice to Proceed on or before that date.

It is also understood and agreed that the quantities given herewith are approximate only and are subject to increase or decrease, and that the undersigned will perform all quantities of work as either increased or decreased, in accordance with the provisions of the Contract Specifications.

It is also understood and agreed that the estimated quantities shown for the items for which a UNIT PRICE is asked in this Proposal are only for the purpose of comparing on a uniform basis, bids offered for the work under this contract, and the undersigned agrees that he is satisfied with and will at no time, dispute said estimated quantities as a means of claims for anticipated profit or loss of profit, because of a difference between the quantities of the various classes of work done or the materials and equipment installed, and the said estimated quantities. On UNIT PRICE bids, payment will be made only for the actual number of units incorporated into the finished project at the contract UNIT PRICE.

After the HiePRO bid due date and time, the figures will be extended and/or totaled in accordance with the bid prices of the acceptable proposals and the totals will be compared. In the comparison of bids, words written in the proposal shall govern over figures and unit prices will govern over totals. Until the award of the contract, however, the right will be reserved to reject any and all proposals and to

waive any defects or technicalities as may be deemed best for the interest of the State.

It is also understood and agreed that liquidated damages in the amount of Three hundred and no/100 dollars (\$ 300.00) for each and every calendar day in excess thereof prior to completion of the contract shall be withheld from payments due to the Contractor.

It is also understood and agreed that if this bid is accepted, the successful bidder must enter into and execute a contract with the Board of Land and Natural Resources and furnish a Performance and Payment Bond, as required by law. These bonds shall conform to provisions of Section 103D-324 and 325, Hawaii Revised Statutes and any law applicable hereto.

It is also understood and agreed that the successful bidder will provide all necessary labor, materials, tools, equipment, and other incidentals necessary to do all the work and furnish all the materials specified in the contract in the manner and time herein prescribed, and according to the requirements of The Engineer as therein set forth.

It is understood that by submitting this proposal, the undersigned is declaring that his firm has not been assisted or represented on this matter by an individual who has, in a State capacity, been involved in the subject matter of this contract in the past two years.

It is understood that by submitting this proposal in accordance with HAR 3-122-192, the undersigned is declaring that the price submitted is independently arrived without collusion.

It is also understood that by submitting this proposal, a Certification for Safety and Health Programs for bids in excess of \$100,000 (in accordance with HRS 396-18), the undersigned certifies that his organization will have a written safety and health plan for this project that will be available and implemented by the Notice to Proceed date of this project. Details of the requirements of this plan may be obtained from the Department of Labor and Industrial Relations, Occupational, Safety and Health Division (HIOSH).

It is further understood and agreed that the successful bidder shall comply with paragraph 3.1.a "SUBCONTRACTING" of the General Provisions which requires that the contractor shall perform with his own organization and with the assistance of workmen under his immediate superintendence, work of a value not less than twenty percent (20%) of the value of all work embraced in the Contract, except that certain contract items of work, if specifically referred to in the special provisions, will be exempted from said twenty percent requirement.

Compliance with §103-310 HRS. As a condition of award all bidders shall comply with all laws governing entities doing business in the State, including Chapter 237 HRS (general excise tax); Chapter 383 HRS (employment security – unemployment insurance); Chapter 386 HRS (workers compensation); Chapter 392 HRS (temporary disability insurance); and Chapter 393 HRS (pre-paid health care), and shall produce all documents to the State (DLNR, Engineering Division) required to demonstrate compliance with these subsections. Any bidder making a false affirmation or certification under this subsection shall be suspended and may be debarred from further offerings or awards pursuant to §103D-702 HRS.

RECEIPT OF ADDENDA

The bidder also acknowledges receipt of any and all addenda issued by the Engineering Division, by recording the date of receipt of the respective addenda in the space provided below:

<u>Addendum</u>	<u>Date Received</u>	<u>Addendum</u>	<u>Date Received</u>
No. 1	_____	No. 5	_____
No. 2	_____	No. 6	_____
No. 3	_____	No. 7	_____
No. 4	_____	No. 8	_____

It is understood that failure to receive any such addendum shall not relieve the Contractor from any obligation under this Proposal as submitted.

It is also understood and agreed that if this Proposal is accepted and the undersigned should fail or neglect to contract as aforesaid, the Board may determine that the bidder has abandoned the Contract, and thereupon, forfeiture of the security accompanying his proposal shall operate and the same shall become the property of the Board.

JOINT CONTRACTORS OR SUBCONTRACTORS
TO BE ENGAGED ON THIS PROJECT

The Bidder agrees that the following is a complete listing of all joint contractors or subcontractors covered under Chapter 444, Hawaii Revised Statutes (HRS), who will be engaged by the Bidder on this project to perform the required work indicated pursuant to Section 103D-302, HRS. It is the sole responsibility of the contractor to review the requirements of this Project and determine the appropriate licenses that are required to complete the Project. The Bidder certifies that the completed listing of joint contractors or subcontractors fulfills the requirements for the project and the Bidder, together with the listed subcontractors or joint contractors have all the specialty contractor's licenses to complete the work, except as provided for in HRS §103D-302(b). Failure of the Bidder to comply with this requirement may be just cause for rejection of the bid.

"A" General Engineering Contractors and "B" General Building Contractors are reminded that due to the Hawaii Supreme Court's January 28, 2002 decision in Okada Trucking Co., Ltd. v. Board of Water Supply, et al., 97 Haw. 450 (2002), they are prohibited from undertaking any work, solely or as part of a larger project, which would require the general contractor to act as a specialty contractor in any area in which the general contractor has no license. Although the "A" and "B" contractor may still bid on and act as the "prime" contractor on an "A" or "B" project (See, HRS §444-7 for the definitions of an "A" and "B" project.), respectively, the "A" and "B" contractor may only perform work in the areas in which they have the appropriate contractor's license (*An "A" or "B" contractor obtains "C" specialty contractor's licenses either on its own, or automatically under HAR § 16-77-32*). The remaining work must be performed by appropriately licensed entities.

General Engineering "A" Contractors automatically have these "C" specialty contractor's licenses: C-3, C-9, C-10, C-17, C-24, C-31a, C-32, C-35, C-37a, C-37b, C-38, C-43, C-49, C-56, C-57a, C-57b and C-61.

General Building "B" Contractors automatically have these "C" specialty contractor's licenses: C-5, C-6, C-10, C-12, C-24, C-25, C-31a, C-32a, C-42a and C-42b.

In completing the Joint Contractors or Subcontractors List, describe the specialty contractor's nature and scope of work to be performed for this project and provide the complete firm name of the joint contractor or subcontractor in the respective columns. If the Bidder is a general contractor and providing the work of the required specialty contractor, fill in the Bidder's (general contractor's) name and nature and scope of work to be performed on this project.

List only one joint contractor or subcontractor per required specialty contractor's classification, unless within the same specialty, the work of each joint contractor or subcontractor can be described so that there is no overlap in work descriptions.

If a contractor's license is required by law for the performance of the work which is called for in this bid, the bidder and all subcontractors must have the required license before the submission of the bidder's proposal in the case of a non-federal aid project, and for federal-aid projects, the bidder must have the required license prior to the award of the project and all subcontractors prior to the start of the subcontracted work.

BASE BID

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

JOINT CONTRACTORS OR SUBCONTRACTORS LIST FOR THE ADDITIVE(S):

Bidder agrees that for projects with additives(s), the Bidder, joint contractor or subcontractor listed in the completed “Joint Contractors or Subcontractors List for the Additives(s)” will perform work for the respective additives.

ADDITIVE BID NO. 1

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

ADDITIVE BID NO. 2

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

ADDITIVE BID NO. 3

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

DEDUCTIVE BID NO. 1

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

Enclosed herewith is a:

- | | | | |
|----|-----------------------------|---|--------|
| 1. | Surety Bond (*1) |) | |
| 2. | Legal Tender (*2) |) | |
| 3. | Cashier's Check (*3) |) | |
| 4. | Certificate of Deposit (*3) |) | in the |
| 5. | Certified Check (*3) |) | amount |
| 6. | Official Check (*3) |) | of |
| 7. | Share Certificate (*3) |) | |
| 8. | Teller's Check (*3) |) | |
| 9. | Treasurer's Check (*3) |) | |

(Cross Out Those Not Applicable)

_____ Dollars (\$_____)

as required by law.

Respectfully submitted,

Name of Company, Joint Venture
or Partnership

Contractor's License No.

By _____
Signature (*4)

Title _____

Print Name _____

Date _____

Address _____

Telephone No. _____

E-Mail Address _____

NOTES:

1. Surety bond underwritten by a company licensed to issue bonds in this State;
2. Legal tender; or
3. A certificate of deposit; share certificate; or cashier's, treasurer's, teller's, or official check drawn by, or a certified check accepted by, and payable on demand to the State by a bank, a savings institution, or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration.
 - A. These instruments may be utilized only to a maximum of \$100,000.
 - B. If the required security or bond amount totals over \$100,000, more than one instrument not exceeding \$100,000 each and issued by different financial institutions shall be accepted.
4. Please attach to this page evidence of the authority of this officer to submit bids on behalf of the Company and also the names and residence addresses of all officers of the Company.
5. Fill in all blank spaces with information asked for or bid may be invalidated. PROPOSAL MUST BE INTACT, MISSING PAGES MAY INVALIDATE YOUR BID.

End of Proposal

SPECIAL PROVISIONS

Amend INTERIM GENERAL CONDITIONS, dated October 1994, as follows:

Section 2 – Proposal Requirements and Conditions

1. AMEND Section 2.1 Qualification of Bidder with the following:

Written Notice of Intent to Bid or Offer: A written Notice of Intent to Bid is not required for the Solicitation.

Standard Qualification Questionnaire: Bidders may be required to complete a standard qualifications questionnaire. When requested, the information shall be furnished within two working days or longer at the discretion of the Engineer. Failure to furnish the requested information within the time allowed may be grounds for a determination of non-responsibility, in accordance with HRS Section 103D-310 and HAR Section 3-122-108.

Hawaii Business or Compliant Non-Hawaii Business Requirement: Bidders shall be incorporated or organized under the laws of the State or be registered to do business in the State as a separate branch or division that is capable of fully performing under the contract, as stipulated in §3-122-112 HAR. A certified letter is not required prior to bid opening.

Compliance with §3-122-112 HAR: As a condition for award of the contract and as proof of compliance with the requirements of 103D-310(c) HRS, the apparent low bidder shall furnish the required documents to the Department. If the valid required certificates are not submitted on a timely basis for award of a contract, a bidder otherwise responsive and responsible may not receive the award. Bidder is responsible to apply for and submit the following documents to the Department.

- A. Tax Clearance (HRS Chapter 237): Bidder shall obtain a tax clearance certificate from the Hawaii State Department of Taxation (DOTAX) and the Internal Revenue Service (IRS). The certificate is valid for six months from the most recently approved stamp date on the certificate; the certificate must be valid on the date received by the Department.
- B. Department of Labor (DLIR) “Certificate of Compliance”. (HRS Chapter 383 - Unemployment Insurance, Chapter 386 - Workers’ Compensation, Chapter 392 - Temporary Disability Insurance, and 393 – Prepaid Health Care): Bidder shall obtain a certificate of compliance from the Hawaii State Department of Labor and Industrial relations (DLIR). The certificate is valid for six months from the date of issue; certificates must be valid on the date received by the Department.
- C. Department of Commerce and Consumer Affairs (DCCA), Business Registration Division (BREG) “Certificate of Good Standing”. Bidder shall obtain a certificate of good standing issued by the Department of Commerce and Consumer Affairs (DCCA), Business Registration Division (BREG). The certificate of good standing is valid for six months from the date of issue; certificates must be valid on the date received by the Department.

Hawaii Compliance Express. Alternately, instead of separately applying for these certificates at the various state agencies, bidder may choose to use the Hawaii Compliance Express (HCE), which allows businesses to register online through a simple wizard interface at <http://vendors.ehawaii.gov> to acquire a “Certificate of Vendor compliance” indicating that bidder’s status is compliant with requirements of §103D-310(c), HRS, shall be accepted for contracting and final payment purposes.

Bidders that elect to use the new HCE services will be required to pay an annual fee of \$15.00 to the Hawaii

Information Consortium, LLC (HIC). Bidders choosing not to participate in the HCE program will be required to provide the paper certificates as instructed in the previous paragraphs.

2. **ADD** Section 2.4a, Pre-Bid Conferences

Required Pre-bid Conferences: For construction and design-build projects with an estimated value of \$500,000 or more and solicited under the competitive sealed bid method (103D-302 HRS); and for construction and design-build projects with an estimated value of \$100,000 or more and solicited under the competitive sealed proposal method (103D-303 HRS); a pre-bid conference is required.

Other Pre-Bid Conferences: The Department may require a pre-bid conference for construction or design-build projects that are below the dollar threshold listed in above or when projects have special or unusual requirements.

Other Conditions: The Department may require the prospective Bidders to make a physical inspection of the project site and make attendance at the pre-bid conference a condition for submitting an offer.

Nothing stated at the pre-bid conference shall change the solicitation unless a change is made by written addendum.

3. **DELETE** Section 2.5, Addenda and Interpretations, in its entirety and replace with the following:

“Discrepancies, omissions, or doubts as to the meaning of drawings and specifications should be communicated using the question and answer section on the HIEPRO solicitation for interpretation and must be received in the time frame set in the HIEPRO solicitation. Any interpretation, if made and any supplemental instructions will be in the form of written addenda to the plans and specifications and made available prior to the offer due date. It shall be the prospective bidder’s sole responsibility to verify and obtain any said addenda. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the contract documents.”

Section 3 – Award and Execution of Contract

1. **AMEND** Section 3.3, Award of Contract, by deleting “sixty (60)” and replacing with “ninety (90)” in the first paragraph.

2. **AMEND** Section 3.3, Award of Contract, by adding the following after the first paragraph:

“If the contract is not awarded within the one hundred eighty (180) days, the Department may request the successful Bidder to extend the time for the acceptance of its bid. The Bidder may reject such a request without penalty; and in such case, the Department may at its sole discretion make a similar offer to the next lowest responsive and responsible bidder and so on until a bid is duly accepted or until the Department elects to stop making such requests.”

3. **AMEND** Section 3.9, Notice to Proceed, by replacing the last paragraph with the following:

In the event the Notice to Proceed is not issued within three hundred and sixty-five (365) calendar days after the date of bid opening, the Contractor may submit a claim for increased labor and materials costs (but not overhead costs). The claim shall be for labor and material

costs incurred after 365 days and the full duration of the contract time allowed for the performance of the work (as specified on Page P-1 of the [Bid] PROPOSAL) have elapsed. Such claims shall be accompanied with the necessary documentation to justify the claim. No payments will be made for escalation costs that are not fully justified as determined by the State.

4. **ADD** Section 3.10, Protests:

“3.10 PROTESTS—Pursuant to Section 103D-701, Hawaii Revised Statutes, an actual or prospective offeror who is aggrieved in connection with the solicitation or award may submit a protest. Any protest shall be submitting in writing to the Chairperson, Department of Land and Natural Resources, 1151 Punchbowl Street, Honolulu, Hawaii 96813, or designee as specified in the solicitation.

A protest shall be submitted in writing within five (5) working days after the aggrieved person knows or should have known the facts giving rise thereto; provided that a protest based upon the content of the solicitation shall be submitted in writing prior to the date set for receipt of offers. Further provided that a protest of an award or proposed award shall be submitted within five (5) working days after the posting of the award of the contract.

The notice of award, if any, resulting from this solicitation shall be posted on the HIEPRO website.

Section 5 – Control of Work

AMEND Section 5.8 Value Engineering Incentive by deleting “\$100,000” and replacing with “\$250,000” in the first paragraph.

Section 6 – Substitution of Materials and Equipment

ADD the following to Section 6.3 Sub-paragraph b:

4. If the substitution meets all the requirements of the specifications and plans.

Section 7 – Prosecution and Progress

1. **DELETE** Section 7.2d in its entirety and replace with the following:

“d. Proof of Insurance Coverage

A Certificate of Insurance or other documentary evidence, to the satisfaction of the Engineer, that the Contractor has in place all insurance coverage required by the contract. The Certificate of Insurance shall contain wording which identifies the Project number and Project title for which the certificate of insurance is issued. Refer to the following for insurance requirements:

1. Insurance Requirements

- (a) Obligation of Contractor** - Contractor shall not commence any work until it obtains, at its own expense, all required herein insurance. Such insurance must have the approval of the Department as to limit, form and amount and must be maintained with a company authorized by laws of the State to issue such insurance in the State of Hawaii. Coverage by a “Non-Admitted” carrier is permissible provided the carrier has a AM Best’s Rating of “A-VII” or better.

- (b) All insurance described herein will be maintained by the Contractor for the full period of the contract and in no event will be terminated or otherwise allowed to lapse prior to written certification of final acceptance of the work by the Department.
- (c) Certificate(s) of Insurance acceptable to the Department shall be filed with the Engineer prior to commencement of the work. Certificates shall identify if the insurance company is a “captive” insurance company or a “Non-Admitted” carrier to the State of Hawaii. The Best’s Rating must be stated for the “Non-Admitted” carrier. Certificates shall contain a provision that coverages afforded under the policies will not be canceled or changed until at least thirty (30) days written notice has been given to the Engineer by registered mail. The insurance policies shall name the State of Hawaii, its officers and employees as an additional insured and such coverage shall be noted on the certificate. Should any policy be canceled before final acceptance of the work by the Department, and the Contractor fails to immediately procure replacement insurance as specified, the Department, in addition to all other remedies it may have for such breach, reserves the right to procure such insurance and deduct the cost thereof from any money due to the Contractor.
- (d) Nothing contained in these insurance requirements is to be construed as limiting the extent of Contractor’s responsibility for payment of damages resulting from its operations under this contract, including the Contractor’s obligation to pay liquidated damages, nor shall it affect the Contractor’s separate and independent duty to defend, indemnify and hold the Department harmless pursuant to other provisions of this contract. In no instance will the Department’s exercise of an option to occupy and use completed portions of the work relieve the Contractor of its obligation to maintain the required insurance until the date of final acceptance of the work.
- (e) All insurance described herein shall be primary and cover the insured for all work to be performed under the contract, all work performed incidental thereto or directly or indirectly connected therewith, including traffic detour work or other work performed outside the work area, and all change order work.
- (f) The Contractor shall, from time to time, furnish the Engineer, when requested, satisfactory proof of coverage of each type of insurance required or a copy of the actual policies covering the work. Failure to comply with the Engineer’s request may result in suspension of the work, and shall be sufficient grounds to withhold future payments due the Contractor and to terminate the contract for Contractor’s default.
- (g) If the Contractor is self-insured, it shall furnish, upon the request and the satisfaction of the Engineer, any documentation to demonstrate the ability to self-insure itself. The Engineer, from time to time, can conduct an audit to determine the ability of the Contractor to be self-insured. Failure to comply with the Engineer’s request will be considered a material breach of the contract, and at the discretion of the Engineer, may be sufficient grounds to terminate the contract, suspend any work or withhold future payments.
- (h) It is the responsibility of the Contractor to notify the Department of any changes to its insurance policies or if the Contractor receives a notice of cancellation of any of its insurance policies. The Contractor will immediately provide written notice to the Department should the insurance policies evidenced on its Certificate of Insurance form be cancelled, limited in scope, or not renewed upon expiration.

2. Types of Insurance - The Contractor shall purchase and maintain insurance described below which shall provide coverage against claims arising out of the Contractor's operations under the contract, whether such operations be by the Contractor itself or by the subcontractor or by anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable.

- (a) **Worker's Compensation.** The Contractor and all subcontractors shall obtain worker's compensation insurance for all persons whom they employ or may employ in carrying out the work under this contract. This insurance shall be in strict conformity with the requirements of the most current and applicable State of Hawaii Worker's Compensation Insurance laws in effect on the date of the execution of this contract and as modified during the duration of the contract.
- (b) **Commercial General Liability.** The Contractor shall obtain General Liability insurance with a limit of not less than \$1,000,000 per occurrence and \$2,000,000 aggregate. The insurance policy shall contain the following clauses: 1) "The State of Hawaii is added as an additional insured as respects to operations performed for the State of Hawaii."; and 2) "It is agreed that any insurance maintained by the State of Hawaii will apply in excess of, and not contributed with, insurance provided by this policy." The required limit of insurance may be provided by a single policy or with a combination of primary and excess policies."
- (c) **Comprehensive Automobile Liability.** The Contractor shall obtain Auto Liability insurance covering all owned, non-owned and hired autos with a combined single Limit of not less than \$1,000,000 per accident for bodily injury and property damage. The insurance policy shall contain the following clauses: 1) "The State of Hawaii is added as an additional insured as respects to operations performed for the State of Hawaii."; and 2) "It is agreed that any insurance maintained by the State of Hawaii will apply in excess of, and not contributed with, insurance provided by this policy." The required limit of insurance may be provided by a single policy or with a combination of primary and excess policies.

Furthermore, the Contractor's commercial general liability insurance and automobile liability insurance shall include coverage for bodily injury, sickness, disease or death of any person, arising directly or indirectly out of, or in connection with, the performance of work under this contract.

The Contractor's property damage liability insurance shall provide for all damages arising out of injury to or destruction of property of others including the Department's, arising directly or indirectly out of or in connection with the performance of the work under this contract including explosion or collapse.

The Contractor shall either:

- i. Require each of its subcontractors to procure and to maintain during the life of its subcontract, subcontractors' comprehensive general liability, automobile liability and property damage liability insurance of the type and in the same amounts specified herein; or
- ii. Insure the activities of its subcontractors in its own policy.

The Contractor will be permitted, in cooperation with insurers, to maintain a self-insured

retention for up to 25% of the per occurrence combined single limits of the commercial general liability and the automobile liability policies. The existence of the self-insured retention must be noted on the certificate of insurance coverage submitted to the Department or else it will be understood that the insurer is providing first dollar coverage for all claims. For all claims within the self-insured retention amount, the rights, duties and obligations between the Contractor and the Department shall be identical to that between a liability insurer and the Department, as an additional insured, as if there was no self-insured retention.

- (d) **Builder's Risk Insurance.** Unless included in the Specifications of this project, the Contractor shall not be required to provide builder's risk insurance. If required as noted in the Specifications, builder's risk insurance shall be provided during the progress of work and until final acceptance by the Department upon completion of the contract. It shall be "All Risk" (including but not limited to earthquake, windstorm and flood damage) completed value insurance coverage on all completed work and work in progress to the full replacement value thereof. Such insurance shall include the Department as additional name insured. The insurance policy shall contain the following clauses: 1) "The State of Hawaii is added as an additional insured as respects to operations performed for the State of Hawaii."; and 2) "It is agreed that any insurance maintained by the State of Hawaii will apply in excess of, and not contributed with, insurance provided by this policy." The required limit of insurance may be provided by a single policy or with a combination of primary and excess policies.

The Contractor shall submit to the Engineer for its approval all items deemed to be uninsurable. The policy may provide for a deductible in an amount of up to 25% of the amount insured by the policy. With respect to all losses up to any deductible amount, the relationship between the Contractor and the Department shall be that of insurer and additional insured as if no deductible existed".

2. DELETE Section 7.16 in its entirety and replace with the following:

"RESPONSIBILITY FOR DAMAGE CLAIMS; INDEMNITY – The Contractor shall indemnify the State and the Department against all loss of or damage to the State's or the Department's existing property and facilities arising out of any act or omission committed in the performance of the work by the Contractor, any subcontractor or their employees and agents. Contractor shall defend, hold harmless and indemnify the Department and the State, their employees, officers and agents against all losses, claims, suits, liability and expense, including but not limited to attorneys' fees, arising out of injury to or death of persons (including employees of the State and the Department, the Contractor or any subcontractor) or damage to property resulting from or in connection with performance of the work and not caused solely by the negligence of the State or the Department, their agents, officers and employees. The State or the Department may participate in the defense of any claim or suit without relieving the Contractor of any obligation hereunder. The purchase of liability insurance shall not relieve the Contractor of the obligations described herein.

The Contractor agrees that it will not attempt to hold the State and its Departments and Agencies and their officers, representatives, employees or agents, liable or responsible for any losses or damages to third parties from the action of the elements, the nature of the work to be done under these specifications or from any unforeseen obstructions, acts of God, vandalism, fires or encumbrances which may be encountered in the prosecution of the work.

The Contractor shall pay all just claims for materials, supplies, tools, labor and other just claims against the Contractor or any subcontractor in connection with this contract and the surety bond will not be released by final acceptance and payment by the Department unless all such claims are paid or released. The Department may, but is not obligated to, withhold or retain as much of the monies due or to become due the Contractor under this contract considered necessary by the Engineer to cover such just claims until satisfactory proof of payment or the establishment of a payment plan is presented.

The Contractor shall defend, indemnify and hold harmless the State and its Departments and Agencies and their officers, representatives, employees or agents from all suits, actions or claims of any character brought on account of any claims or amounts arising or recovered under the Worker's Compensation Laws or any other law, by-law, ordinance, order or decree.

Section 8 – Measurement and Payment

1. **DELETE** Section 8.7a in its entirety and replace with the following:

- a. Tax Clearances from the State of Hawaii Department of Taxation and Internal Revenue Service, subject to section 103D-328, HRS, current within two months of issuance date indicating that all delinquent taxes levied or accrued under State Statutes against the contractor have been paid.

2. **ADD** Section 8.7d, Certificate of Compliance:

- d. A Certification from the Contractor affirming that the Contractor has, as applicable, remained in compliance with all laws as required by Section 103D-310, HRS, and Section 3-122-112, HAR. A contractor making a false affirmation shall be suspended and may be debarred pursuant to section 103D-702, HRS.

1. Certification of Compliance for Final Payment, State Procurement Office Form-22. Must be Signed Original.

3. **ADD** Section 8.7e, Hawaii Compliance Express:

- e. In lieu of submitting the tax clearances from Taxation and IRS, and SPO Form -22, the Contractor may choose to use the Hawaii Compliance Express as described on page SP-1 of this Special Provisions.

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DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01019

GENERAL SPECIFICATIONS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work shall consist of furnishing all labor, tools, materials and equipment necessary and required to construct in place complete all work as indicated on the drawings and as specified herein.

1.2 GENERAL

- A. Examination of Premises: The Contractor shall contact The State and obtain permission before visiting the site.
- B. All lines and grades shall be established by a licensed surveyor , or licensed Civil Engineer, registered in the State of Hawaii. The Contractor shall submit evidence of current and valid registration.
- C. Notices: The Contractor shall notify The State and give at least three (3) working days notice before starting any work.
- D. Disruption of Utility Services: All work related to the temporary disconnection of electrical system shall be pre-arranged with The State so that any disruption of such services will be kept to a minimum. In the event temporary power hook-up is required, the Contractor shall provide the necessary services.
- E. Contractor's Operations
 - 1. The Contractor must employ, insofar as possible, such methods and means of carrying out the work so as not to cause any interruption or interference to the facility's operations. Where the Contractor's operations would result in interruptions which would hamper the operations of the facilities, the Contractor shall rearrange the schedule of work accordingly.
 - 2. The Contractor shall maintain safe passageway to and from the facility for the user agency personnel and the public at all times.
- F. Lead Paint
 - 1. When the project includes paint to be disturbed that was applied prior to 1980, it shall be assumed to contain lead. The Contractor shall inform its employees, subcontractors, and all other persons engaged in the project that lead containing paints are present in the existing buildings at the job site and to follow the requirements of the Department of Labor

and Industrial Relations, Division of Occupational Safety and Health, Title 12, Subtitle 8, Chapter 148, Lead Exposure in Construction, Hawaii Administrative Rules (Chapter 12-148, HAR).

G. Parking Policy for Contractor

1. The Contractor and its employees will not be allowed to park in zones assigned to facility personnel.
2. Areas to be used by the Contractor shall be as designated by The State. Any lawn damaged by the Contractor shall be restored as instructed by The State at no cost to the State.

H. Toilet Accommodations: The Contractor may use the existing toilet facilities if so designated by The State; however, it is the Contractor's responsibility to keep same clean and in a sanitary condition at all times.

I. Protection of Property: The Contractor shall continually maintain adequate protection of all its work from damage and shall protect all property, including but not limited to buildings, equipment, furniture, grounds, vegetation, material, utility systems located at and adjoining the job site. The Contractor shall repair, replace or pay the expense of repair of damages resulting from its operations.

J. Use of Power Driven Equipment: The Contractor is cautioned to take all necessary safety precautions to protect the facility personnel, and the public whenever power driven equipment is used.

K. Safety: The Contractor shall carefully read and strictly comply with the requirements of the Hawaii Occupational Safety and Health Law, Chapter 396, Hawaii Revised Statutes, as amended, is applicable and made a part of the Contract.

L. Clean Up Premises: The Contractor shall clean up and remove from premises all debris accumulated from operations as necessary or as directed. See also Section 7.25 of the General Conditions.

M. Responsibility

1. The State will hold the Contractor liable for all the acts of Subcontractors and shall deal only with the prime Contractor in matters pertaining to other trades employed on the job. The Contractor shall be responsible for coordinating the work of all trades on the job.
2. Should the Contractor discover any discrepancy in the plans or specifications, the Contractor shall immediately notify The State before proceeding any further with the work, otherwise, the Contractor will be held responsible for any cost involved in correction of work placed due to such discrepancy.

N. Cooperation With Other Contractors: The State reserves the right at any time to contract for or otherwise perform other or additional work within the contract zone limits of this Contract. The Contractor of this project shall, to the extent ordered by the State, conduct its work so as

not to interfere with or hinder the progress or completion of the work performed by other contractors.

- O. Division of the Work: The Divisions and Sections into which these Specifications are divided shall not be considered an accurate or complete segregation of work by trades. This also applies to all work specified within each Section.

P. Drawings and Specifications

1. The Contractor shall not make alterations in the drawings and specifications. In the event the contractor discovers any errors or discrepancies, the Contractor shall immediately notify The State in accordance with the General Conditions.
2. Where devices, or items, or parts thereof are referred to in the singular, it is intended that such reference shall apply to as many such devices, items or parts as are required to properly complete the work.
3. Specifications and drawings are prepared in abbreviated form and include incomplete sentences. Omission of words or phrases such as "the Contractor shall", "as shown on the drawings", "a", "an", and "the" are intentional. Omitted words and phrases shall be provided by inference to form complete sentences.

Q. Required Submittals

1. Required submittals as specified in the Technical Sections of these specifications include one or more of the following: Shop drawings; color samples; material samples; technical data; schedules of materials; schedules of operations; guarantees; operating and maintenance manuals; and as-built drawings.
2. The Contractor shall make a comprehensive list of the required submittals, by Specification Section, and submit this list to The State within 15 days after notice to proceed.
3. As-Built Drawings: When as-built drawings are required for submittal, the following shall apply:
 - a. As-built drawings, the intent of which is to record the actual in-place construction so that any future renovations or tie-ins can be anticipated accurately, shall be required.
 - b. All deviations from alignments, elevations and dimensions which are stipulated on the plans shall be recorded in red on the as-built drawings.
 - c. The following procedure shall be followed:
 1. Immediately after these changes are constructed in place, the Contractor shall record them on the field office plans.
 2. Within two weeks after final inspection of the project, the Contractor shall transfer the changes marked on the field office plans onto a clean copy of plans using a red pencil. Any deletions shall be so noted and redrawn as necessary. The Contractor

shall stamp or mark the tracings "AS-BUILT", and also sign and date each drawing so marked.

3. The Contractor shall submit the as-built drawings to The State for review and approval. After The State approves the as-built drawings, the Contractor shall submit an electronic copy in Adobe PDF format on CD ROM.
4. Any as-built drawing which The State determines does not accurately record the deviation shall be corrected by the State, and the Contractor shall be charged for the services.

END OF SECTION

SECTION 01090

STANDARD REFERENCES

PART 1 - GENERAL

Wherever used in the project, the following abbreviations will have the meanings listed:

<u>Abbreviation</u>	<u>Company</u>
AA	Aluminum Association Incorporated 818 Connecticut Avenue, N.W. Washington, D.C. 20006
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, N.W., Suite 225 Washington, D.C. 20001
ACI	American Concrete Institute P.O. Box 19150 Detroit, MI
AEIC	Association of Edison Illuminating Companies 51 East 42nd Street New York, NY 10017
AFBMA	Anti-Friction Bearing Manufacturer's Association 60 East 42nd Street New York, NY 10017
AGA	American Gas Association 8501 East Pleasant Valley Road Cleveland, OH 44131
AGMA	American Gear Manufacturer's Association 1330 Massachusetts Avenue, N.W. Washington, D.C.
AISC	American Institute of Steel Construction 101 Park Avenue New York, NY 10017
AISI	American Iron and Steel Institute 1000 16th Street, N.W. Washington, D.C. 20036

<u>Abbreviation</u>	<u>Company</u>
AITC	American Institute of Timber Construction 333 West Hampden Avenue Englewood, CO 80110
AMCA	Air Moving and Conditioning Association, Inc. 30 West University Drive Arlington Heights, IL 60004
ANSI	American National Standards Institute, Inc. 1430 Broadway New York, NY 10018
APA	American Plywood Association 1119 A Street Tacoma, WA 98401
API	American Petroleum Institute 1801 K Street N.W. Washington, DC 20006
ARI	Air-Conditioning and Refrigeration Institute 1814 North Fort Myer Drive Arlington, VA 22209
ASCE	American Society of Civil Engineers 345 East 47th Street New York, NY 10017
ASCII	sAmerican Standard Code for Information Interchange United States of America Standards Institute 1430 Broadway New York, NY 10018
ASE Code	American Standard Safety Code for Elevators, Dumbwaiter and Escalators American National Standards Institute 1430 Broadway New York, NY 10018
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers United Engineering Center 345 East 47th Street New York, NY 10017

<u>Abbreviation</u>	<u>Company</u>
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWPA	American Wood Preservers Association 1625 Eye Street Washington, DC 20006
AWS	American Welding Society 2501 N.W. 7th Street Miami, FL 33125
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
CBM	Certified Ballast Manufacturers 2120 Keith Building Cleveland, OH 44115
CMAA	Crane Manufacturers Association of America, Inc. (Formerly called: Overhead Electrical Crane Institute - OECI) 1326 Freeport Road Pittsburgh, PA 15238
CRSI	Concrete Reinforcing Steel Institute 180 North La Salle Street Chicago, IL 60601
CSA	Canadian Standards Association 178 Rexdale Boulevard Rexdale, Ontario, M9W 1R3, Canada
DEMA	Diesel Engine Manufacturer's Association 122 East 42nd Street New York, NY 10017
DIS	Division of Industrial Safety California Department of Industrial Relations 2422 Arden Way Sacramento, CA 95825

<u>Abbreviation</u>	<u>Company</u>
EEI	Edison Electric Institute 90 Park Avenue New York, NY 10016
EIA	Electronic Industries Association 2001 Eye Street N.W. Washington, DC 20006
EJMA	Expansion Joint Manufacturer's Association 331 Madison Avenue New York, NY 10017
ESO	Electrical Safety Orders, California Administrative Code, Title 8, Chap. 4, Subarticle 5 Office of Procurement, Publications Section P.O. Box 20191 8141 Elder Creek Road Sacramento, CA 95820
FEDSPEC	Federal Specifications General Services Administration Specification and Consumer Information Distribution Branch Washington Navy Yard, Bldg. 197 Washington, DC 20407
FEDSTDS	Federal Standards (see FEDSPECS)
FM	Factory Mutual Research 1151 Boston-Providence Turnpike Norwood, MA 02062
HEI	Heat Exchange Institute 122 East 42nd Street New York, NY 10017
HI	Hydraulic Institute 1230 Keith Building Cleveland, OH 44115
IAPMO	International Association of Plumbing and Mechanical Officials 5032 Alhambra Avenue Los Angeles, CA 90032

<u>Abbreviation</u>	<u>Company</u>
ICBO	International Conference of Building Officials 5360 South Workman Mill Road Whittier, CA 90601
ICEA	Insulated Cable Engineers Association P.O. Box P South Yarmouth, MA 02664
IEEE	Institute of Electrical and Electronics Engineers, Inc. 345 East 47th Street New York, NY 10017
IES	Illuminating Engineering Society C/O United Engineering Center 345 East 47th Street New York, NY 10017
ISA	Instrument Society of America 400 Stanwix Street Pittsburgh, PA 15222
JIC	Joint Industrial Council 7901 Westpark Drive McLean, VA 22101
MILSPEC	Military Specifications Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. 127 Park Street, N.E. Vienna, VA 22180
NAAMM	National Association of Architectural Metal Manufacturers 100 South Marion Street Oak Park, IL 60302
NACE	National Association of Corrosion Engineers P.O. Box 986 Katy, TX 77450
NEC	National Electric Code National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210

<u>Abbreviation</u>	<u>Company</u>
NEMA	National Electrical Manufacturer's Association 155 East 44th Street New York, NY 10017
NESC	National Electric Safety Code American National Standards Institute 1430 Broadway New York, NY 10018
NFPA	National Forest Products Association (Formerly called: National Lumber Manufacturer's Association) 1619 Massachusetts Avenue, N.W. Washington, DC 20036
OSHA	Occupational Safety and Health Act U.S. Department of Labor San Francisco Regional Office 450 Golden Gate Avenue, Box 36017 San Francisco, CA 94102
PPIC	The Plumbing & Piping Industry Council, Inc. Suite 402 510 Shatto Place Los Angeles, CA 90020
SAE	Society of Automotive Engineers 2 Pennsylvania Street New York, NY 10001
SAMA	Scientific Apparatus Makers Association One Thomas Circle Washington, DC 20005
SBCC	Southern Building Code Congress 1116 Brown-Marx Building Birmingham, AL 35203
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc. 8224 Old Courthouse Road Tysons Corner Vienna, VA 22180
SSPWC	Standard Specifications for Public Works Construction Building News, Inc. 3055 Overland Avenue Los Angeles, CA 90034

<u>Abbreviation</u>	<u>Company</u>
TEMA	Tubular Exchanger Manufacturer's Association 331 Madison Avenue New York, NY 10017
UBC	Uniform Building Code Published by ICBO
UL	Underwriters Laboratories Inc. 207 East Ohio Street Chicago, IL 60611
UMC	Uniform Mechanical Code Published by ICBO
UPC	Uniform Plumbing Code Published by IAPMO
USBR	Bureau of Reclamation U.S. Department of Interior Engineering and Research Center Denver Federal Center, Building 67 Denver, CO 80225
WWPA	Western Wood Products Association (Formerly called: West Coast Lumberman's Association - WCLA) Yeon Building Portland, CA 97204

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01100

ARCHAEOLOGICAL PROTECTION

PART 1 - GENERAL

- 1.1 This section covers the requirements for the protection and preservation of historical sites and values.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

- 3.1 CONSTRUCTION METHOD: Representatives of the State will from time to time examine the area as work proceeds. If historical values are noted, the State may order a halt to the work in the vicinity of the historical values until the State can examine further. The Contractor shall notify the State if he finds anything he suspects to be of historic significance and shall discontinue further work in the vicinity of the find until the State can examine the area. In either case, further work in the vicinity of such historical or suspected historical values may proceed only upon approval by the State. Such approval can be normally expected within one week and shall in no case require more than one month.

END OF SECTION

SECTION 01230

ADDITIVE AND DEDUCTIVE BID ITEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for alternates.
- B. The description of alternates is not intended to give a detailed description of all additional or deductive work required by the alternate item(s), as only the principal features of such additional or deductive work are listed.
- C. Should any one or all of the alternates become a part of the contract, the cost of all additional or deductive work required by the alternate item(s), even though not specifically mentioned herein, are included in the lump sum bid price.

1.2 DEFINITIONS

- A. Alternate: An amount proposed by Bidders (Offerors) and stated on the Bid Form for certain work defined herein that may be added to or deducted from the Total Lump Sum Bid Price amount if State decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Total Lump Sum Bid Price.

1.3 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into the Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 SCHEDULE OF ALTERNATIVES

- A. Additive Bid No. 1: Bollards at the utility pole.
- B. Additive Bid No. 2: High Density Storage System.
- C. Additive Bid No. 3: All work involved with the installation of a photovoltaic system including the PV disconnect switch next to the electrical meter.
- D. Deductive Bid No. 1: Cesspool closure. If no cesspool is located as indicated on the drawings, the Deductive Bid No. 1 shall be authorized.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.1 SUBMITTALS

A. Shop drawings shall be required for:

1. Division 01 – General Requirements
2. Division 02 – Site Construction
3. Division 03 - Concrete
4. Division 04 - Masonry
5. Division 05 – Metals
6. Division 06 – Wood and Plastics
7. Division 07 – Thermal and Moisture Protection
8. Division 08 – Doors and Windows
9. Division 09 – Finishes
10. Division 10 – Specialties
11. Division 12 - Furnishings
12. Division 13 – Special Construction
13. Division 15 – Mechanical
14. Division 16 – Electrical
15. Any others as called for in the plans, specifications or by The State.

B. Other required submittals shall include:

1. Product Data.
2. Installer Qualifications.
3. Owner & Maintenance Manual.

4. Certificate.

5. Warranty.

6. Any others as called for in the plans, specifications, or by The State.

1.2 BIDDER'S SPECIAL RESPONSIBILITY FOR COORDINATING CONTRACTUAL WORK AND SUBMITTALS:

A. The Contractor is responsible for the coordination of all contractual work and submittals.

B. The Contractor shall have a rubber stamp made up in the following format:

CONTRACTOR NAME

PROJECT: _____

JOB NO: _____

THIS SUBMITTAL HAS BEEN CHECKED BY THIS GENERAL CONTRACTOR. IT IS CERTIFIED CORRECT, COMPLETE, AND IN COMPLIANCE WITH CONTRACT DRAWINGS AND SPECIFICATIONS. ALL AFFECTED CONTRACTORS AND SUPPLIERS ARE AWARE OF, AND WILL INTEGRATE THIS SUBMITTAL INTO THEIR OWN WORK.

DATE RECEIVED _____

SPECIFICATION SECTION _____

SPECIFICATION PARAGRAPH _____

DRAWING NUMBER _____

SUBCONTRACTOR NAME _____

SUPPLIER NAME _____

MANUFACTURER NAME _____

CERTIFIED BY: _____

C. This stamp, "filled in", should appear on the title sheet of each shop drawing, on a cover sheet of submittals in an 8-1/2" x 11" format, or on one face of a cardstock tag (min. 3" x 6") tied to each sample. The tag on the samples should state what the sample is so that, if the tag is accidentally separated from the sample, it can be matched up again. The back of this tag will be used by The State for his receipt, review, and log stamp and for any comments that relate to

the sample.

- D. All submittals for material, equipment, and shop drawings listed in the contract documents, including dimensioned plumbing shop drawings, shall be required and shall be reviewed by The State, prior to any ordering of materials and equipment.
- E. Unless otherwise noted, the Contractor shall submit to The State for his review eight copies of all shop drawings, piping layout, and/or catalog cuts for fabricated items and manufactured items (including mechanical and electrical equipment) required for the construction. Drawings shall be submitted in sufficient time to allow The State not less than twenty regular working days for examining the drawings.
- F. The drawing shall be accurate, distinct, and complete and shall contain all required information, including satisfactory identification of items, units and assemblies in relation to the contract drawings and specifications.
- G. Unless otherwise approved by The State, shop drawings shall be submitted only by the Contractor, who shall indicate by a signed stamp on the drawings or other approved means that the Contractor has checked the shop drawings and that the work or equipment shown is in accordance with contract requirements and has been checked for dimensions and relationship with work of all other trades involved. All deviations from the plans and specifications shall be listed. The practice of submitting incomplete or unchecked shop drawings for The State to correct or finish will not be acceptable, and shop drawings which, in the opinion of The State, clearly indicate that they have not been checked by the Contractor will be considered as not complying with the intent of the contract documents and will be returned to the Contractor for resubmission in the proper form.
- H. When the shop drawings have been reviewed by The State, two sets of submittals will be returned to the Contractor appropriately stamped. If major changes or corrections are necessary, the drawing may be rejected and one set will be returned to the Contractor with such changes or corrections indicated, and the Contractor shall correct and resubmit eight copies of the drawings, unless otherwise directed by The State. No changes shall be made by the Contractor to the resubmitted shop drawings other than those changes indicated by The State. The resubmittal shall be so indicated on the shop drawing.
- I. The review of such drawings and catalog cuts by The State shall not relieve the Contractor from responsibility for correctness of the dimensions, fabrication details, and space requirements or for deviations from the contract drawings and specifications, unless the Contractor has called attention to such deviations, in writing, by a letter accompanying the drawings and The State approved the change or deviations, in writing, at the time of submission; nor shall review by The State relieve the Contractor from the responsibility for errors in the shop drawings. When the Contractor does call such deviations to the attention of The State, he shall state in his letter whether or not such deviations involve any deduction or extra cost adjustment.
- J. The approval of the above drawings, lists, prints, specifications, or other data shall in no way release the Contractor from his responsibility for the proper fulfillment of the requirements of this contract nor for fulfilling the purpose of the installation nor from his liability to replace the

same should it prove defective or fail to meet the specified requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

Section No. – Title	Shop Drawings & Diagrams	Samples	Certificates (Material, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature and Brochures	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-Built Drawings	Others	Qualification Data	Manufacturer's Guaranty or Warranty
01450 – Moisture Vapor and Alkalinity Testing							■	■							■	
02050 – Demolition														■		
02200 – Earthwork			■	■			■	■								
02225 – Trenching and Backfilling			■	■			■	■						■		
02361 – Termite Control			■	■			■					■			■	■
02362 – Soil Treatment for Vegetation Control			■	■	■									■		
02500 – Concrete Curbs			■				■							■		
02510 – Water Distribution	■		■	■												■
02530 – Sanitary Sewerage			■				■									■

Section No. – Title	Shop Drawings & Diagrams	Samples	Certificates (Material, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature and Brochures	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-Built Drawings	Others	Qualification Data	Manufacturer's Guaranty or Warranty
02580 – Pavement Markings			■	■	■											
02600 – Storm Drainage System			■	■												■
02740 – Flexible Pavement			■	■	■		■							■		
02810 – Irrigation System									■		■		■	■		■
02820 – Chain Link Fences and Gates	■		■	■			■		■						■	■
02930 – Exterior Plants											■			■		
03300 – Cast-in-Place Concrete	■		■	■										■		
04810 – Unit Masonry Assemblies	■	■	■	■			■			■				■	■	
05120 – Structural Steel Framing	■		■	■			■								■	
05310 – Steel Decking	■		■	■			■									
06070 – Wood Treatment			■	■	■											■
06100 – Rough Carpentry			■	■			■							■		
06160 – Sheathing				■			■									■

Section No. – Title	Shop Drawings & Diagrams	Samples	Certificates (Material, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature and Brochures	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-Built Drawings	Others	Qualification Data	Manufacturer's Guaranty or Warranty
06402 – Interior Architectural Woodwork	■	■	■	■											■	■
07210 – Building Insulation				■	■											■
07242 – Direct-Applied Finish System	■	■		■			■		■		■			■	■	■
07540 – Thermoplastic Membrane Roofing	■		■	■			■		■						■	■
07620 Sheet Metal Flashing and Trim	■	■		■					■						■	■
07841 – Penetration Fire stopping			■	■			■								■	■
07920 – Joint Sealants		■		■												■
08113 – Hollow Metal Doors and Frames	■			■												■
08120 – Aluminum Doors and Frames	■		■	■		■	■		■		■			■	■	■
08200 – Flush Wood Doors	■	■		■												■
08411 – Aluminum Framed Storefront	■		■	■		■	■		■					■	■	■
08520 – Aluminum Windows	■		■	■		■	■		■					■	■	■

Section No. – Title	Shop Drawings & Diagrams	Samples	Certificates (Material, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature and Brochures	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-Built Drawings	Others	Qualification Data	Manufacturer's Guaranty or Warranty
08620 – Tubular Daylighting Device	■			■			■								■	■
08710 – Door Hardware				■			■		■		■	■			■	■
08800 - Glazing			■	■			■				■				■	■
08900 – Louvers and Vents	■			■			■							■	■	■
09221 – Non-Structural Metal Framing				■												■
09290 – Gypsum Board				■												■
09300 - Tiling		■		■											■	■
09511 – Acoustical Panel Ceiling	■	■	■	■			■		■						■	■
09651 – Resilient Flooring		■		■					■		■				■	■
09673 – Resinous Flooring		■		■	■				■						■	■
09900 - Painting		■	■	■	■			■	■		■			■	■	■
10676 – Motorized Mobile Storage Shelving	■	■		■							■			■	■	■
10711 – Exterior Sun Control Device	■	■		■		■									■	■
10800 Washroom Accessories				■					■		■					■
12492 – Manual Roller Shades		■		■					■		■				■	■

Section No. – Title	Shop Drawings & Diagrams	Samples	Certificates (Material, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature and Brochures	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-Built Drawings	Others	Qualification Data	Manufacturer's Guaranty or Warranty
13281 – Removal and Disposal of Asbestos	■	■	■	■			■	■		■	■			■	■	
13282 – Lead-Containing Paint Control Measures			■	■	■			■		■				■	■	
13284 – Removal and Disposal of Mercury Containing Lamps			■				■	■						■	■	
13286 – Removal and Disposal of Arsenic-Containing Materials				■	■		■	■						■	■	
13288 – Testing Air Monitoring											■			■		
15000 – General Mechanical Requirements	■		■	■			■		■	■	■		■	■		■
15400 - Plumbing	■		■	■									■			■
15800 – Air Conditioning and Ventilation	■		■	■					■	■			■	■		■
15950 – HVAC Testing/Adjusting Balancing							■			■			■	■	■	
16100 – Basic Materials and Methods	■			■			■		■	■			■			
16400 – Service and Distribution	■			■						■						■
16500 - Lighting				■						■				■		■

Section No. – Title																			
	Shop Drawings & Diagrams																		
	Samples																		
	Certificates (Material, Treatment, Applicator, etc.)																		
	Product Data, Manufacturer's Technical Literature and Brochures																		
	MSDS Sheets																		
	Calculations																		
	Reports (Testing, Maintenance, Inspection, etc.)																		
	Test Plan																		
	O & M Manual																		
	Equipment or Fixture Listing																		
	Schedules (Project Installation)																		
	Maintenance Service Contract																		
	Field Posted As-Built Drawings																		
	Others																		
	Qualification Data																		
	Manufacturer's Guaranty or Warranty																		

END OF SECTION

SECTION 01450

MOISTURE VAPOR AND ALKALINITY TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes additional administrative and procedural requirements for quality assurance.
- B. SPECIFIER'S NOTE: Confirm that testing is required for suspended slabs on remodeling projects. Modify paragraph 1.01 B. accordingly. Generally the Painting Section covers requirements to testing concrete surfaces. Include testing requirements if special conditions exist.
- C. Scope of Work
 - 1. Provide concrete moisture vapor emission and alkalinity testing of all concrete scheduled to receive floor coverings, Portland cement toppings, Portland cement underlayments or resinous coatings.
 - 2. Test concrete placed below, on and above grade.
 - 3. Test concrete surfaces scheduled to receive paint or coatings.

1.2 RELATED SECTIONS

- A. Section 03300 "Cast-In-Place-Concrete."
- B. Section 09651 "Resilient Flooring."
- C. Section 09673 "Resinous Flooring."
- D. Section 09900 "Painting."

1.3 REFERENCES

- A. ASTM F 1869 - Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- B. ASTM F 710 - Standard Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.

1.4 SUBMITTALS

- A. Testing Agency qualifications.

- B. Report all test results in chart form listing test dates, start/stop time, start/stop weight, weight gain in grams, moisture vapor emission value and alkalinity levels.
- C. List test locations on chart and show same on 8-1/2 inch x 11-inch site map (when such map is made available to testing agency).
- D. Deliver results for distribution to Contracting Officer and General Contractor. Furnish 3 copies to the Contracting Officer.

1.5 QUALITY ASSURANCE

- A. Independent Testing Agency or Manufacturer's Approved Contractor
 - 1. Certified by Test Kit Manufacturer for product use.
 - 2. Other agency with verifiable experience.
- B. Commercially produced Moisture Vapor Emission Test Kits
 - 1. Test dish including calcium chloride must be commercially packaged and delivered to test site in sealed factory wrapping.
 - 2. Test done from same source as dish.
 - 3. Test kit must comply with ASTM standards of size and weight.
- C. Wide range pH paper, and distilled or de-ionized water.

1.6 ENVIRONMENTAL CONDITIONS

- A. Testing shall take place after allowing concrete to dry for a minimum of 90 days. Testing to be scheduled no less than 1 nor more than 3 weeks prior to scheduled flooring installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Calcium Chloride Test as manufactured by Vaprecision (800) 449-6194, or equal.
- B. Alkalinity test paper as manufactured by Micro Essential Laboratory, or equal.

PART 3 - EXECUTION

3.1 Quantification of Concrete Moisture Vapor Emission

- A. Test concrete floors in accordance with ASTM F 1869.

- B. The test site shall be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperatures and humidity levels shall be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions shall be 75+ 10 degrees F and 50+ 10 percent relative humidity. When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with the test report.
- C. The number of vapor emission test sites is determined by the square footage of the facility. The minimum number of tests to be placed is equal to 3 in the first 600 square feet and one per each additional 200 square feet. For slabs on grade, locate additional tests adjacent to penetrations and through slab joints at the rate of one per 200 square feet.
- D. Tests sites are to be cleaned of all adhesive residue, curing compounds, paints, sealers, floor coverings, and similar materials 24 hours prior to the placement of test kits.
- E. Weigh test dish on site prior to start of test. Scale must report weight to 0.1 gram. Record weight and start time.
- F. Expose Calcium Chloride and set dish on concrete surface.
- G. Install test containment dome and allow test to proceed for 60 - 72 hours.
- H. Retrieve test dish by carefully cutting through containment dome. Close and reseal test dish.
- I. Weigh test dish on site recording weight and stop time.
- J. Calculate and report results as “pounds of emission per 1,000 square feet per 24 hours”.

2.2 Quantifying ALKALINITY level

- A. Test concrete floors in accordance with ASTM F 710.
- B. At each vapor emission test site, after removal of test containment dome, perform alkalinity test.
 - 1. Place several drops of water onto the concrete surface to form a puddle approximately one-inch in diameter.
 - 2. Allow the water to set for approximately 60 seconds.
 - 3. Dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine alkalinity reading.
- C. Record and report all results.

END OF SECTION

SECTION 01505

MOBILIZATION AND DEMOBILIZATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Description: This section covers the requirements for mobilization and demobilization.

1.2 MOBILIZATION: Mobilization shall consist of the transporting, assembling, constructing, installing, and making ready for use at the job site, all the equipment, machinery, structures, utilities, materials, labor, and incidentals necessary to do the work covered by this contract.

1.3 DEMOBILIZATION: Demobilization shall consist of the dismantling and removal of the above-mentioned equipment, machinery, structures, utilities, materials, and incidentals, and the cleaning up of the site.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GUIDELINES: If the Contractor utilizes private lands other than the sites provided by the Department for mobilization purposes, the provisions of this section shall apply, and the mobilization and demobilization work on said private lands shall be in accordance with the agreement between the Contractor and the land owner.

Any and all additional mobilization or demobilization costs in excess of the maximum amounts specified in the Proposal shall be included in the appropriate unit prices bid in the Proposal. The Contractor shall not receive any compensation for mobilization and demobilization in addition to those specified in the Proposal.

All equipment, machinery, buildings, utilities and incidentals mobilized and demobilized under this section shall remain the property of the Contractor.

END OF SECTION

SECTION 01530

BARRICADES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Description. This work shall consist of furnishing, installing and maintaining barricades in accordance with the requirements of the contract.
- B. Barricade application shall be provided for in the latest edition of the FHWA publication, Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), and as amended.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Lumber: Lumber for rails, frames and braces shall be dry, sound, undamaged, well seasoned, and free from any defect which may impair their strength and durability.
- B. Hardware: Nails shall be galvanized wire nails. As many and as large a size as is practicable shall be used.
- C. Paints: Paints shall be exterior enamel paint of the best grade or first line as made by approved manufacturers.
- D. Sheet Reflecting Material: Sheet reflecting material shall conform to the applicable requirements of Subsection 712.20(C) of the "Standard Specifications for Road and Bridge Construction".
- E. Alternate Designs: Alternate barricade designs such as plastic molded barricades may be used subject to The State's approval. The Contractor shall submit shop drawings or catalog cuts for approval.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. General: Barricades shall be constructed in a first class, workmanlike manner in accordance with details shown on the plans and as specified herein.

Barricades shall be in good condition and approved by The State for use within the project limits. Barricade application and installation shall be as shown on the plans and as directed by The State in accordance with the guidelines provided in the latest edition of the FHWA publication, Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), and any amendments or revisions thereof as may be made from time to time.

Sand bags or other approved weights shall be provided where required or as directed by The State. Sand bags or other approved weights shall not be placed on any striped barricade rail.

Steady burn and/or flashing lamps shall be required on selected barricades used during hours of darkness. Locations shall be as shown on the plans and as directed by The State. Lamps shall be attached on the barricade ends closest to the traveled way and shall be visible to the motorist.

Barricades furnished and paid for as provided for as provided herein may be used for temporary detours, construction phasing, or other temporary traffic control work.

Barricades furnished and paid for use in temporary detours or construction phasing may be used for permanent location called for on the plans.

Upon completion of the construction work, barricades shall be left in place, relocated, or removed and disposed of as shown on the plans or as directed by The State. Barricades left in place, or relocated to new permanent locations shall become the property of the State. Barricades directed to be removed and disposed of shall become the property of the Contractor.

- B. Painting: Wooden rails, frames and braces shall be given a prime coat and 2 finish coats of new white exterior enamel paint. Rail faces to be reflectorized may be left unpainted unless otherwise specified or directed.
- C. Reflectorization: Reflectorization of barricade rails shall be done in a first class, workmanlike manner and the attachment of reflective sheeting shall be as shown on the plans, specified herein, or as directed and approved by The State.

Both vertical faces of each barricade rail shall be reflectorized as shown on the plans.

Wooden rails shall be reflectorized with one of the following:

- 1. Reflective sheeting specified in Subsection 712.20(C)(4) of the "Standard Specifications for Road and Bridge Construction" and backed with a 26 gage galvanized steel sheet, or
- 2. a hardened aluminum backed reflective sheeting as specified in Subsection 712.20(C)(5) of the "Standard Specifications for Road and Bridge Construction."

- D. Color: Rails, frames and braces shall be white.

The front and back faces of barricade rails shall have 6-inch wide alternative colored and white striped sloping downward toward the traveled way at an angle of 45 degrees with the vertical. The colored stripes shall be either orange or red in accordance with the following requirements:

1. Orange and white stripes shall be used in the following conditions:
 - a. Construction work.
 - b. Detours.
 - c. Maintenance work.
 2. Red and white stripes shall be used in the following conditions:
 - a. On roadways with no outlet (ie. dead-ends, cul-de-sacs).
 - b. Ramps or lanes closed for operational purposes.
 - c. Permanent or semipermanent closure or termination of a roadway.
- E. Maintenance: Barricades shall be kept in good condition throughout their usage during construction until the end of the contract.
- F. The Contractor shall repair, repaint, clean or replace the barricades as required and as directed by The State to maintain their effectiveness and appearance.

The Constructor shall immediately replace all lost, stolen or damaged barricades, lamps, sand bags and other approved weights.

Barricades used during construction phasing, temporary detours or other temporary traffic control work shall be cleaned and repaired as necessary, prior to being relocated to a permanent location shown on the plans or as directed.

No extra payment will be made for any repair work, repainting, or cleaning of barricades. The State shall determine the suitable condition of each barricade and shall determine when each barricade shall be repaired, repainted or cleaned.

END OF SECTION

SECTION 01567

POLLUTION CONTROL

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Rubbish Disposal

1. No burning of debris and/or waste materials shall be permitted on the project site.
2. No burying of debris and/or waste material except for materials which are specifically indicated elsewhere in these specifications as suitable for backfill shall be permitted on the project site.
3. All unusable debris and waste material shall be hauled away to an appropriate off-site dump area. During loading operations, debris and waste materials shall be watered down to allay dust.
4. No dry sweeping shall be permitted in cleaning rubbish and fines which can become airborne from floors or other paved areas. Vacuuming, wet mopping or wet or damp sweeping is permissible.
5. Enclosed chutes and/or containers shall be used for conveying debris from above to ground floor level.
6. Clean-up shall include the collection of all waste paper and wrapping materials, cans, bottles, construction waste materials and other objectionable materials, and removal as required. Frequency of clean-up shall coincide with rubbish producing events.

B. Dust

1. The Contractor shall prevent dust from becoming airborne at all times including non-working hours, weekends and holidays in conformance with the State Department of Health, Administrative Rules, Title 11, Chapter 60 - Air Pollution Control.
2. The method of dust control and costs shall be the responsibility of the Contractor. Methods of dust control shall include the use of water, chemicals or asphalt over surfaces which may create airborne dust.
3. The Contractor shall be responsible for all damage claims in accordance with Section 7.16 - "Responsibility for Damage Claims" of the GENERAL CONDITIONS.

C. Noise

1. Noise shall be kept within acceptable levels at all times in conformance with the State Department of Health, Administrative Rules, Title 11, Chapter 46 - Community Noise Control for Oahu. The Contractor shall obtain and pay for the Community Noise Permit from the State Department of Health when the construction equipment or other devices emit noise at levels exceeding the allowable limits.
2. All internal combustion engine-powered equipment shall have mufflers to minimize noise and shall be properly maintained to reduce noise to acceptable levels.
3. Pile driving operations shall be confined to the period between 9:00 a.m. and 5:30 p.m., Monday through Friday. Pile driving will not be permitted on weekends and legal State and Federal holidays.
4. Starting-up of construction equipment meeting allowable noise limits shall not be done prior to 6:45 a.m. without prior approval of The State. Equipment exceeding allowable noise levels shall not be started-up prior to 7:00 a.m.

D. Erosion

1. During interim grading operations, the grade shall be maintained so as to preclude any damage to adjoining property from water and eroding soil.
2. Temporary berms, cut-off ditches and other provisions which may be required because of the Contractor's method of operations shall be installed at no cost to the State.
3. Drainage outlets and silting basing shall be constructed and maintained as shown on the plans to minimize erosion and pollution of waterways during construction.

E. Others

1. Wherever trucks and/or vehicles leave the site and enter surrounding paved streets, the Contractor shall prevent any material from being carried onto the pavement. Waste water shall not be discharged into existing streams, waterways, or drainage systems such as gutters and catch basins unless treated to comply with the State Department of Health water pollution regulations.
2. Trucks hauling debris shall be covered as required by PUC Regulation. Trucks hauling fine materials shall be covered.
3. No dumping of waste concrete will be permitted at the job-site.
4. Except for rinsing of the hopper and delivery chute, and for wheel washing where required, concrete trucks shall not be cleaned on the job-site.
5. Except in an emergency, such as a mechanical breakdown, all vehicle fueling and maintenance shall be done in a designated area. A temporary berm shall be constructed

around the area when runoff can cause a problem.

6. When spray painting is allowed such spray painting shall be done by the "airless spray" process. Other types of spray painting will not be allowed.

F. Suspension of Work

1. Violations of any of the above requirements or any other pollution control requirements which may be specified in the Technical Specifications herein shall be cause for suspension of the work creating such violation. No additional compensation shall be due the Contractor for remedial measures to correct the offense. Also, no extension of time will be granted for delays caused by such suspensions.
2. If no corrective action is taken by the Contractor within 72 hours after a suspension is ordered by The State, the State reserves the right to take whatever action is necessary to correct the situation and to deduct all costs incurred by the State in taking such action from monies due the Contractor.
3. The State may also suspend any operations which he feels are creating pollution problems although they may not be in violation of the above-mentioned requirements. In this instance, the work shall be done by force account as described in Subsection 4.2b - "Additional Work" of the GENERAL CONDITIONS and paid for in accordance with Subsection 8.4b - "Force - Account Work" therein. The count of elapsed working days to be charged against the contract in this situation shall be computed in accordance with Subsection 7.18 - "Contract Time" of the GENERAL CONDITIONS.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01581

PROJECT SIGN

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish all labor, materials and equipment necessary to construct and install all project sign as specified hereinafter.

1.2 SUBMITTAL

- A. The contractor shall provide The State with six (6) shop drawings of the project sign for review and approval by The State prior to ordering the sign.

1.3 LETTER STYLE

- A. Copy is centered and set in Adobe Type Futura Heavy. If this specific type is not available, Futura Demi Bold may be substituted. Copy should be set and spaced by a professional typesetter and enlarged photographically for photo stencil screen process.

1.4 ART WORK

- A. Constant elements of the sign layout - frame, outline, stripe, and official state information - may be duplicated following drawing measurements, or be reproduced and enlarged photographically using a layout template if provided. The "STATE OF HAWAII" masthead should be reproduced and enlarged as specified, using the artwork provided.

1.5 TITLES

- A. The specific major work of the project under construction is emphasized by using 3-3/4" type, all capitals. Secondary information such as location or buildings uses 2-1/4" type, all capitals. Other related information of lesser importance uses letter heights as indicated on 01581-3, upper / lower case letters.
- B. Design should follow the example on page 01581-3.

PART 2 - PRODUCTS

2.1 MATERIALS

A. LUMBER

- 1. Panel is 3/4" exterior grade high density overlaid plywood, with resin-bonded surfaces on both sides.

2. 4"x4" sign posts shall be Douglas Fir No. 1 or better.

B. PAINTS & INKS

Screen print inks are matte finish. Paints are satin finish, exterior grade. References to Ameritone Color Key Paint are for color match only.

COLOR:

1. 1BL10A Bohemian Blue
2. 2H16P Softly (White)
3. 2VR2A Hot Tango (Red)
4. 1M52E Tokay (Gray)

C. CONCRETE

Concrete shall be class B with a 2,500 psi 28-day compressive strength.

PART 3 - EXECUTION

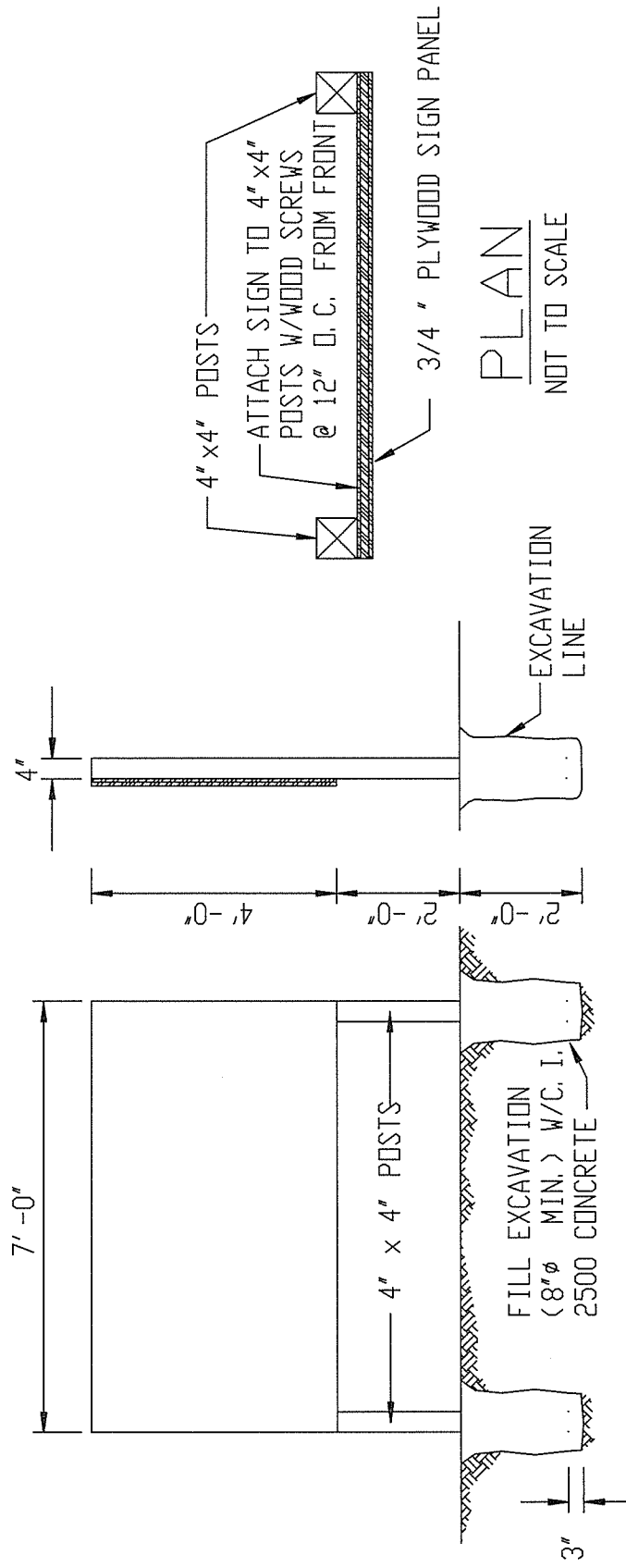
3.1 GENERAL

- A. The Project Sign shall be constructed with new materials as specified above.
- B. The Project sign shall be installed at the location indicated on the drawings or as designated by The State. The project sign shall be erected upon commencement of work.

3.2 MEASUREMENTS AND PAYMENT

The construction of the project sign, including all equipment, labor and material necessary to furnish and install the project sign will be paid for under the "Project Sign" proposal item.

END OF SECTION



PLAN
NOT TO SCALE

SIDE ELEVATION
NOT TO SCALE

FRONT ELEVATION
NOT TO SCALE

SECTION 01715

EXISTING CONDITIONS – HAZARDOUS MATERIALS SURVEY

PART 1 - GENERAL

1.1 SUMMARY

- A. A report entitled *Limited Hazardous Materials Survey Report, Hawaii District Land Division Headquarters in Hilo, Hilo, Hawaii, Hawaii, dated December 28, 2018*, was prepared by EnviroServices & Training Center, LLC for the design of this project.
- B. Related Sections include the following:
 - 1. Section 13281 “Removal And Disposal Of Asbestos Containing Materials”; for requirements of all work that disturbs Asbestos Containing Materials.
 - 2. Section 13282 “Lead-Containing Paint Control Measures”; for requirements of all work that disturbs Lead-Containing Paint.
 - 3. Section 13284 “Removal And Disposal Of Mercury Containing Lamps”; for requirements of all work that disturbs Mercury Lamps.
 - 4. Section 13286 “Removal And Disposal Of Arsenic-Containing Materials”; for requirements of all work that disturbs Arsenic-Containing Materials.
 - 5. Section 13288 “Testing/Air Monitoring”; for requirements of all work that disturbs Asbestos Containing Materials and Lead-Containing Paint.

1.2 ASBESTOS

- A. The structure to be modified under this contract was surveyed for the presence of asbestos containing materials (ACM). A copy of the initial survey report, as well as any subsequent supplemental survey reports, if performed, is included in the Section.
 - 1. The Contractor may perform further surveys at its own expense if ACM not shown in the reports is suspected in the areas in which work will be performed. If ACM is found, notify the Engineer immediately.
 - 2. If there is ACM outside of the areas in which work will be performed, this ACM shall not be disturbed in any way.
- B. If applicable, the Contractor shall notify his employees, subcontractors and all other persons engaged in the demolition and abatement work of the presence of asbestos in accordance with the requirements of Chapter 110, Article 12-110-2 (f) (1) (B) of the Occupational Safety and Health Standards, State of Hawaii.

- C. In the event that work is required in any area on the site other than those designated in the project scope, the Contractor shall request copies of the asbestos survey reports for each such area from the Engineer. Based on the information contained in the additional survey(s), notify all persons on the project as indicated in paragraph 1.2 B.

1.3 LEAD CONTAINING PAINT

- A. Inform employees, Subcontractors and all other persons engaged in the project that lead containing paint (LCP) is present in the existing building and at the job site. Follow the requirements of Title 12 (Department of Labor and Industrial Relations), Subtitle 8 (Division of Occupational Safety and Health), Chapter 148 (Lead Exposure in Construction), Hawaii Administrative Rules.
- B. Review the attached lead testing data which identifies the locations LCP was found. Lead testing was for design purposes only and the results **do not satisfy** any of the requirements of HIOSH Chapter 12-148.

1.4 MERCURY

- A. Inform employees, Subcontractors and all other persons engaged in the project that mercury-containing lamps are present in the existing building and at the job site.

1.5 ARSENIC CONTAINING MATERIALS

- A. The Contractor shall notify his employees, subcontractors and all other persons engaged in the demolition and renovation work of the presence of arsenic-containing materials.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SURVEY (attached)

Limited Hazardous Materials Survey Report, Hawaii District Land Division Headquarters in Hilo, Hilo, Hawaii, Hawaii, dated December 28, 2018, prepared by EnviroServices & Training Center, LLC.

END OF SECTION

LIMITED HAZARDOUS MATERIALS SURVEY REPORT

**HAWAII DISTRICT LAND DIVISION HEADQUARTERS IN HILO
HILO, HAWAII, HAWAII**

Prepared for:
ERSKINE ARCHITECTS, INC.
540 Lagoon Drive, Suite 4
Honolulu, Hawaii 96819

Prepared by:
ENVIROSERVICES & TRAINING CENTER, LLC
505 Ward Avenue, Suite 202
Honolulu, Hawaii 96814
tel: (808) 839-7222

ETC Project No. 18-4033

December 28, 2018

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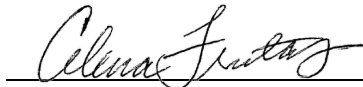
1.0 CERTIFICATIONS AND LIMITATIONS

EnviroServices & Training Center, LLC (ETC) has completed a Limited Hazardous Materials Survey (Survey) at the State of Hawaii, Department of Land and Natural Resources (DLNR), Hawaii District Land Division Headquarters located at 180 Kalanikoa Street, Hilo, Hawaii, Hawaii (Subject Site). ETC's findings and recommendations contained herein are based on site observations, government regulations and laboratory data, which were gathered at the time and location of the study. Opinions stated in this report do not apply to changes that may have occurred after the services were performed.

ETC has performed specified services for this project with the degree of care, skill and diligence ordinarily exercised by professional consultants performing the same or similar services. No other warranty, guarantee, or representation, expressed or implied, is included or intended; unless otherwise specifically agreed to in writing by both ETC and ETC's Client.

This report is intended for the sole use of Erskine Architects, Inc. exclusively for the Subject Site. Erskine Architects, Inc. may use and release this report, including making and retaining copies, provided such use is limited to the particular site and project for which this report is provided. However, the services performed may not be appropriate for satisfying the needs of other users. Release of this report to third-parties will be at the sole risk of ETC's Client and/or said user, and ETC shall not be liable for any claims or damages resulting from or connected with such release or any third party's use or reuse of this report.

Surveyed & Prepared By:

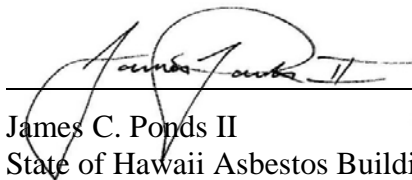


Celena Freitas

State of Hawaii Asbestos Building Inspector # HIASB-3180

State of Hawaii Lead Risk Assessor # PB-0432

Surveyed & Prepared By:



James C. Ponds II

State of Hawaii Asbestos Building Inspector # HIASB-4283

State of Hawaii Lead Risk Inspector # PB-0992

2.0 EXECUTIVE SUMMARY

EnviroServices & Training Center, LLC (ETC) conducted a Limited Hazardous Materials Survey (Survey) and compiled this report at the State of Hawaii, Department of Land and Natural Resources, Hawaii District Land Division Headquarters located at 180 Kalanikoa Street, Hilo, Hawaii, Hawaii (Subject Site). The following hazardous materials were identified during ETC's survey:

2.1 Summary of Asbestos Containing Materials Survey

Laboratory analysis determined that the following materials contain asbestos above the regulatory limit of 1%:

Interior/ Exterior	Location	Material	Estimated Quantity
Interior	Throughout Office Spaces and Warehouse	9"x9" Brown with streaks Floor Tile (FT) and Black Mastic	4,000 Square Feet
Interior	Throughout Warehouse, Offices, Break Room, and Storage Rooms	Brown Mastic under 4" Brown Cove Base	28 Linear Feet
Interior	Toilet 2 - Men	Brown Mastic under 4" Gray Cove Base	28 Linear Feet
Interior	Throughout	Drywall Walls Joint Compound and Texture	5,000 Square Feet
Interior	Break Room	Black Sink Insulation	4 Square Feet
Exterior	Roof	White Flashing on Parapet Wall	20 square Feet

2.2 Summary of Lead Paint Survey

The following colored paints were determined to contain lead in excess of the Environmental Protection Agency (EPA)/United States Department of Housing and Urban Development (HUD) guideline of 0.5% lead by weight defining Lead-Based Paint (LBP):

- Green paint on metal pipes and electrical box in the mechanical room

In addition, lead was detected above the laboratory's reporting limit in four (4) sampled paints. These paints are considered to be lead-containing paint (LCP).

2.3 Summary of Arsenic Survey

The 2'x2' ceiling tiles, located throughout the interior of the office spaces, contain detectable levels of arsenic.

2.4 Summary of Polychlorinated Biphenyl Ballasts and Mercury Containing Lamps

Fourteen (14) light fixtures were inspected. All fourteen (14) ballasts inspected included labeling indicating "No PCBs." Of the sixty-six (66) fluorescent lamps inspected, seven (7) were found to be mercury-containing universal waste.

3.0 INTRODUCTION/PURPOSE

The purpose of this Survey was to inspect the Subject Site for the presence of suspected hazardous materials that may be affected by the renovation project. The Survey was conducted on October 24, 2018 limited to the areas specified by Erskine Architects, Inc. Specifically, ETC completed the following tasks:

- Performed site reconnaissance at the Subject Site;
- Collected seventy-five (75) samples of suspected Asbestos Containing Material (ACM) from the Subject Site;
- Submitted the 75 samples of suspected ACM to EMC Labs, Inc. (EMC) for analysis of asbestos via Polarized Light Microscopy (PLM) in accordance with the Environmental Protection Agency (EPA) Method 600/R-93/116;
- Collected ten (10) paint chip samples from the Subject Site;
- Submitted the 10 paint chip samples to EMC for analysis by flame atomic absorption spectroscopy (FAAS) via EPA Method 7000 for total lead content;
- Collected three (3) samples of suspected arsenic treated material from the Subject Site;
- Submitted the 3 samples of suspected arsenic treated material to NVL Laboratories, Inc. (NVL) for analysis of total arsenic content via EPA Method 6010; and
- Visually inspected fourteen (14) interior fluorescent light fixtures for documentation indicating the presence or lack of PCB-containing ballast oil and mercury-containing lamps, and
- Prepared this report documenting the field activities and the results of the investigation including analytical results, conclusions, and recommendations.

4.0 METHODOLOGY

4.1 Asbestos

ETC personnel collected 75 samples of suspected ACM for asbestos analysis. Samples were collected from various areas of the Subject Site in accordance with EPA guidelines and recommendations.

The suspected ACM were wetted with amended water before sample collection. A small piece was then carefully cut out and placed into a labeled, re-sealable plastic bag. The sampling equipment was cleaned between each sample collection to avoid cross-contamination between samples. The approximate quantity of each suspected ACM was noted. Sample locations were randomly selected in accordance with EPA protocols and recommendations.

Samples were properly logged and recorded following strict chain-of-custody procedures, and sent to EMC located in Phoenix, Arizona, for analysis by PLM in accordance with EPA Method 600/R-93/116. EMC is accredited for bulk asbestos analysis through successful participation in the National Voluntary Lab Accreditation Program (NVLAP).

4.2 Lead Paint

ETC personnel collected and had 10 paint chip samples analyzed in accordance with EPA guidelines and recommendations.

The suspected lead-containing paints were wetted with amended water before sample collection. Paint was carefully scraped and placed into a labeled re-sealable plastic bag. The sampling equipment was cleaned between each sample collection to avoid cross-contamination between samples. Samples were properly logged and recorded following strict chain of custody procedure and submitted to EMC for analysis by FAAS, in accordance with EPA Method 7420. EMC is an Environmental Lead Laboratory Accreditation Program (ELLAP)-accredited laboratory.

4.3 Arsenic

ETC personnel collected 3 samples of material suspected of being treated with arsenic, from the Subject Site. The suspected arsenic treated samples were collected in accordance with EPA guidelines and recommendations.

The suspected arsenic treated materials were wetted with amended water before sample collection. Small pieces were then carefully cut out and placed into a labeled, re-sealable plastic bag. The samples were logged and recorded following strict chain of custody procedure and submitted to NVL Laboratories, Inc. for analysis by EPA Method 6010.

4.4 Polychlorinated Biphenyl Ballasts and Mercury Containing Lamps

ETC inspected 14 light fixtures for documentation indicating the presence or lack of PCB-containing ballast oil and mercury-containing lamps.

Fluorescent light ballasts were inspected for the presence of labeling stating “No PCBs.” If labeling was not observed on the light ballast, the ballast was assumed to be PCB-containing.

Fluorescent light lamps were inspected for the presence of green end caps or labeling indicating low-mercury levels, or silver end caps, indicating high levels of mercury. Silver end capped lamps were considered to be hazardous/universal waste.

5.0 RESULTS

5.1 Asbestos

A total of 75 suspect asbestos samples were collected and submitted for analysis via PLM. Of the materials sampled, six (6) were found to contain levels of asbestos above the regulatory limit of 1%.

Five (5) materials contained glass fibers. Although materials containing such fibers are not specifically regulated, it is ETC's recommendation to handle materials containing glass fibers with appropriate protective equipment.

In accordance with federal and state regulations and industry standard practice, ETC determined homogenous areas of each suspect material and collected multiple representative samples of the material from each homogenous area. Typically, all samples for a suspect material will have similar laboratory results. When the results differ, a single result above the regulatory limit is sufficient to determine that the material within the homogenous area is ACM and the entirety of the homogenous area should be treated as ACM. Thus, ETC may request that the laboratory stops analyzing when the first sample in the set is determined to have asbestos content above one percent. Ten (10) samples were not analyzed for this reason.

The asbestos analytical results are summarized in Table 1 included in Appendix I and the asbestos analytical laboratory report is included in Appendix II.

5.2 Lead Paint

Of the paints sampled, 1 was found to contain lead in excess of the EPA/HUD guideline of 0.5% lead by weight defining LBP. Lead was detected above the laboratory's reporting limit in 4 sampled paints. These paints are considered to be LCP.

The lead results are summarized in Table 2 included in Appendix I. The lead analytical laboratory report is included in Appendix II.

5.3 Arsenic

Of the materials sampled, 1 was found to contain detectable levels of arsenic. The arsenic survey results are recorded in Table 3 included in Appendix I and the arsenic analytical laboratory report is included in Appendix II.

5.4 Polychlorinated Biphenyl Ballasts and Mercury Containing Lamps

Of the fourteen (14) ballasts inspected, all included labeling indicating "No PCBs". Of the sixty-six (66) fluorescent lamps inspected, seven (7) were found to be mercury-containing universal waste. The inventory list is provided in Table 4 included in Appendix I.

6.0 DISCUSSION AND RECOMMENDATIONS

The findings and recommendations of ETC's limited hazardous materials survey extended only to those areas that were accessible at the time of the site reconnaissance. ETC assumes that mastic is present behind the chalkboards in the warehouse, the corkboards in Office 'A', and the mirrors in the restrooms; however, could not confirm or investigate these areas without causing significant damage. ETC collected samples from inconspicuous areas when possible. Any areas that were inaccessible either due to physical restraints (i.e. areas within walls, behind locked doors, beneath flooring materials, hidden materials, etc.) or occupancy are not covered under the scope of this survey and should be evaluated for hazardous materials separately prior to any disturbance.

Based on ETC's visual inspection of the facility and laboratory data, ETC recommends the following:

- Manage and/or remove and dispose of hazardous and regulated materials in accordance with applicable federal, state, and local regulations, prior to renovation and/or demolition activities that may disturb these materials.
- Any material that is suspected to contain a hazardous contaminant but was not tested as part of this survey should be tested prior to disturbance.
- All ACM must be removed and disposed of by a qualified asbestos abatement contractor.
- Handle materials containing glass fibers with appropriate protective equipment to prevent inhalation or ingestion of fibers and contact with skin and mucous membranes.
- Remove and dispose of all lead-containing, including lead-based, paint that may be disturbed during renovation/demolition activities in accordance with applicable federal, state, and local regulations.
- All LBP and LCP waste and debris generated from the removal must either be recycled in accordance with applicable regulatory requirements, where available (e.g. metal components), or undergo Toxicity Characteristic Leaching Procedure (TCLP)-Lead analysis prior to disposal.
- Any arsenic and mercury containing lamps should be removed and disposed of by a qualified contractor.
- If any light ballasts do not have the "No PCBs" indication on the label, or if ballasts are unlabeled; they should be removed from the light fixtures, sealed in properly labeled drums, and disposed of as PCB waste.
- The services of a qualified consultant should be obtained to monitor and inspect the removal activities to ensure compliance with applicable EPA, OSHA, and HIOSH regulations pertaining to the handling of ACM, LBP, LCP, arsenic PCB, and mercury.
- Conduct air monitoring for asbestos fibers and lead dust by qualified personnel during abatement and general renovation/demolition activities of areas that were determined to contain these contaminants.

Appendix **I**

TABLES OF RESULTS

Table 1
Asbestos Survey Results
DLNR Hilo

<i>Sample ID</i>	<i>Homogeneous Area</i>		<i>Material</i>	<i>Condition</i>	<i>Category</i>	<i>Friability</i>	<i>Analysis Layer</i>	<i>Asbestos Content</i>
	<i>Interior/ Exterior</i>	<i>Location</i>						
1833-A01	Interior	Office D and Warehouse	9"x9" Brown Pebble Floor Tile (FT) with mastic	Damaged	Not Applicable	Not Applicable	All	None Detected
1833-A02								
1833-A03								
1833-A04	Interior	Throughout	9"x9" Brown with streaks FT with mastic	Damaged	Misc.	Non-Friable	FT	Chrysotile 5%
							Black Mastic	Chrysotile 10%
1833-A05							All	Not Analyzed
1833-A06							All	Not Analyzed
1833-A07	Interior	Throughout Warehouse, Offices, Break Room, and Storage Rooms	4" Black Cove Base with mastic	Damaged	Misc.	Non-Friable	All	None Detected
1833-A08							Cove Base	None Detected
							Brown Mastic	Chrysotile 3%
1833-A09							All	Not Analyzed
1833-A10	Interior	Toilet 1 - Women	4" Brown Cove Base with mastic	Damaged	Not Applicable	Not Applicable	All	None Detected
1833-A11								
1833-A12								
1833-A13	Interior	Toilet 2 - Men	4" Gray Cove Base with mastic	Damaged	Misc.	Non-Friable	Cove Base	None Detected
							Brown Mastic	Chrysotile 3%
1833-A14							All	Not Analyzed
1833-A15							All	Not Analyzed
1833-A16	Interior	Throughout	Drywall Wall	Good	Misc.	Non-Friable	All	None Detected*
							Drywall	None Detected*
1833-A17							Joint Compound	Chrysotile 3%
							Texture	Chrysotile 2%
1833-A18							All	Not Analyzed
1833-A19	Interior	Offices C and D	Green woven wall paper with adhesive	Good	Not Applicable	Not Applicable	All	None Detected
1833-A20								
1833-A21								

* = Fibrous Glass Detected

Table 1
Asbestos Survey Results
DLNR Hilo

<i>Sample ID</i>	<i>Homogeneous Area</i>		<i>Material</i>	<i>Condition</i>	<i>Category</i>	<i>Friability</i>	<i>Analysis Layer</i>	<i>Asbestos Content</i>
	<i>Interior/ Exterior</i>	<i>Location</i>						
1833-A22	Interior	Open Office Space	Beige woven wall paper with adhesive	Good	Not Applicable	Not Applicable	All	None Detected
1833-A23								
1833-A24								
1833-A25	Interior	Break Room	Green streaked wall paper with adhesive	Good	Not Applicable	Not Applicable	All	None Detected
1833-A26								
1833-A27								
1833-A28	Interior	Toilets 1 and 2	Green wall covering	Good	Not Applicable	Not Applicable	All	None Detected
1833-A29								
1833-A30								
1833-A31	Interior	Break Room	Black sink insulation	Good	Surfacing	Non-Friable	All	Chrysotile 10%
1833-A32							All	Not Analyzed
1833-A33							All	Not Analyzed
1833-A34	Interior	Break Room	Gray vinyl counter top with mastic	Good	Not Applicable	Not Applicable	All	None Detected
1833-A35								
1833-A36								
1833-A37	Interior	Office A and Open Office	Corkboard with black mastic	Damaged	Not Applicable	Not Applicable	All	None Detected
1833-A38								
1833-A39								
1833-A40	Interior	Throughout Offices, Storage Rooms, Break Room, and Toilets	2'x2' Ceiling Tiles with holes	Damaged	Not Applicable	Not Applicable	All	None Detected
1833-A41								
1833-A42								
1833-A43	Interior	Open Office	Light Insulation	Good	Not Applicable	Not Applicable	All	None Detected*
1833-A44								
1833-A45								
1833-A46	Interior	Warehouse	Brown mastic behind cork board	Significantly Damaged	Not Applicable	Not Applicable	All	None Detected
1833-A47								
1833-A48								

* = Fibrous Glass Detected

Table 1
Asbestos Survey Results
DLNR Hilo

<i>Sample ID</i>	<i>Homogeneous Area</i>		<i>Material</i>	<i>Condition</i>	<i>Category</i>	<i>Friability</i>	<i>Analysis Layer</i>	<i>Asbestos Content</i>
	<i>Interior/ Exterior</i>	<i>Location</i>						
1833-A49	Interior	Mechanical/Electrical Room	Foil HVAC wrap with insulation	Good	Not Applicable	Not Applicable	All	None Detected*
1833-A50								
1833-A51								
1833-A52	Interior	Mechanical/Electrical Room	Black vibration cloth	Good	Not Applicable	Not Applicable	All	None Detected*
1833-A53								
1833-A54								
1833-A55	Interior	Mechanical/Electrical Room	Black mastic over drywall ceiling	Good	Not Applicable	Not Applicable	All	None Detected
1833-A56								
1833-A57								
1833-A58	Exterior	Exterior	White Window Caulking	Good	Not Applicable	Not Applicable	All	None Detected
1833-A59								
1833-A60								
1833-A61	Exterior	Exterior	White Door Frame Caulking	Good	Not Applicable	Not Applicable	All	None Detected
1833-A62								
1833-A63								
1833-A64	Exterior	Roof	Silver/Black Patch	Good	Not Applicable	Not Applicable	All	None Detected
1833-A65								
1833-A66								
1833-A67	Exterior	Roof	White Caulking	Good	Not Applicable	Not Applicable	All	None Detected
1833-A68								
1833-A69								
1833-A70	Exterior	Roof	Black/Brown Sealant on Parapet Flashing	Good	Misc.	Non-Friable	Sealant	None Detected
							White Flashing	Chrysotile 5%
							All	Not Analyzed
							All	Not Analyzed
1833-A73	Exterior	Roof	Gray Caulking on Roof Penetrations	Good	Not Applicable	Not Applicable	All	None Detected
1833-A74								
1833-A75								

* = Fibrous Glass Detected

Table 2
Lead Paint Survey Results
DLNR Hilo

<i>Sample ID</i>	<i>Interior/ Exterior</i>	<i>Location</i>	<i>Paint Color</i>	<i>Substrate</i>	<i>Description</i>	<i>Condition</i>	<i>Reporting Limit (% Pb by weight)</i>	<i>Results (% Pb by weight)</i>
1833-L01	Interior	Throughout Offices, Break Room, Storage Rooms, Vault and Mechanical Rooms	White	Drywall	Walls and Ceiling	Intact	0.010	BRL
				Wood	Window Frames			
				Concrete/ CMU	Walls			
				Metal	Pipes and Conduits			
1833-L02	Interior	Toilet 1 and 2	Beige	Drywall	Walls	Intact	0.010	0.241
1833-L03	Interior	Toilet 1 and 2	Green	Drywall	Walls	Intact	0.010	0.012
1833-L04	Interior	Throughout Offices	Brown	Wood	Door/Door Frames	Intact	0.010	0.014
1833-L05	Interior	Mechanical/Electrical	Green	Metal	Pipes/Electrical Box	Intact	0.010	0.514
1833-L06	Exterior	Office and Warehouse	White	Concrete/ CMU	Walls	Intact	0.010	BRL
				Metal	Flashing			
1833-L07	Exterior	Office and Warehouse	Tan	Wood	Door/Door Frames, Posts, Beams, Window Frames	Intact	0.10	0.256
				Metal	Poles and Gutter			
1833-L08	Exterior	Roof	Green	Metal	Corrugated Roof Panels	Intact	0.010	BRL
1833-L09	Exterior	Roof	Red	Metal	Corrugated Roof Panels	Intact	0.010	BRL
1833-L10	Exterior	Roof	Blue	Metal	Corrugated Roof Panels	Intact	0.010	BRL

BRL = Below Reportable Limits

Table 3
Arsenic Survey Results
DLNR Hilo

<i>Sample ID</i>	<i>Location</i>	<i>Material Description</i>	<i>Condition</i>	<i>Reporting Limit (mg/kg)</i>	<i>Results (mg/kg)</i>
1833-Ars01	Throughout Offices, Storage Rooms, Break Room, and Toilets	2'x2' Ceiling Tile with Holes	Good	14.0	1800.0
1833-Ars02	Open Office and Office A	Corkboard	Good	13.0	<13.0
1833-Ars03	Warehouse	Corkboard	Poor	13.0	<13.0

< = Below the reporting Limit

Table 4
PCB Ballast and Mercury Lamps Inventory
DLNR Hilo

<i>Total No. of Fixtures</i>	<i>No. of Fixtures Inspected</i>	<i>No. of Ballasts Inspected</i>	<i>Ballasts</i>		<i>No. of Lamps Inspected</i>	<i>Lamps</i>	
			<i>PCB-Containing/ Not Labeled</i>	<i>Non-PCB Containing</i>		<i>Mercury Containing Universal Waste</i>	<i>Low Mercury Containing</i>
36	14	14	0	14	66	7	59

*Appendix***II**

LABORATORY ANALYTICAL REPORTS AND CHAIN-OF-CUSTODY FORMS

EMC LABS, INC.

9830 S. 51st Street, Suite B109, Phoenix, AZ 85044
Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report
0210506

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	ENVIROSERVICES & TRAINING CENTER	Job# / P.O. #:	18-4033
Address:	505 WARD AVE, STE 202	Date Received:	10/26/2018
	HONOLULU HI 96814	Date Analyzed:	11/02/2018
Collected:	10/24/2018	Date Reported:	11/02/2018
Project Name:	DEPARTMENT OF LAND AND	EPA Method:	EPA 600/R-93/116
Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-001 1833-A01	INTERIOR-OFFICE D & WAREHOUSE	LAYER 1 9"x9" Floor Tile, Brown Pebble	No	None Detected	
					Cork Binder/Filler 100%
		LAYER 2 Mastic, White	No	None Detected	Cellulose Fiber <1%
					Gypsum Carbonates Binder/Filler 99%
0210506-002 1833-A02	INTERIOR-OFFICE D & WAREHOUSE	LAYER 1 9"x9" Floor Tile, Brown Pebble	No	None Detected	
					Cork Binder/Filler 100%
		LAYER 2 Mastic, White	No	None Detected	Cellulose Fiber 1%
					Gypsum Carbonates Binder/Filler 99%
0210506-003 1833-A03	INTERIOR-OFFICE D & WAREHOUSE	LAYER 1 9"x9" Floor Tile, Brown Pebble	No	None Detected	
					Cork Binder/Filler 100%
		LAYER 2 Mastic, White	No	None Detected	Cellulose Fiber <1%
					Gypsum Carbonates Binder/Filler 99%

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Laboratory Report
0210506

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	ENVIROSERVICES & TRAINING CENTER	Job# / P.O. #:	18-4033
Address:	505 WARD AVE, STE 202	Date Received:	10/26/2018
	HONOLULU HI 96814	Date Analyzed:	11/02/2018
Collected:	10/24/2018	Date Reported:	11/02/2018
Project Name:	DEPARTMENT OF LAND AND	EPA Method:	EPA 600/R-93/116
Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-004 1833-A04	INTERIOR- THROUGHOUT	LAYER 1 9"x9" Floor Tile, Brown w/Streaks	Yes	Chrysotile 5%	Carbonates Gypsum Quartz Binder/Filler 95%
		LAYER 2 Mastic, Black	Yes	Chrysotile 10%	Carbonates Gypsum Binder/Filler 90%
0210506-005 1833-A05	INTERIOR- THROUGHOUT	*Not analyzed per client request			
0210506-006 1833-A06	INTERIOR- THROUGHOUT	*Not analyzed per client request			
0210506-007 1833-A07	INTERIOR- THROUGHOUT WHSE, OFCS, BREAK RM & STORAGE RMS	LAYER 1 4" Covebase, Black	No	None Detected	Carbonates Quartz Binder/Filler 100%
		LAYER 2 Mastic, Brown	No	None Detected	Cellulose Fiber <1% Carbonates Gypsum Binder/Filler 99%

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Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-008 1833-A08	INTERIOR- THROUGHOUT WHSE, OFCS, BREAK RM & STORAGE RMS	LAYER 1 4" Covebase, Black	No	None Detected	
					Carbonates Gypsum Binder/Filler 100%
		LAYER 2 Mastic, Brown	Yes	Chrysotile 3%	Cellulose Fiber 2%
					Gypsum Carbonates Quartz Binder/Filler 95%
0210506-009 1833-A09	INTERIOR- THROUGHOUT WHSE, OFCS, BREAK RM & STORAGE RMS	LAYER 1 4" Covebase, Black Note: *Not analyzed per client request			
		LAYER 2 Mastic, Brown Note: *Not analyzed per client request			
0210506-010 1833-A10	INTERIOR-TOILET 1-WOMEN	LAYER 1 4" Covebase, Brown	No	None Detected	
					Carbonates Gypsum Binder/Filler 100%
		LAYER 2 Mastic, Brown	No	None Detected	Cellulose Fiber <1%
					Carbonates Gypsum Binder/Filler 99%

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Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-011 1833-A11	INTERIOR-TOILET 1-WOMEN	LAYER 1 4" Covebase, Brown	No	None Detected	Carbonates Gypsum Binder/Filler 100%
		LAYER 2 Mastic, Brown	No	None Detected	Cellulose Fiber 1% Gypsum Quartz Carbonates Binder/Filler 99%
0210506-012 1833-A12	INTERIOR-TOILET 1-WOMEN	LAYER 1 4" Covebase, Brown	No	None Detected	Carbonates Gypsum Binder/Filler 100%
		LAYER 2 Mastic, Brown	No	None Detected	Cellulose Fiber 1% Gypsum Quartz Carbonates Binder/Filler 99%
0210506-013 1833-A13	INTERIOR-TOILET 1-MEN	LAYER 1 4" Covebase, Gray	No	None Detected	Carbonates Gypsum Binder/Filler 100%
		LAYER 2 Mastic, Brown	Yes	Chrysotile 3%	Cellulose Fiber 1% Gypsum Quartz Carbonates Binder/Filler 96%

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Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-014 1833-A14	INTERIOR-TOILET 1-MEN	LAYER 1 4" Covebase, Gray Note: *Not analyzed per client request LAYER 2 Mastic, Brown Note: *Not analyzed per client request			
0210506-015 1833-A15	INTERIOR-TOILET 1-MEN	LAYER 1 4" Covebase, Gray Note: *Not analyzed per client request LAYER 2 Mastic, Black Note: *Not analyzed per client request			
0210506-016 1833-A16	INTERIOR- THROUGHOUT	LAYER 1 Drywall, White/ Brown LAYER 2 Texture/ Paint, White Note: Layer is mainly Paint	No No	None Detected None Detected	Cellulose Fiber 10% Fibrous Glass 2% Gypsum Carbonates Mica Quartz 88% Cellulose Fiber 5% Carbonates Gypsum Binder/Filler 95%

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Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-017 1833-A17	INTERIOR- THROUGHOUT	LAYER 1 Drywall, White/ Brown	No	None Detected	Cellulose Fiber 10% Fibrous Glass 2% Gypsum Carbonates Mica Quartz 88%
		LAYER 2 Joint Compound, Off White	Yes	Chrysotile 3%	Cellulose Fiber <1% Carbonates Gypsum Mica Quartz 96%
		LAYER 3 Texture/ Paint, White/ Off White	Yes	Chrysotile 2%	Carbonates Mica Gypsum Quartz Binder/Filler 98%
0210506-018 1833-A18	INTERIOR- THROUGHOUT	*Not analyzed per client request			
0210506-019 1833-A19	INTERIOR-OFFICES C & D	LAYER 1 Woven Wall Paper, Green/Beige	No	None Detected	Cellulose Fiber 70% Carbonates Gypsum Binder/Filler 30%
		LAYER 2 Adhesive, Lt. Yellow Note: Difficult to separate adjacent layer	No	None Detected	Synthetic Fiber 2% Carbonates Gypsum Binder/Filler 98%

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	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents	
0210506-020 1833-A20	INTERIOR-OFFICES C & D	LAYER 1 Woven Wall Paper, Green/Beige	No	None Detected	Cellulose Fiber	70%
					Carbonates Gypsum Binder/Filler	30%
		LAYER 2 Adhesive, Lt. Yellow Note: Difficult to separate adjacent layer	No	None Detected	Cellulose Fiber Synthetic Fiber	1% <1%
					Carbonates Gypsum Binder/Filler	98%
0210506-021 1833-A21	INTERIOR-OFFICES C & D	LAYER 1 Woven Wall Paper, Green/Beige	No	None Detected	Cellulose Fiber	70%
					Carbonates Gypsum Binder/Filler	30%
		LAYER 2 Adhesive, Lt. Yellow Note: Difficult to separate adjacent layer	No	None Detected	Synthetic Fiber	2%
					Carbonates Gypsum Binder/Filler	98%
0210506-022 1833-A22	INTERIOR-OPEN OFFICE SPACE	LAYER 1 Woven Wall Paper, Beige/ Tan	No	None Detected	Cellulose Fiber	50%
					Carbonates Gypsum Binder/Filler	50%
		LAYER 2 Adhesive, Tan	No	None Detected	Cellulose Fiber	2%
					Carbonates Gypsum Binder/Filler	98%

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	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents	
0210506-023 1833-A23	INTERIOR-OPEN OFFICE SPACE	LAYER 1 Woven Wall Paper, Beige/ Tan	No	None Detected	Cellulose Fiber	50%
					Carbonates Gypsum Binder/Filler	50%
		LAYER 2 Adhesive, Tan	No	None Detected	Cellulose Fiber	5%
					Carbonates Gypsum Binder/Filler	95%
0210506-024 1833-A24	INTERIOR-OPEN OFFICE SPACE	LAYER 1 Woven Wall Paper, Beige/ Tan	No	None Detected	Cellulose Fiber	50%
					Carbonates Gypsum Binder/Filler	50%
		LAYER 2 Adhesive, Tan	No	None Detected	Cellulose Fiber	5%
					Carbonates Gypsum Binder/Filler	95%
0210506-025 1833-A25	INTERIOR-BREAK RM	LAYER 1 Streaked Wall Paper, Green/ Beige	No	None Detected	Cellulose Fiber	70%
					Synthetic Fiber	5%
					Carbonates Gypsum Binder/Filler	25%
		LAYER 2 Adhesive, Tan	No	None Detected	Cellulose Fiber	10%
					Carbonates Gypsum Binder/Filler	90%

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Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-026 1833-A26	INTERIOR-BREAK RM	LAYER 1 Streaked Wall Paper, Green/ Beige	No	None Detected	Cellulose Fiber 70% Synthetic Fiber 5% Carbonates Gypsum Binder/Filler 25%
		LAYER 2 Adhesive, Tan	No	None Detected	Cellulose Fiber 5% Synthetic Fiber 2% Carbonates Gypsum Binder/Filler 93%
0210506-027 1833-A27	INTERIOR-BREAK RM	LAYER 1 Streaked Wall Paper, Green/ Beige	No	None Detected	Cellulose Fiber 70% Synthetic Fiber 5% Carbonates Gypsum Binder/Filler 25%
		LAYER 2 Adhesive, Tan	No	None Detected	Cellulose Fiber 4% Synthetic Fiber 3% Carbonates Gypsum Binder/Filler 93%
0210506-028 1833-A28	INTERIOR-TOILETS 1 & 2	LAYER 1 Wall Covering, Green/ Beige	No	None Detected	Cellulose Fiber 65% Carbonates Gypsum Binder/Filler 35%
		LAYER 2 Adhesive, Tan	No	None Detected	Cellulose Fiber 5% Carbonates Gypsum Binder/Filler 95%

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	HONOLULU HI 96814	Date Analyzed:	11/02/2018
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Project Name:	DEPARTMENT OF LAND AND	EPA Method:	EPA 600/R-93/116
Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-029 1833-A29	INTERIOR-TOILETS 1 & 2	LAYER 1 Wall Covering, Green/ Beige	No	None Detected	Cellulose Fiber 65%
					Carbonates Gypsum Binder/Filler 35%
		LAYER 2 Adhesive, Tan	No	None Detected	Cellulose Fiber 3%
					Carbonates Gypsum Binder/Filler 97%
0210506-030 1833-A30	INTERIOR-TOILETS 1 & 2	LAYER 1 Wall Covering, Green/ Beige	No	None Detected	Cellulose Fiber 65%
					Carbonates Gypsum Binder/Filler 35%
		LAYER 2 Adhesive, Tan	No	None Detected	Cellulose Fiber 3%
					Carbonates Gypsum Binder/Filler 97%
0210506-031 1833-A31	INTERIOR-BREAK RM	Sink Insulation, Black	Yes	Chrysotile 10%	
					Carbonates Quartz Binder/Filler 90%
0210506-032 1833-A32	INTERIOR-BREAK RM	*Not analyzed per client request			
0210506-033 1833-A33	INTERIOR-BREAK RM	*Not analyzed per client request			

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	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents	
0210506-034 1833-A34	INTERIOR-BREAK RM	LAYER 1 Vinyl Counter, Beige	No	None Detected	Cellulose Fiber	75%
					Gypsum Binder/Filler	25%
		LAYER 2 Mastic, Yellow	No	None Detected	Cellulose Fiber	3%
					Carbonates Gypsum Binder/Filler	97%
0210506-035 1833-A35	INTERIOR-BREAK RM	LAYER 1 Vinyl Counter, Beige	No	None Detected	Cellulose Fiber	75%
					Gypsum Binder/Filler	25%
		LAYER 2 Mastic, Yellow	No	None Detected	Cellulose Fiber	<1%
					Carbonates Gypsum Quartz Binder/Filler	99%
0210506-036 1833-A36	INTERIOR-BREAK RM	LAYER 1 Vinyl Counter, Beige	No	None Detected	Cellulose Fiber	75%
					Gypsum Binder/Filler	25%
		LAYER 2 Mastic, Yellow	No	None Detected	Cellulose Fiber	3%
					Carbonates Gypsum Binder/Filler	97%
0210506-037 1833-A37	INTERIOR-OFC A & OPEN OFFICE	LAYER 1 Corkboard, Brown	No	None Detected		
					Cork Binder/Filler	100%
		LAYER 2 Mastic, Black	No	None Detected	Cellulose Fiber	<1%
					Gypsum Binder/Filler	99%

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Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-038 1833-A38	INTERIOR-OFC A & OPEN OFFICE	LAYER 1 Corkboard, Brown	No	None Detected	
					Cork Binder/Filler 100%
		LAYER 2 Mastic, Black	No	None Detected	Cellulose Fiber <1%
					Gypsum Binder/Filler 99%
0210506-039 1833-A39	INTERIOR-OFC A & OPEN OFFICE	LAYER 1 Corkboard, Brown	No	None Detected	
					Cork Binder/Filler 100%
		LAYER 2 Mastic, Black	No	None Detected	Cellulose Fiber 1%
					Gypsum Binder/Filler 99%
0210506-040 1833-A40	INTERIOR- THROUGHOUT OFCS, STORAGE RMS, BREAK RM & TOILETS	2x2 Ceiling Tile, White/ Brown	No	None Detected	Cellulose Fiber 85%
					Gypsum Binder/Filler 15%
0210506-041 1833-A41	INTERIOR- THROUGHOUT OFCS, STORAGE RMS, BREAK RM & TOILETS	2x2 Ceiling Tile, White/ Brown	No	None Detected	Cellulose Fiber 85%
					Gypsum Binder/Filler 15%

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Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents	
0210506-042 1833-A42	INTERIOR- THROUGHOUT OFCS, STORAGE RMS, BREAK RM & TOILETS	2x2 Ceiling Tile, White/ Brown	No	None Detected	Cellulose Fiber	85%
					Gypsum Binder/Filler	15%
0210506-043 1833-A43	INTERIOR-OPEN OFFICE	Light Insulation, Brown	No	None Detected	Fibrous Glass	95%
					Gypsum Binder/Filler	5%
0210506-044 1833-A44	INTERIOR-OPEN OFFICE	Light Insulation, Brown	No	None Detected	Fibrous Glass	95%
					Gypsum Binder/Filler	5%
0210506-045 1833-A45	INTERIOR-OPEN OFFICE	Light Insulation, Brown	No	None Detected	Fibrous Glass	95%
					Gypsum Binder/Filler	5%
0210506-046 1833-A46	INTERIOR- WAREHOUSE	Mastic, Brown	No	None Detected	Cellulose Fiber	5%
					Gypsum Binder/Filler	95%
0210506-047 1833-A47	INTERIOR- WAREHOUSE	Mastic, Brown	No	None Detected	Cellulose Fiber	10%
					Gypsum Binder/Filler	90%
0210506-048 1833-A48	INTERIOR- WAREHOUSE	Mastic, Brown	No	None Detected	Cellulose Fiber	5%
					Gypsum Binder/Filler	95%

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Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-049 1833-A49	INTERIOR- MECHANICAL/ELEC TRICAL RM	LAYER 1 HVAC Wrap, Silver	No	None Detected	
		LAYER 2 Insulation, Yellow	No	None Detected	Aluminum Binder/Filler 100% Fibrous Glass 100%
0210506-050 1833-A50	INTERIOR- MECHANICAL/ELEC TRICAL RM	LAYER 1 HVAC Wrap, Silver	No	None Detected	
		LAYER 2 Insulation, Yellow	No	None Detected	Aluminum Binder/Filler 100% Fibrous Glass 100%
0210506-051 1833-A51	INTERIOR- MECHANICAL/ELEC TRICAL RM	LAYER 1 HVAC Wrap, Silver	No	None Detected	
		LAYER 2 Insulation, Yellow	No	None Detected	Aluminum Binder/Filler 100% Fibrous Glass 99% Cellulose Fiber 1%
0210506-052 1833-A52	INTERIOR- MECHANICAL/ELEC TRICAL RM	Vibration Cloth, Black	No	None Detected	Fibrous Glass 30%
					Carbonates Binder/Filler 70%
0210506-053 1833-A53	INTERIOR- MECHANICAL/ELEC TRICAL RM	Vibration Cloth, Black	No	None Detected	Fibrous Glass 30%
					Carbonates Binder/Filler 70%

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Laboratory Report
0210506

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	ENVIROSERVICES & TRAINING CENTER	Job# / P.O. #:	18-4033
Address:	505 WARD AVE, STE 202	Date Received:	10/26/2018
	HONOLULU HI 96814	Date Analyzed:	11/02/2018
Collected:	10/24/2018	Date Reported:	11/02/2018
Project Name:	DEPARTMENT OF LAND AND	EPA Method:	EPA 600/R-93/116
Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents	
0210506-054 1833-A54	INTERIOR- MECHANICAL/ELEC TRICAL RM	Vibration Cloth, Black	No	None Detected	Fibrous Glass	30%
					Carbonates Binder/Filler	70%
0210506-055 1833-A55	INTERIOR- MECHANICAL/ELEC TRICAL RM	LAYER 1	No	None Detected	Cellulose Fiber	5%
		Mastic, Black/ Brown			Gypsum Binder/Filler	95%
		LAYER 2	No	None Detected	Cellulose Fiber	15%
		Drywall, Off White/ Brown			Gypsum Carbonates Mica Quartz	85%
0210506-056 1833-A56	INTERIOR- MECHANICAL/ELEC TRICAL RM	LAYER 1	No	None Detected	Cellulose Fiber	5%
		Mastic, Black/ Brown			Gypsum Binder/Filler	95%
		LAYER 2	No	None Detected	Cellulose Fiber	15%
		Drywall, Off White/ Brown			Gypsum Carbonates Mica Quartz	85%

EMC LABS, INC.

9830 S. 51st Street, Suite B109, Phoenix, AZ 85044
Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report
0210506

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	ENVIROSERVICES & TRAINING CENTER	Job# / P.O. #:	18-4033
Address:	505 WARD AVE, STE 202	Date Received:	10/26/2018
	HONOLULU HI 96814	Date Analyzed:	11/02/2018
Collected:	10/24/2018	Date Reported:	11/02/2018
Project Name:	DEPARTMENT OF LAND AND	EPA Method:	EPA 600/R-93/116
Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-057 1833-A57	INTERIOR- MECHANICAL/ELEC TRICAL RM	LAYER 1 Mastic, Black/ Brown	No	None Detected	Cellulose Fiber <1%
					Gypsum Carbonates Quartz Binder/Filler 99%
		LAYER 2 Drywall, Off White/ Brown	No	None Detected	Cellulose Fiber 15%
					Gypsum Carbonates Mica Quartz 85%
0210506-058 1833-A58	EXTERIOR- EXTERIOR	Window Caulking, White	No	None Detected	Cellulose Fiber 2%
					Carbonates Quartz Binder/Filler 98%
0210506-059 1833-A59	EXTERIOR- EXTERIOR	Window Caulking, White	No	None Detected	Carbonates Quartz Binder/Filler 100%
0210506-060 1833-A60	EXTERIOR- EXTERIOR	Window Caulking, White	No	None Detected	Carbonates Quartz Binder/Filler 100%
0210506-061 1833-A61	EXTERIOR- EXTERIOR	Door Frame Caulking, White	No	None Detected	Carbonates Quartz Binder/Filler 100%

EMC LABS, INC.

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Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report
0210506

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	ENVIROSERVICES & TRAINING CENTER	Job# / P.O. #:	18-4033
Address:	505 WARD AVE, STE 202	Date Received:	10/26/2018
	HONOLULU HI 96814	Date Analyzed:	11/02/2018
Collected:	10/24/2018	Date Reported:	11/02/2018
Project Name:	DEPARTMENT OF LAND AND	EPA Method:	EPA 600/R-93/116
Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents	
0210506-062 1833-A62	EXTERIOR- EXTERIOR	Door Frame Caulking, White	No	None Detected	Carbonates Quartz Binder/Filler	100%
0210506-063 1833-A63	EXTERIOR- EXTERIOR	Door Frame Caulking, White	No	None Detected	Cellulose Fiber Carbonates Quartz Binder/Filler	<1% 99%
0210506-064 1833-A64	EXTERIOR-ROOF	Patch, Black/ Silver	No	None Detected	Aluminum Gypsum Quartz Binder/Filler	100%
0210506-065 1833-A65	EXTERIOR-ROOF	Patch, Black/ Silver	No	None Detected	Aluminum Gypsum Quartz Binder/Filler	100%
0210506-066 1833-A66	EXTERIOR-ROOF	Patch, Black/ Silver	No	None Detected	Aluminum Gypsum Quartz Binder/Filler	100%
0210506-067 1833-A67	EXTERIOR-ROOF	Caulking, White	No	None Detected	Silicone	100%
0210506-068 1833-A68	EXTERIOR-ROOF	Caulking, White	No	None Detected	Silicone	100%

EMC LABS, INC.

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Laboratory Report
0210506

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	ENVIROSERVICES & TRAINING CENTER	Job# / P.O. #:	18-4033
Address:	505 WARD AVE, STE 202	Date Received:	10/26/2018
	HONOLULU HI 96814	Date Analyzed:	11/02/2018
Collected:	10/24/2018	Date Reported:	11/02/2018
Project Name:	DEPARTMENT OF LAND AND	EPA Method:	EPA 600/R-93/116
Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-069 1833-A69	EXTERIOR-ROOF	Caulking, White	No	None Detected	Silicone 100%
0210506-070 1833-A70	EXTERIOR-ROOF	LAYER 1 Sealant, Black/ Brown	No	None Detected	Carbonates Quartz Binder/Filler 100%
		LAYER 2 Flashing, White	Yes	Chrysotile 5%	Carbonates Quartz Binder/Filler 95%
0210506-071 1833-A71	EXTERIOR-ROOF	LAYER 1 Sealant, Black/ Brown Note: *Not analyzed per client request LAYER 2 Flashing, White Note: *Not analyzed per client request			
0210506-072 1833-A72	EXTERIOR-ROOF	LAYER 1 Sealant, Black/ Brown Note: *Not analyzed per client request LAYER 2 Flashing, White Note: *Not analyzed per client request			
0210506-073 1833-A73	EXTERIOR-ROOF	Caulking, Gray	No	None Detected	Carbonates Quartz Binder/Filler 100%

EMC LABS, INC.

9830 S. 51st Street, Suite B109, Phoenix, AZ 85044
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Laboratory Report
0210506

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client:	ENVIROSERVICES & TRAINING CENTER	Job# / P.O. #:	18-4033
Address:	505 WARD AVE, STE 202	Date Received:	10/26/2018
	HONOLULU HI 96814	Date Analyzed:	11/02/2018
Collected:	10/24/2018	Date Reported:	11/02/2018
Project Name:	DEPARTMENT OF LAND AND	EPA Method:	EPA 600/R-93/116
Address:	NATURAL RESOURCES-SINGLE STORY	Submitted By:	JAMES PONDS II
	OFFICE BUILDING HILO	Collected By:	

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0210506-074 1833-A74	EXTERIOR-ROOF	Caulking, Gray	No	None Detected	Carbonates Quartz Binder/Filler 100%
0210506-075 1833-A75	EXTERIOR-ROOF	Caulking, Gray	No	None Detected	Carbonates Quartz Binder/Filler 100%



Analyst - Octavio Gavarreteayestas



Signatory - Lab Director - Kurt Kettler

Distinctly stratified, easily separable layers of samples are analyzed as subsamples of the whole and are reported separately for each discernible layer. All analyses are derived from calibrated visual estimate and measured in area percent unless otherwise noted. The report applies to the standards or procedures identified and to the sample(s) tested. The test results are not necessarily indicated or representative of the qualities of the lot from which the sample was taken or of apparently identical or similar products, nor do they represent an ongoing quality assurance program unless so noted. These reports are for the exclusive use of the addressed client and that they will not be reproduced wholly or in part for advertising or other purposes over our signature or in connection with our name without special written permission. The report shall not be reproduced except in full, without written approval by our laboratory. The samples not destroyed in testing are retained a maximum of thirty days. The laboratory measurement of uncertainty for the test method is approximately less than 1 by area percent. Accredited by the National Institute of Standards and Technology, Voluntary Laboratory Accreditation Program for selected test method for asbestos. The accreditation or any reports generated by this laboratory in no way constitutes or implies product certification, approval, or endorsement by the National Institute of Standards and Technology. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. Polarized Light Microscopy may not be consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials.

CHAIN OF CUSTODY

EMC Labs, Inc.
9830 S. 51st St., Ste B-109
Phoenix, AZ 85044
(800) 362-3373 Fax (480) 893-1726

LAB#: 210506
TAT: 3-5 day
Rec'd: OCT 26 P.M.

COMPANY NAME: **ENVIROSERVICES & TRAINING CENTER, LLC**

505 Ward Ave. Suite #202

Honolulu, HI 96814

CONTACT: James Ponds II

Phone/Fax: (808) 839-7222 ext 232/(808) 839-4455

Email: jponds@gotoetc.com, cfreitas@gotoetc.com

BILL TO: (If Different Location)

Trina Oshiro

Now Accepting: **VISA - MASTERCARD**

Price Quoted: \$____ / Sample \$____ / Layers

COMPLETE ITEMS 1-4: (Failure to complete any items may cause a delay in processing or analyzing your samples)**1. TURNAROUND TIME:** [Same Day RUSH] [1-Day] [2-Day] [3-4-5 Day] [6-10 Day]****Prior confirmation of turnaround time is required

****Additional charges for rush analysis (please call marketing department for pricing details)

****Laboratory analysis may be subject to delay if credit terms are not met

2. TYPE OF ANALYSIS: [Bulk-PLM] [Air-PCM] [Lead] [Point Count] [Fungi: AOC, W-C, Bulk, Swab, Tape]**3. DISPOSAL INSTRUCTIONS:** [Dispose of samples at EMC] / [Return samples to me at my expense]

(If you do not indicate preference, EMC will dispose of samples 60 days from analysis.)

4. Project Name: Department of Land and Natural Resources - Single Story office Building #110P.O. Number: _____ Project Number: 18-4033

EMC SAMPLE #	CLIENT SAMPLE #	DATE & TIME SAMPLED	LOCATION/MATERIAL TYPE	Samples Accepted Yes / No	AIR SAMPLE INFO / COMMENTS		
					ON	OFF	FLOW RATE
<u>1</u>	<u>1833-A01</u>	<u>10/24/18</u>	<u>* See Attachment</u>	<u>Y</u> N			
<u>5</u>	<u>through</u>	<u>1</u>		<u>Y</u> N			
<u>75</u>	<u>1833-A75</u>			<u>Y</u> N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			

SPECIAL INSTRUCTIONS: Please stop at first positiveSample Collector: (Print) C. Freitas & J. Ponds II

(Signature)

Relinquished by: J. Ponds IIDate/Time: 10/25/18Received by: Diana FedericoDate/Time: 10/26/18Relinquished by: Diana FedericoDate/Time: 10/26/18Received by: OTIDate/Time: 10/26/18

Relinquished by: _____

Date/Time: _____

Received by: _____

Date/Time: _____

** In the event of any dispute between the above parties for these services or otherwise, parties agree that jurisdiction and venue will be in Phoenix, Arizona and prevailing party will be entitled to attorney's fees and court costs.

**Asbestos Samples
DLNR Hilo**

210506

Sample ID	Homogeneous Area		Material
	Interior/ Exterior	Location	
1833-A01	Interior	Office D and Warehouse	9"x9" Brown Pebble Floor Tile (FT) with mastic
1833-A02			
1833-A03			
1833-A04	Interior	Throughout	9"x9" Brown with streaks FT with mastic
1833-A05			
1833-A06			
1833-A07	Interior	Throughout Warehouse, Offices, Break Room, and Storage Rooms	4" Black cove base with mastic
1833-A08			
1833-A09			
1833-A10	Interior	Toilet 1 - Women	4" Brown cove base with mastic
1833-A11			
1833-A12			
1833-A13	Interior	Toilet 2 - Men	4" Gray cove base with mastic
1833-A14			
1833-A15			
1833-A16	Interior	Throughout	Drywall Wall
1833-A17			
1833-A18			
1833-A19	Interior	Offices C and D	Green woven wall paper with adhesive
1833-A20			
1833-A21			
1833-A22	Interior	Open Office Space	Beige woven wall paper with adhesive
1833-A23			
1833-A24			
1833-A25	Interior	Break Room	Green streaked wall paper with adhesive
1833-A26			
1833-A27			
1833-A28	Interior	Toilets 1 and 2	Green wall covering
1833-A29			
1833-A30			
1833-A31	Interior	Break Room	Black sink insulation
1833-A32			
1833-A33			
1833-A34	Interior	Break Room	Gray vinyl counter top with mastic
1833-A35			
1833-A36			
1833-A37	Interior	Office A and Open Office	Corkboard with black mastic
1833-A38			
1833-A39			
1833-A40	Interior	Throughout Offices, Storage Rooms, Break Room, and Toilets	2'x2' Ceiling Tiles with holes
1833-A41			
1833-A42			

**Asbestos Samples
DLNR Hilo**

210506

Sample ID	Homogeneous Area		Material
	Interior/ Exterior	Location	
1833-A43	Interior	Open Office	Light Insulation
1833-A44			
1833-A45			
1833-A46	Interior	Warehouse	Corkboard with brown mastic
1833-A47			
1833-A48			
1833-A49	Interior	Mechanical/Electrical Room	Foil HVAC wrap with insulation
1833-A50			
1833-A51			
1833-A52	Interior	Mechanical/Electrical Room	Black vibration cloth
1833-A53			
1833-A54			
1833-A55	Interior	Mechanical/Electrical Room	Black mastic over drywall ceiling
1833-A56			
1833-A57			
1833-A58	Exterior	Exterior	White Window Caulking
1833-A59			
1833-A60			
1833-A61	Exterior	Exterior	White Door Frame Caulking
1833-A62			
1833-A63			
1833-A64	Exterior	Roof	Silver/Black Patch
1833-A65			
1833-A66			
1833-A67	Exterior	Roof	White Caulking
1833-A68			
1833-A69			
1833-A70	Exterior	Roof	Black/Brown Sealant on Parapet Flashing
1833-A71			
1833-A72			
1833-A73	Exterior	Roof	Gray Caulking on Roof Penetrations
1833-A74			
1833-A75			



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emclab@emclabs.com

LEAD (Pb) IN PAINT CHIP SAMPLES
EMC SOP METHOD #L01/1 EPA SW-846 METHOD 7420

EMC LAB #: L72051		DATE RECEIVED: 10/26/18	
CLIENT: Enviroservices & Training Center, LLC		REPORT DATE: 10/31/18	
		DATE OF ANALYSIS: 10/30/18	
CLIENT ADDRESS: 505 Ward Ave. Suite #202 Honolulu, HI 96814		P.O. NO.:	
PROJECT NAME: Department of Land and Natural Resources-Single Story Office Building Hilo		PROJECT NO.: 18-4033	


EMC # L72051-	SAMPLE DATE /18	CLIENT SAMPLE #	DESCRIPTION	REPORTING LIMIT (%Pb by weight)	%Pb BY WEIGHT
1	10/24	1833-L01	Int./Throughout Offices, Break Rm., Storage Rms., Vault and Mechanical Rms./White/Drywall/Walls and Ceiling, Wood/Window Frames, Concrete/CMU/Walls, Metal/Pipes and Conduits	0.010	BRL
2	10/24	1833-L02	Int./Toilet 1 and 2/Beige/Drywall/Walls	0.010	0.241
3	10/24	1833-L03	Int./Toilet 1 and 2/Green/Drywall Walls	0.010	0.012
4	10/24	1833-L04	Int./Throughout Offices/Brown/Wood/Door/Door Frames	0.010	0.014
5	10/24	1833-L05	Int./Mech./Electrical/Green/Metal/Pipes/Electrical Box	0.013	0.514
6	10/24	1833-L06	Ext./Office and Warehouse/White/Concrete/CMU/Walls, Metal/Flashing	0.010	BRL

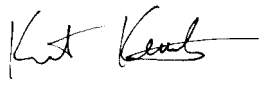
^ = Dilution Factor Changed * = Excessive Substrate May Bias Sample Results **BRL** = Below Reportable Limits # = Very Small Amount Of Sample Submitted, May Affect Result

This report applies to the standards or procedures identified and to the samples tested only. The test results are not necessarily indicative or representative of the qualities of the lot from which the sample was taken or of apparently identical or similar products, nor do they represent an ongoing quality assurance program unless so noted. Unless otherwise noted, all quality control analyses for the samples noted above were within acceptable limits.

Where it is noted that a sample with excessive substrate was submitted for laboratory analysis, such analysis may be biased. The lead content of such sample may, in actuality, be greater than reported. EMC makes no warranty, express or implied, as to the accuracy of the analysis of samples noted to have been submitted with excessive substrate. Resampling is recommended in such situations to verify original laboratory results.

These reports are for the exclusive use of the addressed client and are rendered upon the condition that they will not be reproduced wholly or in part for advertising or other purposes over our signature or in connection with our name without special written permission. Samples not destroyed in testing are retained a maximum of sixty (60) days.

ANALYST: 
Jason Thompson

QA COORDINATOR: 
Kurt Kettler



9830 South 51st Street, Suite B-109 / PHOENIX, ARIZONA 85044 / 480-940-5294 or 800-362-3373 / FAX 480-893-1726
emclab@emclabs.com

LEAD (Pb) IN PAINT CHIP SAMPLES
EMC SOP METHOD #L01/1 EPA SW-846 METHOD 7420

EMC LAB #: L72051		DATE RECEIVED: 10/26/18	
CLIENT: Enviroservices & Training Center, LLC		REPORT DATE: 10/31/18	
		DATE OF ANALYSIS: 10/30/18	
CLIENT ADDRESS: 505 Ward Ave. Suite #202 Honolulu, HI 96814		P.O. NO.:	
PROJECT NAME: Department of Land and Natural Resources-Single Story Office Building Hilo		PROJECT NO.: 18-4033	

EMC # L72051-	SAMPLE DATE /18	CLIENT SAMPLE #	DESCRIPTION	REPORTING LIMIT (%Pb by weight)	%Pb BY WEIGHT
7	10/24	1833-L07	Ext./Office and Warehouse/Tan/Wood/Door/Door Frames, Posts, Beams, Window Frames, Metal/Poles and Gutter	0.010	0.256
8	10/24	1833-L08	Ext./Roof/Green/Metal/Corrugated Roof Panels	0.010	BRL
9	10/24	1833-L09	Ext./Roof/Red/Metal/Corrugated Roof Panels	0.010	BRL
10	10/24	1833-L10	Ext./Roof/Blue/Metal/Corrugated Roof Panels	0.010	BRL

^ = Dilution Factor Changed * = Excessive Substrate May Bias Sample Results BRL = Below Reportable Limits # = Very Small Amount Of Sample Submitted, May Affect Result

This report applies to the standards or procedures identified and to the samples tested only. The test results are not necessarily indicative or representative of the qualities of the lot from which the sample was taken or of apparently identical or similar products, nor do they represent an ongoing quality assurance program unless so noted. Unless otherwise noted, all quality control analyses for the samples noted above were within acceptable limits.

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ANALYST:

Jason Thompson

QA COORDINATOR:

Kurt Kettler

CHAIN OF CUSTODY

EMC Labs, Inc.
9830 S. 51st St., Ste B-109
Phoenix, AZ 85044
(800) 362-3373 Fax (480) 893-1726

LAB#: <u>272051</u>
TAT: <u>3 days</u>
Rec'd: <u>10/26/18</u>

COMPANY NAME: **ENVIROSERVICES & TRAINING CENTER, LLC**
 505 Ward Ave. Suite #202
 Honolulu, HI 96814

CONTACT: **James Ponds II**
 Phone/Fax: **(808) 839-7222 ext 232/(808) 839-4455**
 Email: **jponds@gotoetc.com, cfreitas@gotoetc.com**

BILL TO: (If Different Location)

Trina Oshiro

Now Accepting: **VISA – MASTERCARD**

Price Quoted: \$ ____ / Sample \$ ____ / Layers

COMPLETE ITEMS 1-4: (Failure to complete any items may cause a delay in processing or analyzing your samples)1. **TURNAROUND TIME:** [Same Day RUSH] [1-Day] [2-Day] [3-4-5 Day] [6-10 Day]****Prior confirmation of turnaround time is required

****Additional charges for rush analysis (please call marketing department for pricing details)

****Laboratory analysis may be subject to delay if credit terms are not met

2. **TYPE OF ANALYSIS:** [Bulk-PLM] [Air-PCM] [Lead] [Point Count] [Fungi: AOC, W-C, Bulk, Swab, Tape]3. **DISPOSAL INSTRUCTIONS:** [Dispose of samples at EMC] / [Return samples to me at my expense]

(If you do not indicate preference, EMC will dispose of samples 60 days from analysis.)

4. **Project Name:** Department of Land and Natural Resources - Single Story office Building HiloP.O. Number: _____ Project Number: 18-4033

EMC SAMPLE #	CLIENT SAMPLE #	DATE & TIME SAMPLED	LOCATION/MATERIAL TYPE	Samples Accepted Yes / No	AIR SAMPLE INFO / COMMENTS		
					ON	OFF	FLOW RATE
<u>1</u>	<u>1833-L01</u>	<u>10/24/18</u>	<u>* See Attachment</u>	<u>Y</u> N			
<u>5</u>	<u>through</u>	<u>1</u>		<u>Y</u> N			
<u>10</u>	<u>1833-L10</u>	<u>1</u>		<u>Y</u> N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			

SPECIAL INSTRUCTIONS: NASample Collector: (Print) C. Freitas & J. Ponds II

(Signature)

Relinquished by: J. Ponds IIDate/Time: 10/25/18Received by: [Signature]Date/Time: 10/26/18Relinquished by: [Signature]Date/Time: 10/26/18Received by: [Signature]Date/Time: 10/26/18

Relinquished by: _____

Date/Time: _____

Received by: _____

Date/Time: _____

** In the event of any dispute between the above parties for these services or otherwise, parties agree that jurisdiction and venue will be in Phoenix, Arizona and prevailing party will be entitled to attorney's fees and court costs.

**Lead Paint Samples
DLNR Hilo**

<i>Sample ID</i>	<i>Interior/ Exterior</i>	<i>Location</i>	<i>Paint Color</i>	<i>Substrate</i>	<i>Description</i>
1833-L01	Interior	Throughout Offices, Break Room, Storage Rooms, Vault and Mechanical Rooms	White	Drywall	Walls and Ceiling
				Wood	Window Frames
				Concrete/ CMU	Walls
				Metal	Pipes and Conduits
1833-L02	Interior	Toilet 1 and 2	Beige	Drywall	Walls
1833-L03	Interior	Toilet 1 and 2	Green	Drywall	Walls
1833-L04	Interior	Throughout Offices	Brown	Wood	Door/Door Frames
1833-L05	Interior	Mechanical/Electrical	Green	Metal	Pipes/Electrical Box
1833-L06	Exterior	Office and Warehouse	White	Concrete/ CMU	Walls
				Metal	Flashing
1833-L07	Exterior	Office and Warehouse	Tan	Wood	Door/Door Frames, Posts, Beams, Window Frames
				Metal	Poles and Gutter
1833-L08	Exterior	Roof	Green	Metal	Corrugated Roof Panels
1833-L09	Exterior	Roof	Red	Metal	Corrugated Roof Panels
1833-L10	Exterior	Roof	Blue	Metal	Corrugated Roof Panels

October 30, 2018

Celena Freitas

EnviroServices & Training Center, LLC

505 Ward Avenue, Suite 202

Honolulu, HI 96814



Laboratory | Management | Training

RE: Metals Analysis; NVL Batch # 1821390.00

Dear Ms. Freitas,

Enclosed please find the test results for samples submitted to our laboratory for analysis. Preparation of these samples was conducted following protocol outlined in EPA Method SW 846 -3051 unless stated otherwise. Analysis of these samples was performed using analytical instruments in accordance with U.S. EPA, NIOSH, OSHA and other ASTM methods.

For matrix materials submitted as paint, dust wipe, soil or TCLP samples, analysis for the presence of total metals is conducted using published U.S. EPA Methods. Paint and soil results are usually expressed in mg/Kg which is equivalent to parts per million (ppm). Lead (Pb) in paint is usually expressed in mg/Kg (ppm), Percent (%) or mg/cm² by area. Dust wipe sample results are usually expressed in ug/wipe and ug/ft². TCLP samples are reported in mg/L (ppm). For air filter samples, analyses are conducted using NIOSH and OSHA Methods. Results are expressed in ug/filter and ug/m³. Other matrix materials are analyzed accordingly using published methods or specified by client. The reported test results pertain only to items tested and are not blank corrected.

For recent regulation updates pertaining to current regulatory levels or permissible exposure levels, please call your local regulatory agencies for more details.

This report is considered highly confidential and will not be released without your approval. Samples are archived for two weeks following analysis. Samples that are not retrieved by the client are discarded after two weeks.

Thank you for using our laboratory services. If you need further assistance please feel free to call us at 206-547-0100 or 1-888-NVLLABS.

Sincerely,

A handwritten signature in black ink, appearing to read "Nick Ly".

Nick Ly, Technical Director



1.888.NVL.LABS
1.888.(685.5227)
www.nvllabs.com

NVL Laboratories, Inc.
4708 Aurora Ave N, Seattle, WA 98103
p 206.547.0100 | f 206.634.1936

Analysis Report

Total Metals

Client: EnviroServices & Training Center, LLC

Address: 505 Ward Avenue, Suite 202
Honolulu, HI 96814

Batch #: 1821390.00

Matrix: Bulk

Method: EPA 3051/6010C

Client Project #: 18-4033

Date Received: 10/26/2018

Samples Received: 3

Samples Analyzed: 3

Attention: Ms. Celena Freitas

Project Location: DLNR Hilo

Lab ID	Client Sample #	Elements	Sample wt (g)	RL mg / kg	Results in mg / kg	Results in ppm
18109787	1833-Ars01	Arsenic (As)	0.2954	14.0	1800.0	1800.0
18109788	1833-Ars02	Arsenic (As)	0.3082	13.0	< 13.0	< 13.0
18109789	1833-Ars03	Arsenic (As)	0.3042	13.0	< 13.0	< 13.0

Sampled by: Client

Analyzed by: Shalini Patel

Reviewed by: Nick Ly

Date Analyzed: 10/29/2018

Date Issued: 10/30/2018



Nick Ly, Technical Director

mg/ kg = Milligrams per kilogram

ppm = Parts per million

Note : Method QC results are acceptable unless stated otherwise.

Unless otherwise indicated, the condition of all samples was acceptable at time of receipt.

RL = Reporting Limit

'<' = Below the reporting Limit

Company EnviroServices & Training Center, LLC **NVL Batch Number** 1821390.00
Address 505 Ward Avenue, Suite 202 **TAT** 5 Days **AH** No
Honolulu, HI 96814 **Rush TAT**
Project Manager Ms. Celena Freitas **Due Date** 11/2/2018 **Time** 9:30 AM
Phone (808) 839-7222 **Email** cfreitas@gotoetc.com
Cell (808) 561-6877 **Fax** (808) 839-4455

Project Name/Number: 18-4033 **Project Location:** DLNR Hilo

Subcategory Inductively Coupled Plasma (ICP) - Group Tests

Item Code ICP-M2 EPA 6010 (price per analyte) <paint>

Metals Arsenic (As)

Total Number of Samples 3

Rush Samples

	Lab ID	Sample ID	Description	A/R
1	18109787	1833-Ars01		A
2	18109788	1833-Ars02		A
3	18109789	1833-Ars03		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Federal Express				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Emily Schubert		NVL	10/26/18	930
Analyzed by	Shalini Patel		NVL	10/29/18	
Results Called by					
<input type="checkbox"/> Faxed <input type="checkbox"/> Emailed					

Special Instructions:

Date: 10/26/2018

Time: 2:21 PM

Entered By: Emily Schubert



Laboratory | Management | Training

METALS CHAIN OF CUSTODY

1821390

Turn Around Time

- ☐ 2 Hour ☐ 4 Hours ☐ 24 Hours
☐ 2 Days ☐ 3 Days ☐ 4 Days
☒ 5 Days ☐ 6-10 Days

Please call for TAT less than 24 Hours

Company EnviroServices & Training Center, LLCProject Manager Celena FreitasAddress 505 Ward Avenue, Suite 202Cell (808) 839 - 7222Honolulu, Hawaii 96814

Email _____

Phone (808) 839-7222

Fax () -

Project Name/Number **18-4033**Project Location **DLNR Hilo**☒ Total Metals☒ FAA (ppm)☐ Air Filter☐ Paint Chips (%)☐ Soil

RCRA 8

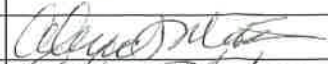

RCRA 11

☐ TCLP☒ ICP (PPM)☐ Paint Chips (cm)☐ Dust Wipes☐ Barium☐ Chromium☐ Silver☐ Copper☐ GFAA (ppb)☐ Drinking Water☐ Waste Water☒ Arsenic☐ Mercury☐ Lead☐ Zinc☐ CVAA (ppb)☒ Other _____☐ Selenium☐ Cadmium☐ Other _____

Reporting Instructions _____

☐ Call () - ☐ Fax () - ☒ Email cfreitas@gotoetc.comTotal Number of Samples **3**

	Sample ID	Description	A/R
1	1833-Ars01	2'x2' Ceiling Tiles with Holes	
2	1833-Ars02	Corkboard	
3	1833-Ars03	Corkboard (Warehouse)	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

	Print Name	Signature	Company	Date	Time
Sampled by	Celena Freitas		ETC	10/24/18	
Relinquish by	Celena Freitas		ETC	10/25/18	

Office Use Only

	Print Name	Signature	Company	Date	Time
Received by	Emily S		NVL	10/24/18	9:30 PM
Analyzed by					
Called by					
Faxed/Email by					

DIVISION 02 – SITE CONSTRUCTION

SECTION 02050

DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

The work includes demolition and removal as indicated in the plans or specified herein. All materials resulting from demolition work, except as indicated or specified otherwise, shall become the property of the Contractor and shall be removed from the limits of Government property and disposed offsite in accordance with all regulatory requirements. The Contractor shall pay for all necessary permits and certificates that may be required in connection with this work.

1.2 GENERAL REQUIREMENTS

- A. It shall be the responsibility of the Contractor to examine the project site and determine for himself the existing conditions.
- B. Obvious conditions which exist on the site shall be accepted as part of the work, even though they may not be indicated on the drawings and/or described herein, or may vary therefrom.
- C. Burning of any debris on-site will not be permitted.
- D. Permits: The Contractor shall procure and pay for all necessary permits and certificates that may be required in connection with this work.
- E. Related Sections include the following:
 - 1. Section 01567 "Pollution Control."
 - 2. Section 01715 "Existing Conditions – Hazardous Materials Survey Report."
 - 3. Section 02100 "Site Preparation."

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 – Submittals.
- B. Submit proposed demolition and removal procedures to The State for approval before work is started. Procedures shall provide for coordination with other work in progress and a detailed description of methods and equipment to be used for each operation, and sequence of operations.
- C. Landfill Disposal Receipts: Submit copies of receipts issued by a landfill facility. Include

receipts with Contractor Daily Progress Report.

1.4 PROTECTION

- A. Existing Improvements: Protect existing improvements that are to remain in place, that are to be reused, or that is to remain the property of The State, by temporary covers, shoring, bracing, and supports. Repair items damaged during performance of the work or replace with new to the satisfaction of The State. Do not overload structural elements. Provide new supports or reinforcement for existing construction weakened by demolition, removal, and relocation work. Construction equipment and vehicles shall neither be permitted on, nor shall be stored on the existing work that is to remain in place.
- B. Trees and Shrubs: See Section 02100 – SITE PREPARATION.
- C. Public Safety: Where pedestrian and driver safety is endangered in the work or storage areas, use traffic barricades with flashing lights. Notify The State prior to beginning any such work. The Contractor shall conduct operations with minimum interference to streets, driveways, sidewalks, and passageways, etc.
- D. Dust Control: Take appropriate action to check the spread of dust to the surrounding area and to avoid the creation of a nuisance in the surrounding area. Do not use water if the results in hazardous or objectionable conditions, such as flooding or pollution. Comply with all dust regulations imposed by local air pollution agencies.
- E. Explosives: Use of explosives will not be permitted.
- F. Hazardous Materials: The presence of hazardous materials including, but not limited to, asbestos and mercury containing materials and lead based paint is present on this project. See Section 01715 – EXISTING CONDITIONS – HAZARDOUS MATERIALS SURVEY REPORT. The Contractor shall take the necessary precautions and perform work in accordance with applicable Sections in these Specifications. All materials removed shall be disposed of off-site by the Contractor at his expense in compliance with all regulatory agency requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXISTING UTILITIES AND STRUCTURES

- A. Demolish and remove portions of existing building that is above grade as indicated on the plans. All glass shall be removed during demolition.
- B. The existing slab-on-grade and below grade utilities shall be secured (capped) and remain in place, unless otherwise indicated on the plans. Seal and cap utility lines where necessary as required by regulations of the authority having jurisdiction.
- C. The location of utility lines throughout the Site is not definitively known. Should any unknown

and/or active line be encountered during excavation, the Contractor shall immediately notify The State of such discovery. The State shall then investigate and issue instructions for the preservation or disposition of the unknown line. Authorization for extra work shall be issued by the Engineer only as he deems necessary.

- D. Where demolition occurs adjacent to utilities and structures to remain, the contractor shall provide adequate protection in accordance with Section 01019 – GENERAL SPECIFICATIONS

3.2 SAFETY

Work shall be done in accordance with safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America and the Department of Labor and Industrial Relations, Occupational, Safety and Health Division (HIOSH).

3.3 DISPOSITION OF MATERIALS

- A. Title to Materials: Title to all materials and equipment to be removed, except as specified otherwise, is vested in the Contractor upon receipt of notice to proceed. The State will not be responsible for the condition or loss of, or damage to, such property after notice to proceed. Materials and equipment shall not be viewed by prospective purchasers or sold on the site. Burning or burying of materials on the site will not be permitted.
- B. When removing the materials from the property, truck loads shall be trimmed, covered, and loaded as to prevent spillage.
- C. All waste material shall be hauled away to an appropriate off-site dump area and in accordance with all regulations. The Contractor shall provide to The State disposal receipts for all disposed materials.
- D. Remove rubbish and debris from the job site daily, unless otherwise directed. Store materials which cannot be removed daily in areas specified by The State.

3.4 CLEANUP

- A. Debris and Rubbish: Remove and transport debris and rubbish in a manner that will prevent spillage into ocean or adjacent areas. Cleanup spillage from ocean and adjacent areas. The Contractor shall leave the premises clean, neat, and orderly.
- B. Regulations: Comply with Federal, State, and local hauling and disposal regulations.

END OF SECTION

SECTION 02100

SITE PREPARATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. The work to be performed under this section shall include clearing the premises of all obstacles and obstructions, the removal of which will be necessary for the proper reception, construction, execution and completion of the other work included in this contract.
- B. Related Sections include the following:
 - 1. Section 02050 "Demolition."
 - 2. Section 02270 "Sediment And Erosion Control."
 - 3. Section 02510 "Water Distribution."

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

- A. Maintenance of Traffic: The Contractor shall conduct operations with minimum interference to streets, driveways, sidewalks, passageways, etc.
- B. Protection: Throughout the progress of the work, protection shall be provided for all property and equipment, and temporary barricades shall be provided as necessary. Work shall be done in accordance with the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America, and the State of Hawaii's Occupational Safety and Health Standards, Rules and Regulations.
- C. Fires: No burning of fires of any kind will be allowed.
- D. Reference Points: Bench marks, etc., shall be carefully maintained, but if disturbed or destroyed, shall be replaced as directed, at the Contractor's expense.
- E. Disposal: All materials resultant from operations under this Section, except as indicated or specified otherwise, shall become the property of the Contractor and shall be removed from the site in accordance with all regulations. Loads of materials shall be trimmed to prevent droppings.

3.2 EXISTING UTILITY LINES

- A. The location of underground utility lines to each structure is not known other than those indicated in their approximate locations on the Drawings.
- B. Water and Sewer
 - 1. Refer to Section 02510 – WATER DISTRIBUTION for notification and coordination requirements prior to disruption of water service.
 - 2. Seal and cap utility lines where necessary as required by regulations of the authority having jurisdiction or as directed by The State. Contractor shall recharge the water service line to check for and repair any leaks at cap prior to abandoning-in-place.
- C. Cable Television (CATV), Telephone and Electrical Lines: Removal of infrastructure owned and operated by other agencies shall be coordinated with each agency as required.
- D. Other: Should any unknown line be encountered during excavation the Contractor shall immediately notify The State of such discovery. The State shall then investigate and issue instructions for the preservation or disposition of the unknown line. Authorization for extra work shall be issued by The State only as he deems necessary.

3.3 REMOVAL OF VEGETATION OBSTRUCTIONS

- A. The Contractor may need to trim vegetation growing into the project limits that prohibit access to complete the work included in this contract. Contractor may trim vegetation only within State property.
- B. If removal is required, plants and hedges shall be removed to a minimum depth of 6 inches. The Contractor shall remove trees and its roots to a minimum of 3 feet below existing ground level. Remove all large roots in excess of 2 inches in diameter, and backfill and compact the resulting depression. All debris accumulated from this operation shall be completely removed from the premises by the Contractor.

3.4 CLEAN UP OF PREMISES

Clean up and remove all debris accumulated from construction operations from time-to-time as directed. Upon completion of the construction work and before final acceptance of the contract work, remove all surplus materials, equipment, scaffoldings, etc., and leave entire job site raked clean and neat to the satisfaction of The State.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Licensed Geotechnical Engineer: The Contractor shall retain and pay for the services of a geotechnical engineer to monitor and perform testing during the earthwork operations and prepare and sign the final Grading Report. The geotechnical engineer shall be a licensed civil engineer licensed in the state of Hawaii and specializing in geotechnical engineering with at least five (5) years of licensed experience.
- B. It shall be the responsibility of the Contractor to examine the project site and determine for himself the existing conditions. Obvious conditions of the site existing on the date of the bid opening shall be accepted as part of the work, even though they may not be clearly indicated on the drawings and/or described herein.
- C. Related Sections include the following:
 - 1. Section 02100 – “Site Preparation.”
 - 2. Section 02225 – “Trenching And Backfilling. “
 - 3. Section 02270 – “Sediment And Erosion Control.”
 - 4. Section 02930 – “Exterior Plants.”

1.2 REFERENCES

- 1. The “Standard Specifications for Public Works Construction”, dated September 1986, as revised, except as amended in the plans and/or specifications herewith, of the Department of Public Works, as applicable to the City and County of Hawaii, hereafter referred to as the “DPW Standard Specifications”, or as herein specified. (Paragraphs concerning Measurement and Payment are not applicable to this project.)
- 2. The “Standard Details for Public Works Construction”, September 1984, of the Department of Public Works, including all revisions, as applicable to the County of Hawaii, hereafter referred to as the DPW “Standard Details”, or as herein specified.

1.3 QUALITY ASSURANCE AND CODES

- A. Source Quality Control: Test import and on-site materials proposed for use to demonstrate that the materials conform to the specified requirements. Tests shall be performed by a qualified independent testing laboratory and paid for by the Contractor.
- B. Test for Moisture-Density Relations: Submit test results for each material at least 7 days prior

to compacting of each material.

- C. Field Dry Density and Moisture Content Tests: Submit field test data sufficiently in advance of construction so as not to delay work. Furnish a drawing showing test locations, test numbers, test elevations, and test results. Submit test results within 3 days of test date. Field density tests shall be performed for subgrade of excavation for pavements, areas to receive fill, and backfill and fill lifts.
- D. The Contractor shall verify testing and reporting requirements with The State prior to the start of earthwork operations.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01300 – Submittals.
- B. Test Reports: Submit test reports as directed by The State. Contractor shall verify all requirements prior to the start of earthwork operations.
- C. Certification of Compaction: An independent geotechnical testing laboratory working under the supervision of a licensed civil engineer licensed in Hawaii shall test and certify all compaction work. Certifications and test results shall be submitted to The State within three (3) days of the test.
- D. Field Dry Density and Moisture Content Tests: Submit field test data not listed above sufficiently in advance of construction so as not to delay work. Furnish a drawing showing test locations, test numbers, test elevations, and test results. Submit test results within 3 days of test date.
- E. Manufacturer's product literature: Submit manufacturer's product literature including description of material and physical properties and laboratory test data for bedding material, sub-bedding material, general fill, and structural fill to The State for approval at least 15 calendar days prior to construction.

1.5 CONTRACTOR'S RESPONSIBILITIES

- A. All clearing, site preparation or earthwork performed on the project up to the approximate finish grade or subgrades shall be conducted by the Contractor under the inspection of the Licensed Geotechnical Engineer.
- B. It is the Contractor's responsibility to prepare the ground surface to receive the fills and to place, spread, mix, moisture condition, and compact the fill in accordance with the specifications herein. The Contractor shall also remove all unsuitable and deleterious materials.
- C. It is also the Contractor's responsibility to have suitable and sufficient compaction equipment on the job site to handle the amount of fill being placed. If necessary, excavation equipment shall be shut down to allow completion of compaction. Sufficient watering apparatus will also be provided by the Contractor with due consideration for the fill material, rate of placement, and the time of year.

- D. The Contractor shall not implement blasting as a means for removal of material.
- E. The Licensed Geotechnical Engineer shall promptly notify both the Contractor and The State verbally of any failing compaction tests and the results of such tests to the extent the tests show a lack of compliance with specifications. These items shall also be documented by the Licensed Geotechnical Engineer.
- F. If any field density test indicates inadequate compaction or moisture content, the Contractor shall moisture condition and recompact and retest until adequate compaction and adequate moisture content is achieved.
- G. During construction, drainage shall be provided to minimize ponding of water adjacent to or on foundation and pavement areas. Ponded areas shall be drained immediately. Any subgrade soil that has become soft due to ponding shall be removed to firm material and replaced with properly compacted structural fill at no cost to the State.

1.6 PROTECTION

- A. The Contractor shall ensure adequate temporary sediment and erosion control measures are installed prior to any earthwork operations as specified on the Plans and in Section 02270 – SEDIMENT AND EROSION CONTROL.
- B. Take all precautions and safety measures as required to protect the State free and harmless from liability of any kind. Conduct operations with minimum interference to streets, driveways, sidewalks, trails, etc.
- C. The Contractor shall protect from damage all surrounding buildings, structures, roads, embankments, walls, fences, utilities, trees, walks, pavements, etc. Any damage shall be repaired or replaced by the Contractor to the satisfaction of The State at no additional cost to the State.

1.7 PERMITS

The Contractor shall obtain and pay for all necessary permits prior to the commencement of work.

1.8 CONSTRUCTION LINES, LEVELS AND GRADES

- A. The Contractor shall verify all lines, levels and elevations indicated on the drawings or as directed by The State before any clearing, excavation or construction begins. Any discrepancy shall be immediately brought to the attention of The State and any changes shall be made in accordance with his instructions. The Contractor shall not be entitled to extra payment if he fails to report the discrepancies before proceeding with any work whether within the area affected or not.
- B. The establishment of grades and staking out the entire work shall be done by a licensed Surveyor or a licensed Civil Engineer, registered in the State of Hawaii. He shall be solely responsible for their accuracy. Erect and maintain substantial batter boards showing

construction lines and levels.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials shall be in accordance with the below-listed sections of the DPW Standard Specifications, including all revisions, and shall govern all work except for the subsections of Measurement and Payment which shall not be applicable.

- | | |
|-------------------------------------|------------|
| 1. Trench Backfill | Section 11 |
| 2. Select Borrow for Subbase Course | Section 30 |
| 3. Aggregate Base Course | Section 31 |

- B. Unsuitable Soils

Unsuitable soils are materials classified as SP, MH, ML, CH, CL, PT, OL, and OH according to Unified Soil Classification System (USCS) and ASTM D2487. These materials shall not be used as structural fill, structural backfill, and below slabs-on-grade and pavements.

- C. General Fill Material:

1. All on-site and imported materials shall be tested by the Contractor's Geotechnical Engineer and approved by the Engineer prior to their use. An adequate number of field density tests shall be performed to check that the required degree of compaction has been achieved.
2. Oversized rock particles greater than 3-inch in maximum dimension resulting from the excavation process shall not be re-used as backfill unless it can be crushed and screened to provide a well graded, fine to coarse granular mixture conforming to the structural fill or structural backfill requirements stated herein.

- D. Structural Fill and Structural Backfill

1. Structural fill and structural backfill shall be a granular, generally well-graded material with particles ranging from coarse to fine and classified as GW, GW-GM, GP-GM, SW, SW-SM, or SP-SM according to the USCS. It shall be free of organic matter, vegetation, debris, clayey soils, and particles larger than 3 inches in maximum dimension. It shall be non-expansive with less than 15 percent of fines passing a U.S. No. 200 standard sieve. It shall have a California Bearing Ratio (CBR) value of at least 30, a CBR swell of less than 2 percent after 4 days of soaking, a liquid limit of 25 percent or less, and a plasticity index of 10 or less.
2. Material classified as GM or SM may be used as structural fill or structural backfill provided it meets the requirements stated herein and its fines are non-plastic.

3. Fill in landscape and non-structural areas shall be free of vegetation, debris, trash, concrete, old pavements, and particles larger than 3 inches in maximum dimension. It shall have a CBR swell of less than 3 percent when compacted at optimum moisture content and after 4 days of soaking and a CBR value of at least 10.
- E. Topsoil: See Section 02930 – EXTERIOR PLANTS.
- F. Gravel for gravel bed areas: See Landscape Plans.

PART 3 - EXECUTION

3.1 SITE PREPARATION

- A. All areas within the limits of grading as indicated on the plans shall be cleared of trees, vegetation, and deleterious materials such as rubbish, roots, and organics and disposed of off-site in accordance with Section 02100 – SITE PREPARATION. This removal shall be completed prior to excavating and filling.
- B. Any abandoned underground structures such as cesspools, cisterns, tunnels, septic tanks, wells, pipelines, or other structures not shown on the drawings that are discovered shall be removed and the resulting depression backfilled and compacted in accordance with these specifications.
- C. The Contractor shall select, install and maintain shoring, sheeting, bracing, and underpinning as necessary to maintain safe excavations. The Contractor shall be responsible for ensuring such measures: (1) comply fully with OSHA Excavations and Trenches requirements, (2) provide necessary support to the sides of excavations, (3) provide safe access to backfill, compaction, and testing within the excavation, (4) prevent settlement and undermining of pavements, existing structures, foundations and slabs, and aboveground and underground utilities, (5) protect against excavation instability, boiling, and/or blowout of excavation bottoms, and (6) are removed entirely from the project site after excavation has been completed.
- D. All earthwork shall be performed in strict accordance with applicable law, including local ordinances, and applicable OSHA requirements. All excavations shall be protected and guarded against danger to life, limb, and property.

3.2 EXCAVATION

- A. Excavate to contours, dimensions and depths indicated on the plans. Notify The State immediately in writing in the event that it becomes necessary to remove material to a depth greater than indicated. Refill excavations cut below the depths indicated with structural fill and compact as specified herein. Excavate soil disturbed or weakened by construction operations or soils softened from exposure to weather at no cost to the State. Refill with structural fill and compact as specified herein.
- B. Excavation for footings, pavements, etc., shall have level beds on undisturbed, firm bearing, compacted subgrade. Remove soft or yielding material at the subgrade level and replace with

structural fill as directed by The State.

- C. Excavated materials declared unsuitable by the Licensed Geotechnical Engineer shall be removed from the site at the Contractor's expense.

3.3 FILL PLACEMENT

- A. Fill and backfill shall not be constructed when weather conditions detrimentally affect the quality of the finished course. Do not construct fill and backfill in the rain or on saturated subgrade. If weather conditions are windy, hot or arid, with high rate of evaporation, schedule the placement in cooler portions of the day and furnish equipment to add moisture to the fill or backfill during and after placement.
- B. Areas to receive fill shall be scarified to a depth of at least 6 inches, moistened as necessary to about 2% above the optimum moisture content and compacted to the degree of compaction specified in paragraph 3.4 below. If soft or loose spots are encountered, the loose/soft areas shall be removed to firm material and the resulting depression shall be filled with properly compacted structural fill.
- C. Protect compacted subgrade from exposure to weather elements. If shrinkage cracks appear on the excavated or compacted subgrade, the subgrade shall be scarified and thoroughly moisture conditioned and recompacted to provide a firm base and to close all cracks.
- D. Moisten or aerate material as necessary to provide the moisture content and obtaining the specified compaction with the equipment used. Any soft or yielding areas detected during the subgrade compaction shall be treated by removing the soft or loose materials to firm soils and backfilling with structural fill.
- E. General Fill: General fill in non-structural areas shall be placed in not more than 8-inch thick horizontal loose lifts, moisture conditioned to between optimum and 3% wet of optimum moisture content, and compacted to at least 90% of the maximum dry density as determined by ASTM D1557 test method.
- F. Structural Fill
 - 1. Place structural fill and structural backfill under footing, concrete slabs, and pavements.
 - 2. In advance of preparing the subgrade or depositing a specified layer of material, existing material within the area where such materials is to be placed, which in the opinion of The State is unsuitable as subgrade foundation, shall be removed and the resulting space refilled with properly compacted structural fill.
 - 3. The subgrade above which fill is to be placed shall be scarified at least 6 inches, moisture conditioned to between optimum and 2% above optimum moisture, and compacted to at least 90% of the maximum dry density as determined by ASTM D1557 test method.
 - 4. Structural fill shall be placed in not more than 8-inch thick horizontal loose lifts, moisture conditioned to within 2% of its optimum moisture content and compacted to at least 95%

of the maximum dry density as determined by ASTM D1557 test method except as indicated otherwise.

3.4 COMPACTION

- A. Compact each lift before placing overlaying lift. Compact each lift of structural fill with equipment well suited to the fill being placed. Compaction shall be accomplished continuously over the entire area. Sufficient passes shall be made to ensure that specified density is obtained. Compact areas not accessible to rollers or compactors with mechanical hand tampers.
- B. Compaction and Testing
 - 1. Compaction shall be accomplished by sheepsfoot roller, pneumatic tire rollers, steel-wheeled rollers, or other suitable equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.
 - 2. Soils materials and compaction of all fill shall be tested by an independent testing agency approved by The State and test results submitted to The State. Perform one field density test for every 500 square feet or fraction thereof of subgrade and each lift of fill and backfill. All cost of testing shall be borne by the Contractor.
 - 3. Test structural fill for ASTM D2487 gradation limits and ASTM D1557 for moisture density relations. Perform a new set of tests for any source change.
 - 4. Field Density testing shall be made throughout the area for each compacted layer or as directed by The State. Perform field density and moisture content test in accordance with ASTM D 1556 or ASTM D6938. When test results indicate inadequate compaction, the material shall be recompacted and retested to meet specification requirements. Submit a plan showing test locations, test numbers, test elevations, and test results within 3 days of test date.
 - 5. Each layer of fill and backfill shall be thoroughly compacted from edge to edge using suitable compaction equipment designed for the purpose. All field dry density and moisture content testing and reporting shall be conducted under the supervision of a licensed Civil Engineer licensed in the State of Hawaii at no additional cost to the State. If any field density test indicates inadequate compaction or moisture content, the Contractor shall moisture condition, recompact, and retest until adequate compaction and adequate moisture content is achieved. Verify that test results conform to the specified requirements, and that sufficient tests are performed.

3.5 GRADING

- A. Grading shall conform to the ordinances of the applicable County issuing the Grading Permit and as amended.
- B. Landscaped areas shall be graded with an allowance for a thickness of topsoil as required in Section 02930 – EXTERIOR PLANTS. Areas to be top soiled shall be compacted to 85% of

maximum dry density before placing topsoil. Topsoil shall be spread evenly, compacted lightly and raked to a uniform place at required contours and grades.

- C. The complete excavation and fill surface shall be true to grade and elevation and shall provide a firm base. Tolerances shall be 0.10 feet.

3.6 CLEANUP

Clean up and remove all debris accumulated from construction operations from time to time and when directed by The State. Upon completion of the construction work and before final acceptance of work, remove all surplus materials, equipment, etc. and leave entire jobsite clean and neat.

END OF SECTION

SECTION 02225

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. This Section covers the requirements for trenching, backfilling, and compacting as needed for installation of underground utilities associated with the Work.
- B. Licensed Geotechnical Engineer: The Contractor shall retain and pay for the services of a geotechnical engineer to monitor and perform testing during the earthwork operations and prepare and sign the final Grading Report. The geotechnical engineer shall be a licensed civil engineer licensed in the state of Hawaii and specializing in geotechnical engineering with at least five (5) years of licensed experience.
- C. Related Sections include the following:
 - 1. Section 02100 "Site Preparation."
 - 2. Section 02200 "Earthwork. "
 - 3. Section 03350 "Controlled Low Strength Material" (CLSM).

1.2 REFERENCES

- 1. The "Standard Specifications for Public Works Construction", dated September 1986, as revised, except as amended in the plans and/or specifications herewith, of the Department of Public Works, as applicable to the City and County of Hawaii, hereafter referred to as the "DPW Standard Specifications", or as herein specified. (Paragraphs concerning Measurement and Payment are not applicable to this project.)
- 2. The "Standard Details for Public Works Construction", September 1984, of the Department of Public Works, including all revisions, as applicable to the County of Hawaii, hereafter referred to as the DPW "Standard Details", or as herein specified.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 – Submittals.
- B. Test Reports: Submit test reports as directed by The State. Contractor shall verify all requirements prior to the start of earthwork operations.
- C. Certification of Compaction: Geotechnical testing laboratory shall test and certify all compaction work. Certifications and test results shall be submitted to The State within three (3) days of the test.

- D. Field Dry Density and Moisture Content Tests: Submit field test data not listed above sufficiently in advance of construction so as not to delay work. Furnish a drawing showing test locations, test numbers, and elevations. Submit test results within 3 days of test date.
- E. Manufacturer's product literature: Submit manufacturer's product literature including description of material and physical properties and laboratory test data for bedding material, satisfactory fill, and structural fill to The State for approval at least 15 calendar days prior to construction.
- F. Dewatering plan: Describe methods for removing collected water from open trenches and excavations, and diverting surface water or piped flow away from work area and excavations. Describe the basic components of the dewatering system proposed and its planned method of operation. Provide dewatering plan, sketches, or details along with calculations by a licensed professional civil engineer specializing in geotechnical engineering and licensed in the State of Hawaii.

1.4 QUALITY ASSURANCE

- A. Compaction requirements are defined by American Society for Testing and Materials (ASTM) publication D 1557 "Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb Rammer and 18-inch Drop."
- B. Design of all excavation support systems by a structural engineer licensed in the State of Hawaii. The Contractor's engineer shall verify the actual subsurface conditions are consistent with the subsurface conditions used in their design and shall make modifications to the excavation support and dewatering systems where necessary.
- C. Dewatering System: The dewatering system shall protect against excavation instability, boiling, and/or blow out of the excavation and trench bottoms, damage to existing utilities, and settlement and/or ground movements, instability, and distress to buildings, foundations, walls, structures, and pavements.

1.5 CONTRACTOR'S RESPONSIBILITIES

- A. It is the Contractor's responsibility to prepare the ground surface to receive the fills and to place, spread, mix, moisture condition, and compact the fill in accordance with these Specifications herein. The Contractor shall also remove all unsuitable and deleterious materials.
- B. It is also the Contractor's responsibility to have suitable and sufficient compaction equipment on the job site to handle the amount of fill being placed. If necessary, excavation equipment shall be shut down to allow completion of compaction. Sufficient watering apparatus will also be provided by the Contractor with due consideration for the fill material, rate of placement, and the time of year.
- C. The Contractor shall not implement blasting as a means for removal of material.
- D. The Licensed Geotechnical Engineer shall promptly notify both the Contractor and The State

verbally of any failing compaction tests and the results of such tests to the extent the tests show a lack of compliance with these Specifications. These items shall also be documented by the geotechnical engineer.

- E. If any field density test indicates inadequate compaction or moisture content, the Contractor shall moisture condition and recompact and retest until adequate compaction and adequate moisture content is achieved.
- F. During construction, drainage shall be provided to minimize ponding of water adjacent to or on foundation and pavement areas. Ponded areas shall be drained immediately. Any subgrade soil that has become soft due to ponding shall be removed to firm material and replaced with compacted structural fill.

1.6 UTILITIES

- A. Unless shown to be removed, protect lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the State.
- B. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
- C. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the State.
- D. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify The State and secure his instructions.
- E. Do not proceed with permanent relocation of utilities until written instructions are received from The State.

1.7 PROTECTION

- A. Shoring: Adequate shoring and bracing should be provided by the Contractor in accordance with U.S. Department of Labor Occupational Safety and Health Administration guidelines and other governmental regulations for the utility trenches and other similar deep excavations.
- B. Barricade open trenches and post warning lights adjacent to work areas if accessible to the public.
- C. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
- D. Protect buildings, structures, embankments, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.
- E. During the period of construction, the Contractor shall protect the public against mud, dust and similar nuisances and shall take steps to abate such nuisances.

1.8 PERMITS

Obtain all necessary permits required from applicable agencies. All permit fees will be considered incidental to the work and a separate payment shall not be made.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials shall be in accordance with the below-listed sections of the DPW Standard Specifications, including all revisions, and shall govern all work except for the subsections of Measurement and Payment which shall not be applicable.
 - 1. Trench Backfill Section 11
 - 2. Select Borrow for Subbase Course Section 30
 - 3. Aggregate Base Course Section 31
- B. Pipe bedding material shall consist of clean, free draining basaltic gravel material conforming to the gradation requirements of ASTM D448, No. 67 size.
- C. Controlled Low Strength Material shall be used in sewer line trench backfill within County right-of-way and shall meet the requirements of Section 03350 – CONTROLLED LOW STRENGTH MATERIAL (CLSM).
- D. Oversized rock particles greater than 3-inch in maximum dimension resulting from the excavation process shall not be used in the trench and excavation backfill unless it can be crushed and screened to provide a well graded, fine to coarse granular mixture conforming to the trench backfill requirements stated herein.
- E. All trench backfill and imported materials shall be tested by the Licensed Geotechnical Engineer and approved by The State before they are used. If in the opinion of The State that the Contractor's proposed backfill does not meet the material requirements specified herein, the Contractor shall resubmit and provide material test results that meet the material requirements of this project.

PART 3 - EXECUTION

3.1 SITE PREPARATION

- A. Prior to trenching for new utility lines and manholes within existing paved areas, the areas along the proposed utility alignment should be prepared by saw-cutting and removing the existing pavements. All old pavements shall be demolished and removed off-site by the Contractor at his own expense in compliance with all regulatory agency requirements.
- B. Prior to trenching and excavating for the new utility lines and manhole installations, the as-

built conditions of all underground utilities and structures, including mains and laterals, should be field verified to check on their locations and depths.

- C. The location of the existing utilities shown on the Plans is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall scan the project site with electromagnetic and sonic equipment and mark the surface of the ground where existing underground utilities are discovered.
- D. Any existing underground utilities and structures that may interfere with the new utility lines shall be removed and/or relocated, if still in use, as directed by The State. The remaining portions of any lines to be abandoned and left in-place shall be properly cut and plugged.

3.2 TRENCHING

- A. Excavation and dewatering shall be conducted in accordance with Section 02200 – EARTHWORK.
- B. The trench width shall be kept to a minimum to reduce the potential for ground settlements. The trench payment width shall be as specified on the Plans. The bottom of trenches shall be accurately graded to provide uniform bearing and support for the pipes.
- C. Where soft or unsuitable material is encountered at the bottom of the trench, remove such material and replace with properly compacted structural fill as specified in Section 02200 - EARTHWORK. When removal of unsuitable excavated material creates a shortage of backfill material, the Contractor shall, at no cost to the State, furnish material as specified in this Section in the amount required to complete the backfill.
- D. Temporary storage of excavated material shall be done in such a manner as not to obstruct pedestrian or vehicular traffic. Storage of excavated or backfill materials in the stream is not allowed. Whenever, in the opinion of The State, proper storage of excavated material cannot be made onsite, the material shall be hauled away from the work site. If the excavated material meets the requirements for backfill material and proper storage cannot be made at the site, the material shall be stockpiled at approved locations for later use in backfill.
- E. Surplus Material: Unless otherwise specified in the Plans or Specifications, or ordered by The State, surplus excavated material shall become the Contractor's property and shall be removed from the work site and disposed of at no cost to the State.

3.3 PIPE SUBGRADE TREATMENT

- A. Prior to the placement of bedding for new utilities, the bottom of the utility trenches shall be compacted to a firm consistency. Any soft or yielding materials at the bottom of the trenches shall be excavated to firm material and replaced with additional bedding material. All trenches shall be backfilled as soon as practical after the utility lines have been properly installed and tested to reduce exposure of the trench to weather elements. Contractor shall take advantage of periods of low tides for trenching and dewatering works.

3.4 BACKFILL, PLACEMENT, AND COMPACTION

- A. All backfill material shall be placed by hand or by approved mechanical methods. The compaction of backfill material shall be done by tamping with hand tools or other suitable equipment such as pneumatic tampers or vibratory compactors. The method of compaction shall be approved by The State and all compaction shall be done to the satisfaction of The State.
- B. Place bedding material from at least 4 inches below the pipe invert to at least 12 inches above the crown of the pipe.
- C. Pipe bedding material shall be placed and tamped, supplemented by hand shoveling, to provide full contact with the entire periphery of the pipes. The bedding material shall be placed in not more than 8-inch thick loose lifts and compacted with vibratory equipment to a dense consistency as evidenced by little to no settlement of the gravel under repeated passes with the compaction equipment with the vibrator turned on, but not less than 6 passes per lift. Care shall be taken to protect the pipes from damage during the backfilling operations.
- D. Jetting of the bedding and trenching backfill shall not be allowed.
- E. The trench backfill above the bedding material shall be placed in not more than 8-inch thick loose lifts, moisture conditioned to between optimum moisture content and 3 percent wet of the optimum moisture content, and compacted to a relative compaction of at least 90 percent.
- F. The top at least 24 inches of the trench backfill below paved areas shall consist of base course and structural fill. Trench backfill placed within 24 inches of paved areas shall be compacted to a relative compaction of at least 95 percent for structural fill and base course.

3.5 FIELD QUALITY CONTROL

- A. Trenches shall not be backfilled until approved by the State.
- B. Where compaction and minimum relative compaction are indicated, test trench backfill for moisture-density relations in accordance with ASTM D 1557. Perform at least one moisture-density relations test for each material used and provide additional tests for each change of source. Perform one field density and moisture content test in accordance with ASTM D 1556 or ASTM D 6938 per 150 feet or fraction thereof of trench backfill in each lift but not less than one test per lift. Furnish a plan showing test location, test number, elevation, and test results to the State within 3 days of the test date. If field density tests indicate inadequate compaction, the Contractor shall re-compact and retest until adequate compaction is achieved. Verify that test results conform to the specified requirements, and that sufficient tests are performed.
- C. Any work determined to be not in compliance shall be removed and properly replaced at no additional cost to the State.

END OF SECTION

SECTION 02270

SEDIMENT AND EROSION CONTROL

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. The work to be performed under this section shall include furnishing all labor, materials and equipment necessary for the installation and maintenance of the construction sediment and erosion control measures.
- B. All sediment and erosion control measures shall comply with the State Department of Health regulations and Hawaii County Code Chapter 10 - Erosion and Sedimentation Control.
- C. All erosion and sediment control measures are to be placed prior to any disturbance caused by grading and or excavation.
- D. The Contractor shall ensure that erosion and sediment control measures are implemented and maintained as necessary.
- E. Related Sections include the following:
 - 1. Section 02050 "Demolition."
 - 2. Section 02100 "Site Preparation."
 - 3. Section 02200 "Earthwork."

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Filter Sock
 - 1. Composite Filter Media: Sanitized, mature compost with no identifiable feedstock constituents or offensive odors meeting all local, state, and Federal quality requirements. Biosolids compost shall meet the Standards for Class A Biosolids outlined in 40 Code of Federal Regulations (CFR) Part 503.
 - 2. Compost used for filtration shall meet the following parameters:

Parameter	Unit	Value
pH:		6 - 8
Moisture Content:	%, wet weight	30 - 60
Organic Matter:	%, dry weight	25 - 65
Particle Size:	% passing mesh size, dry weight	2 in. = 100% 0.375 in. = 10 – 30%
Stability (CO ₂ Rate):	Mg CO ₂ -C per gram of organic matter per day	< 8
Physical Contaminants (Manmade Inerts):	%, dry weight	< 1

3. Filter Sock: Filter sock shall utilize an outer layer of filtration mesh, and an inner layer of containment netting. All layers shall collectively enclose the compost filtration media. Filter sock shall be 12” nominal diameters or as indicated on the Drawings.

B. Filter Fabric

1. The woven geotextile fabric for sediment and erosion control shall be MIRAFI 140N or an acceptable equivalent. The fabric shall meet the following minimum physical requirements:

Fabric Property	Test Method	Unit	Min. Avg. Roll Value
Grab Tensile Strength	ASTM D-4632	lb	120
Grab Tensile Elongation, MD/CD	ASTM D-4632	%	50/50
Trapezoid Tear Strength, MD/CD	ASTM D-4533	lb	50/50
CBR Puncture Strength	ASTM D-6241	lb	310
Apparent Opening Size (AOS)	ASTM D-4751	US Sieve	70
Permittivity	ASTM D-4491	sec ⁻¹	1.7
Flow Rate	ASTM D-4491	gal/min/ft ²	135
UV Resistance (at 500 hours)	ASTM D-4355	% strength retained	70

2. Any request to substitute an equivalent filter fabric shall be subject to review and approval by The State.
3. The fabric shall be kept in a dry location and shall be protected from the direct rays of the sun.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Prior to starting any construction, the Contractor shall install the sediment control measures at the construction limits as indicated on the plans and per manufacturer's specifications to prevent silt and debris from leaving the project site.
- B. An ingress/egress aisle shall be provided to prevent any mud, dirt, rock or sediment from being tracked onto public roadways. The ingress/egress aisle is to be underlain by filter fabric.
- C. Install temporary berms, cut-off ditches and other provisions needed for construction methods and operations. Should there be a question if the temporary measures are insufficient to prevent erosion, The State shall make the final determination.
- D. Temporary seeding shall be placed on exposed surfaces that will not be brought to final grading or permanent cover treatment within 30 days of the exposure to reduce erosion and sedimentation by stabilizing exposed soils. Seeded areas shall be checked regularly for bare spots, washouts, and healthy growth to assure that a good stand of grass is being maintained. Reseed areas that fail to establish vegetation cover as soon as such areas are identified.

3.2 MAINTENANCE

- A. Sediment control measures shall be inspected immediately after each rainfall and at least daily during prolonged rainfall.
- B. Filter socks shall be inspected for depth of sediment, tears, and proper location. If there is any evidence of movement, filter sock shall be restored to original location and anchored with sandbags. Any deficiencies shall be repaired immediately.
- C. Should the any portion of the filter sock decompose or become ineffective prior to the end of the expected usable life and the measure is still necessary, the ineffective portion shall be replaced promptly at no additional cost to the State.
- D. Sediment deposits on a filter sock shall be removed after each storm event and/or when deposits reach approximately 1/2 the height of the barrier or when the sediments limit or prevent the flow of water through the filter sock.
- E. Any sediment deposits remaining in place after the filter sock is no longer required shall be graded to conform to the existing grade, prepared, and seeded.
- F. Upon completion of the project the Contractor shall remove all sediment and erosion control measures from the Site.

3.3 CONFORMANCE

- A. Failure to conform to the above requirements and regulations will be cause for temporary or permanent suspension of operations. If operations are suspended due to the Contractor's failure

to conform, the Contractor shall maintain the project during the period of suspension at no cost to the State.

END OF SECTION

SECTION 02361
TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Soil treatment with termiticide.
 - 2. Wood treatment with borate.
- B. Related Sections include the following:
 - 1. Section 06100 "Rough Carpentry" for wood preservative treatment by pressure process.
 - 2. Section 07620 "Sheet Metal Flashing and Trim" for custom-fabricated metal termite shields.

1.3 UNIT PRICES

- A. Basis of Bids: Unit price for each termite bait station(s) provided.
 - 1. See Division 01 – "Proposal" for list of unit prices.

1.4 PERFORMANCE REQUIREMENTS

- A. Service Life of Soil Treatment: Soil treatment by use of a termiticide that is effective for not less than five years against infestation of subterranean termites.

1.5 SUBMITTALS

- A. Product Data: For termiticide and bait-station system.
 - 1. Include the EPA-Registered Label for termiticide products.
- B. Product Certificates: For termite control products, signed by product manufacturer.
- C. Qualification Data: For Installer of termite control products.
- D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Brand name and manufacturer of termiticide.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes, and rates of application used.
6. Areas of application.
7. Water source for application.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located, and who employs workers trained and approved by bait-station system manufacturer to install manufacturer's products.
- B. Regulatory Requirements: Formulate and apply termiticides according to the EPA-Registered Label.
- C. Source Limitations: Obtain termite control products through one source.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

1.8 COORDINATION

- A. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Five years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

- A. Continuing Service: Beginning at Substantial Completion, provide 12 months' continuing service including monitoring, inspection, and re-treatment for occurrences of termite activity. Provide a standard continuing service agreement. State services, obligations, conditions, and terms for agreement period; and terms for future renewal options.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Termiticides:
 - a. Aventis Environmental Science USA LP; Termidor.
 - b. Bayer Corporation; Premise 75.
 - c. Dow AgroSciences LLC; Dursban TC or Equity.
 - d. FMC Corporation, Agricultural Products Group; Talstar, Prevail FT or Torpedo.
 - e. Syngenta; Demon TC.

2.2 SOIL TREATMENT

- A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.
 - 1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
 - 1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
 - 1. Slabs-on-Grade and Basement Slabs: Underground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 2. Foundations: Adjacent soil including soil along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, piers, and chimney bases; also along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 - 3. Masonry: Treat voids.
 - 4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

- C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- D. Post warning signs in areas of application.
- E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION

SECTION 02362

SOIL TREATMENT FOR VEGETATION CONTROL

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish all labor, materials and equipment necessary placing or spraying weed killer on the prepared pavement subgrade prior to the installation of the base course.
- B. Related Sections include the following:
 - 1. Section 02100 "Site Preparation."
 - 2. Section 02740 "Flexible Pavement."

1.2 SUBMITTALS

- A. Submit in accordance with Section 01300 – Submittals.
 - 1. Product Data:
 - a. Treatments.
 - b. Application instructions.
 - c. Copies of the EPA-registered labels for all chemicals.
 - d. Product Data: Material Safety Data Sheets.
 - 2. Product Certificates: Signed by manufacturers of weed killer products certifying that treatments furnished comply with requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

Weed Killer shall be "Casoron 4G", "Norosac 4G", or an approved equal for under asphalt application on new pavement.

PART 3 – EXECUTION

3.1 APPLICATION

- A. Mix the under-asphalt weed killer and uniformly spread using calibrated application equipment at the maximum rates permit for under asphalt use.

- B. Retreat nut grass and weeds two (2) days after initial application and again if growth still exists.
- C. Notify The State 24 hours before application of weed killer.

END OF SECTION

SECTION 02500

CONCRETE CURBS AND SIDEWALK

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish all labor, materials and equipment necessary for the installation of concrete curbs and headers as indicated on the drawings and as specified within.
- B. Related Sections include the following:

Section 03300 "Cast-In-Place Concrete."

1.2 SUBMITTALS

- A. Submit in accordance with Section 01300 – Submittals.
- B. Certificates: Submit affidavits from the manufacturers or supplier's certifying that types of materials being supplied meet the requirements of these specifications.
- C. Design Mixtures: Submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- D. Field quality-control test and inspection reports.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Materials for concrete curbs and headers shall be supplied and constructed in accordance with the below-listed sections of the "Standard Specifications for Public Works Construction", September 1986, of the Department of Public Works, including all revisions, as applicable to the County of Hawaii, hereafter referred to as the STANDARD SPECIFICATIONS. Subsections of Measurement and Payment which shall not be applicable.
 - 1. Section 29 – Subgrade.
 - 2. Section 31 – Aggregate Base Course.
 - 3. Section 39 – Portland Cement Concrete.
 - 4. Section 41 – Concrete Curb and Gutter.
 - 5. Section 42 – Concrete Sidewalk.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The Contractor shall stake out area of new curbs and headers using wooden stakes on which final finish elevations, base course and subgrade elevations are clearly marked. All such stakes and elevations shall be approved by The State before any work is done.
- B. Concrete Sidewalks And Pavement Repair: Any existing concrete pavement that have been damaged by construction activities shall be repaired to the original condition and to the satisfaction of the Engineer.

3.2 FINAL INSPECTION

- A. At the time of final inspection of the work performed under the Contract, the work covered by this Section shall be complete in every respect and operating as designed. All surplus materials of every character, resulting from the work of this Section, shall have been removed. Any defects discovered in the work, subsequent to this inspection, shall be corrected prior to final acceptance.

END OF SECTION

SECTION 02510

WATER DISTRIBUTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. The work included in this section shall consist of furnishing all labor, materials, equipment, tools and incidentals necessary to install exterior water system as indicated on the Plans and specified herein. Work shall be governed by “Water System Standards, 2002,” and all its amendments as adopted by the Department of Water Supply, County of Hawaii.
- B. Related Sections include the following:
 - 1. Section 02200 “Earthwork.”
 - 2. Section 02225 “Trenching And Backfilling.”

1.2 REFERENCES

- A. The reference construction standards shall supplement the requirements of these specifications. Where there is a conflict between the reference standards and the project specifications, the project specification shall govern. The following reference construction standards, including addendums and revisions, are hereby incorporated into and made a part of these specifications and shall be applicable to all work performed by the Contractor:
 - 1. Board of Water Supply, “Water System Standards, State of Hawaii 2002”, and all its amendments as adopted by the Department of Water Supply, County of Hawaii.
 - 2. The “Water System External Corrosion Control Standards, Volume 3” dated 1991, of the Board of Water Supply, City and County of Honolulu.
 - 3. Hawaii County Code Chapter 17, otherwise known as the “Plumbing Code”.

1.3 SUBMITTALS

- A. Product Data
 - 1. Water service line piping, fittings, joints, valves, and couplings.
 - 2. Valve boxes.
- B. Certificates: The Contractor shall furnish to The State affidavits from the manufacturers of pipe, pipe coating, fittings, and valves, furnished and installed under this Section certifying that such materials delivered to the project conform to the requirements of this Section. Certificate of disinfection shall also be submitted to The State.

- C. Shop Drawings: Shop Drawings shall be submitted as specified in the DWS Standards.
- D. Warranty: The Contractor shall furnish to The State warranties from the manufacturers of pipe and fittings furnished and installed under this Section.

1.4 DWS CHARGES

- A. Department of Water Supply Water System Development Fee, connection and installation fees, inspection charges, and charges for other required work by DWS shall be paid by the Contractor using Allowances as listed in the Offer.

1.5 DISRUPTION OF SERVICE

- A. Contractor shall schedule his work as to minimize disruption of water supply to onsite submeter. Water service disruption shall be coordinated with affected property owners.

1.6 NOTIFICATION

- A. The Contractor shall notify and coordinate any connection or temporary service disruption with The State at least 30 days in advance of Work.
- B. The Contractor shall further notify neighboring property owners of any water service disruptions initially at least 20 working days in advance and again at least 24 hours in advance.

1.7 PRODUCT HANDLING

- A. Delivery: Handle pipe carefully to ensure delivery at the project site in sound, undamaged condition. The State will reject damaged pipe on site. Contractor shall replace damaged pipe at no additional expense to the State.
- B. Storage: Do not store materials directly on the ground. Adequately support piping to prevent warpage. Use protective covers where pipe may be damaged by direct sunlight.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials for Water Distribution System: In accordance with the appropriate sections of the DWS Standards, except as amended in the drawings and/or revised specifications herewith. Paragraph concerning Measurements and Payments in the Sections are not applicable to this project.
 - 1. Valves and Appurtenances Section 205.
 - 2. Copper Service Pipe and Appurtenances Section 208.
- B. Warning and Identification Tape

1. Polyethylene plastic tape, acid and alkali resistant, approximately 3" wide, minimum 0.003" thick, with a strength of 1,500 psi lengthwise and 1,250 psi crosswise, maximum elongation of 350%.
2. Warning and identification of service imprinted in bold black lettering continuously over the entire length of the tape which reads "CAUTION, BURIED WATER LINE BELOW" or similar wording.
3. The tape color and printing shall be permanent and unaffected by moisture.
4. Color: Blue.

PART 3 - EXECUTION

3.1 LOCATION AND ADJUSTMENTS OF EXISTING UTILITY LINES

- A. The Contractor shall be responsible for precisely laying out the various exterior utility lines shown on the Contract Drawings or as provided elsewhere in these Specifications. The location shown on the Contract Drawings of the various existing utility lines, which the new lines are to cross over or under or connect to where determined on the basis of the best information available; however, no assurance can be provided that the actual locations will be precisely as shown on the Contract Drawings. The Contractor shall field verify the location of the existing utilities prior to the start of construction, and shall notify The State of any discrepancies or problems.
- B. In performing all work, the Contractor shall exercise due care and caution necessary to avoid any damage to and impairment in the use of any existing utility lines. Any damage inflicted on existing lines resulting from the Contractor's operations shall be immediately repaired and restored as directed by The State at the Contractor's expense.

3.2 INSTALLATION

- A. Excavation and Backfill: Trench excavation and backfill for the laying and installation of the water distribution system shall be in accordance with Section 02225 – TRENCH BACKFILLING.
- B. Water Distribution System: Where an installation detail is not indicated in the Plans, the standard detail in the "Water System Standards" Division 400 including all revisions and addendums shall be followed. Installation shall also be in accordance with the appropriate sections of Division 300 of the Water System Standards as listed below:
 1. General Construction Requirements Section 302.01.
 2. Service Laterals, Connections and Pipes Section 302.18.
 3. Concrete Blocks, Jackets, Beams, Curb Guards, Slab for Fire Hydrants and Meter Boxes, Manhole and Valve Box Collar Section 302.22

4. Valve Boxes Section 302.24.
 5. Pipe Cleaning Section 302.27.
 6. Pipe Pressure Tests Section 302.28.
 7. Chlorination of Water Pipelines Section 302.29.
- C. Metallic warning tape shall be used for onsite sewer lateral installations. It shall be buried directly above the center-line of the utility pipe, approximately 12-inches below finish grade. Where the utility pipe is under pavements and slabs, the tape shall be buried approximately 6-inches below the top of the subgrade.
 - D. Connecting, Testing, Flushing and Disinfection: Install but do not connect new lines until pressure testing is completed. Pressure testing, flushing and disinfection of the system shall be carried out in accordance with the DWS Standards. Supply and install any additional fittings of a temporary nature required for the purpose of working such tests.
 - E. The Contractor shall submit the results of such test to The State for approval.
- 3.3 FINAL INSPECTION
- A. At the time of final inspection of the work performed under the contract, the utilities covered by this Section shall be complete in every respect and operating as designed. Remove all surplus materials of every character resulting from the work of this Section. Correct any defects discovered in the utilities subsequent to this inspection prior to final acceptance.

END OF SECTION

SECTION 02530

SANITARY SEWERAGE

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish all labor, materials, tools and equipment necessary for installation of sewer system, including connection to existing sewer main, new sewer manhole, sewer lateral and cleanouts as indicated on drawings and as specified herein.
- B. Related Sections include the following:
 - 1. Section 02200 – EARTHWORK.
 - 2. Section 02225 – TRENCHING AND BACKFILLING.

1.2 REFERENCES

- A. The “Standard Specifications for Public Works Construction”, dated September 1986, as revised, except as amended in the plans and/or specifications herewith, of the Department of Public Works, as applicable to the City and County of Hawaii, hereafter referred to as the “DPW Standard Specifications”, or as herein specified. (Paragraphs concerning Measurement and Payment are not applicable to this project.)
- B. The “Standard Details for Public Works Construction”, September 1984, of the Department of Public Works, including all revisions, as applicable to the County of Hawaii, hereafter referred to as the DPW “Standard Details”, or as herein specified.
- C. Hawaii County Code Chapter 17, otherwise known as the “Plumbing Code”.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 – SUBMITTALS.
- B. Certificates: Furnish copies of certificates from the manufacturers of pipe, pipe section, fittings, etc. furnished and installed under this section verifying that such materials delivered to the project conform to the requirements of this specification.
- C. Warranty: The Contractor shall furnish to The State warranties from the manufacturers of pipe and fittings furnished and installed under this Section.
- D. Test Results: The Contractor shall submit test reports for all tests conducted.

1.4 PRODUCT HANDLING

- A. Delivery: Handle pipe carefully to ensure delivery at the project site in sound, undamaged condition. The State will reject damaged pipe on site. Contractor shall replace damaged pipe at no additional expense to the State.
- B. Storage: Do not store materials directly on the ground. Adequately support piping to prevent warpage. Use protective covers where pipe may be damaged by direct sunlight.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials for sanitary sewerage shall be in accordance the below-listed sections of the DPW Standard Specifications, including all revisions, and shall govern all work except for the subsections of Measurement and Payment which shall not be applicable.
 - 1. PVC Sewer Pipe and Appurtenances Section 21.
 - 2. Sewer Manholes Section 23.
- B. Warning and Identification Tape
 - 1. Polyethylene plastic tape, acid and alkali resistant, approximately 3" wide, minimum 0.003" thick, with a strength of 1,500 psi lengthwise and 1,250 psi crosswise, maximum elongation of 350%.
 - 2. Warning and identification of service imprinted in bold black lettering continuously over the entire length of the tape which reads "CAUTION, BURIED SEWER LINE BELOW" or similar wording.
 - 3. The tape color and printing shall be permanent and unaffected by moisture.
 - 4. Color: Green.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location and Adjustment of Existing Utility Lines:
 - 1. Precisely lay out the various exterior utility lines shown on the contract drawings as provided elsewhere in these specifications. Locations shown on the drawings of the various existing utility lines which the new lines are to cross over or under or connect to, were determined on the basis of the best information available; however, no assurance can be provided that the actual locations will be precisely as shown on the contract drawings. Contractor shall tone the area prior to excavation and trenching.

2. In performing all work, exercise due care and caution necessary to avoid any damage to and impairment in the use of any existing utility line. Immediately repair and restore any damage inflicted on existing lines resulting from the Contractor's operations as directed by The State at the Contractor's expense.
- B. The Contractor shall visually inspect and test all pipes and appurtenances prior to their installation and shall assume full responsibility for the soundness of the pipes and appurtenances installed.
- C. Installation of the sanitary sewer system shall be in accordance with the applicable sections of the references listed above, except as amended in the plans and/or specifications herewith. The Contractor shall install the sewer pipes beginning at the downstream end and continue laying pipe in the upstream direction
- D. Cleaning: As work progresses, clear the pipe interior of dirt and other debris by keeping swabs in the pipe and pulling them forward past each completed joint.
- E. Pipe Cutting: Cutting for closure or other reasons shall be done neatly by methods recommended by the manufacturer. Sharp edges shall be smoothed to prevent gasket damage.
- F. Excavation and Backfill
1. Trench excavation and backfill for the laying and installation of sewer pipes to the required line and grade and structure excavation for the construction of the appurtenant structures shall be governed by Section 02200 – EARTHWORK and Section 02225 – TRENCHING AND BACKFILLING.
 2. Use surplus material resulting from trench and structure excavation for backfilling, filling and grading to the extent required as specified elsewhere in these Specifications. In performing any work within the contract zone shown on the contract drawings, exercise due care to keep to an absolute minimum any damages to existing improvements, including plants and shrubs. Repair, replace and/or restore all damages to existing improvements to the satisfaction of The State.
- G. Jointing
1. Clean gaskets and seats of foreign materials prior to joint assembly. Apply lubricant as recommended by the pipe manufacturer.
 2. Push-On Joint: Carefully insert the spigot end into the bell to prevent entry of dirt and incorrect entry angle. With suitable fork tool, crowbar, or by hand, make the joint to the insertion depth recommended by the manufacturer. When the selected pipe uses joints not designed for full depth insertion, prevent further closure of previously completed joints by restraining movement of the installed line while making succeeding joints
 3. Mechanical Joint: Carefully center the spigot in the bell and position the gasket evenly in the seat. Tighten bolts alternately to an even torque, causing the follower gland to expand the gasket uniformly for a tight seal.

- H. Metallic warning tape shall be used for onsite sewer lateral installations. It shall be buried directly above the center-line of the utility pipe, approximately 12-inches below finish grade. Where the utility pipe is under pavements and slabs, the tape shall be buried approximately 6-inches below the top of the subgrade.
- I. Final Pipe Cleaning: Prior to testing, clean all lines to be tested by high pressure water jet or mechanical means. Remove and dispose of fluidized materials as approved.
- J. Testing of the sewer lines shall be conducted using the hydrostatic pressure and loading test as specified in Section 21 – “PVC Sewer Pipe and Appurtenances” of the DPW “Standard Specifications”.
- K. Any pipe or appurtenance that has been installed and proven defective shall be removed and replaced by the Contractor at no additional cost to the State.

3.2 FINAL INSPECTION

- A. Before final inspection, ensure sanitary sewer system is free from sand, silt, or other obstructions and remove all surplus materials of every character resulting from the work of this Section.
- B. At the time of final inspection, the utilities covered by this Section shall be complete in every respect and operating as designed. Correct any defects discovered in the utilities subsequent to this inspection prior to final acceptance.

END OF SECTION

SECTION 02580

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish all labor, materials and equipment necessary to provide pavement markers, striping and markings as indicated on the drawings and as specified herein.

1.2 REFERENCES

- A. The “Hawaii Standard Specifications for Road and Bridge Construction”, dated 2005, as revised, of the State of Hawaii Department of Transportation, hereafter referred to as the “State DOT Standard Specifications”, or as herein specified. (Paragraphs concerning Measurement and Payment are not applicable to this project.)

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 – Submittals.
- B. Product Data: Material Safety Data Sheets.
- C. Product Certificates: Certificates from manufacturers or suppliers to verify that types of materials being supplied meet the requirements of these specifications.

1.4 DELIVERY AND STORAGE

- A. Deliver paints and paint material in original sealed containers that plainly show the designated name, specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer. Provide storage facilities at the job site for maintaining materials at temperature recommended by the manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The State DOT Standard Specifications shall govern all work in this section except for subsections on Measurement and Payment which shall not be applicable.
- B. Paint shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's formulation number and directions, and name of the manufacturer, all of which shall be plainly legible at the time of use.
- C. The paint shall be homogeneous, easily stirred to a smooth consistency, and shall show no hard

settlement or other objectionable characteristics.

- D. Paint shall conform to the State DOT Standard Specifications Section 708 – Paints and Section 755 – Pavement Marking Materials.
- E. Pavement Markings shall include, but not limited to, striping, letters, numbers and raised pavement markers.
- F. Pavement Markers shall conform to the State DOT Standard Specifications Section 632 - Markers.

2.2 EQUIPMENT

- A. All equipment, tools and machinery used in the performance of the work covered by this section of the specifications shall be suitable for pavement markings installation and removal, and shall be maintained in satisfactory operating condition at all times.

1. Paint Applicator

- a. The equipment for applying paint to pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. The machine shall be capable of applying the stripe widths indicated on the drawings, shall have a speed during application of not less than five miles per hour, and shall be capable of applying the paint at the coverage rate specified hereinafter and at an even uniform thickness with clear-cut edges.
 - b. The paint applicators shall have a paint reservoir of sufficient capacity and suitable gages to apply paint as specified herein. The reservoirs shall be equipped with suitable air-driven mechanical agitators. The spray mechanism shall be equipped with quick-action valves conveniently located, and shall include necessary pressure regulators and gages in full view and reach of the operator.
 - c. Paint strainers shall be installed in the paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media.
2. Pneumatic spray guns shall be provided for hand application of paint in areas where the mobile paint applicator cannot be used.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Bituminous Pavements: New asphalt concrete pavement shall be allowed to cure for a period of not less than seven days before the application of marking materials unless directed otherwise by The State.

- B. Dust, clay, silt and sand shall be removed from the pavement to be marked before application of paint by sweeping, blow with compressed air, rinsing with water or a combination of these methods as required.
- C. Rubber deposits, surface laitance and other substances adhering to the pavement shall be removed with stiff brooms, scrapers, wire brushes, sandblasting or mechanical abrasion.
- D. Marker adhesives and paints shall not be applied when moisture or foreign matter is present on the pavement surface or when wind conditions are such as to cause dust to be deposited on the prepared areas or to prevent satisfactory application of the paint.

3.2 INSTALLATION

- A. Installation of pavement striping and markings shall be in accordance with of the State DOT Standard Specifications Section 629 – Pavement Markers.
- B. Installation of pavement markers shall be in accordance with the State DOT Standard Specifications Section 632 – Markers.

3.3 CONTROL POINTS

- A. The Contractor shall establish and space control points, satisfactory to the Construction Manager, at intervals that will ensure accurate location of pavement markings.

3.4 TRAFFIC CONTROL

- A. The Contractor shall furnish, install and maintain suitable warning and directional signs, barricades and other traffic control devices near the beginning and well ahead of the work site.
- B. Traffic control devices shall be placed along the newly painted lines to control traffic and to prevent damage to the newly painted surfaces.

3.5 INSPECTION AND ACCEPTANCE

- A. Pavement markings shall be subject to rigid inspection at all times and provisions of this specification will be strictly enforced.
- B. Painting will not commence in any area until pavement surfaces have been inspected and The State's approval is given to the Contractor to proceed. Such approval will be obtained each day and after periods of precipitation.
- C. If The State determines that the painted markings have not dried sufficiently in 90 minutes, painting shall be discontinued until the cause of slow drying is determined and corrected.
- D. Areas found to be deficient in accordance with this specification will be rejected and complete replacement or repainting will be required.
- E. Completed work will meet The State approval in all respects. Final acceptance will be contingent upon conformance with specification requirements outlined in this specification.

3.6 PROTECTION OF WORK

- A. Newly painted surfaces will be protected from damage by vehicles during the time required for paint to harden sufficiently to withstand traffic.
- B. During periods of high winds, painting will be discontinued.
- C. Any damage to newly painted markings due to Contractor's failure to provide adequate protection will be repaired by him at no additional cost to the State.

3.7 CLEANING

- A. Any spilled paints will be cleaned from the paved areas to the satisfaction of The State.
- B. The Contractor will keep the premises clean at all times. Paint, empty containers, and other material or equipment will not be stored or allowed to accumulate on or near the paved areas.

END OF SECTION

SECTION 02600

STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish all labor, materials, tools, equipment and related necessary to complete, in place, and ready for use, drainage improvements in conformity with the dimensions, profiles, sections, and details shown on the plans. Drainage improvements include installation of area drains, cleanouts, and polyvinyl chloride pipes and fittings and cleaning of existing drywell.
- B. Related Sections include the following:
 - 1. Section 02225 – TRENCHING AND BACKFILLING.
 - 2. Section 02270 – SEDIMENT AND EROSION CONTROL.
 - 3. Section 03300 – CAST-IN-PLACE CONCRETE.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01300 – SUBMITTALS.
- B. Certificates: The Contractor shall furnish to The State affidavits from the manufacturers of pipe, pipe coating, fittings, valves, catalog cuts, assembly and instruction manual, etc. for items furnished and installed under this section verifying that such materials delivered to the project conform to the requirements of this specification.
- C. Product data for various storm drainage system components.

1.3 GUARANTEE

The equipment covered by these specifications shall be guaranteed against defective parts due to faulty material or workmanship for one (1) year after date of acceptance of project. The Contractor shall guarantee to replace all defective parts within the period of time specified. All costs for the replacement of defective parts including the removal and reinstallation of the pump shall be paid for by the Contractor at no cost to the State. The guarantee shall be in writing and shall be submitted to The State prior to the completion of the project.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Polyvinyl Chloride (PVC) Pipe: Unless otherwise shown on the plans, drain pipes and fittings 8-inches in diameter and smaller shall be smooth wall PVC pipe in conformance with ASTM

D3034, SDR 35.

- B. Cleanouts: Cleanouts shall be provided as shown on the drawings, at the ends of the pipes and junctions and connections of pipelines, and/or directed by Engineer. Junction angles shall be no steeper than 45 degrees where cleanout pipes connect to the subdrain pipes. Cleanout risers shall be protected from damage during backfilling operations.
- C. Area Drain: Area drain structures shall be manufactured by NDS, Inc., 851 North Harvard Avenue, PO Box 339, Lindsay, California 93247; or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Excavation and Backfill: Trench excavation and backfill for the laying and installation of the drain pipes, to the required line and grade and structure excavation for the improvements shall be in accordance with the Drawings and Section 02225 – TRENCHING AND BACKFILLING.
- B. Surplus Material: Use surplus material resulting from trench excavation for backfilling, filling and grading to the extent required as specified elsewhere in these Specifications.

3.2 FINAL INSPECTION

- A. Before final inspection, ensure storm drainage system, including existing drywell, are clean and free from sand, silt or other obstructions.
- B. Cleaning of existing drywell:
 - 1. Cleaning shall be performed after site has been stabilized and immediately prior to removal of erosion and sediment control measures as delineated in Section 02270 – SEDIMENT AND EROSION CONTROL.
 - 2. All accumulated sediments, sludge, debris, and organic matter shall be removed until aggregate base course is exposed at the bottom of the drywell.
 - 3. All waste material shall be hauled away to an appropriate offsite dump area and in accordance with all Federal, State, and local hauling and disposal regulations.
- C. At the time of final inspection of the work performed under the contract, the drainage improvements covered by this section shall be complete in every respect and operating as designed. All surplus materials in every character resulting from the work of this section shall have been removed. All defects discovered in the drainage improvements subsequent to this inspection shall be corrected prior to final acceptance.

END OF SECTION

SECTION 02740

FLEXIBLE PAVEMENT

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Provide all asphaltic concrete pavement as indicated on the drawings and as specified herein.
- B. Related Sections include the following:
 - 1. Section 02362 "Soil Treatment For Vegetation Control."
 - 2. Section 02580 "Pavement Markings."

1.2 REFERENCES

- A. The "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION", dated September 1986, as revised, except as amended in the plans and/or specifications herewith, of the Department of Public Works, as applicable to the County of Hawaii, hereafter referred to as the "DPW Standard Specifications", or as herein specified. (Paragraphs concerning Measurement and Payment are not applicable to this project.)

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 – Submittals.
- B. Submit job-mix formula including base courses, affidavits from the manufacturers or suppliers of all materials proposed to be furnished and installed under this section certified that such material delivered to the project conforms to the requirements of these Specifications.
- C. Material Product Data and Material Safety Data.
- D. Test Reports: Submit test reports as directed by The State. Contractor shall verify all requirements prior to the start of earthwork operations.
- E. Certification of Compaction: An independent geotechnical testing laboratory working under the supervision of a licensed civil engineer licensed in Hawaii shall test and certify all compaction work. Certifications and test results shall be submitted to The State within three (3) days of the test.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials for roads and parking areas shall be in accordance with the below-listed sections of

the DPW Standard Specifications, including all revisions, and shall govern all work except for the subsections of Measurement and Payment which shall not be applicable.

1. Roadway Excavation Section 12
 2. Subgrade Section 29
 3. Aggregate Base Course Section 31
 4. Asphalt Concrete Pavement (Mix #4) Section 34
- B. Tack coat shall be either SS1 or SS-1H emulsified asphalt conforming to the requirements under AASHTO M 140.
- C. Pavement Edging: Pavement edging shall be Permaloc AsphaltEdge with mill finish or an approved equal. Anchors shall be 10-inch spiral steel spikes.

PART 3 - EXECUTION

3.1 PREPARATION

- A. The Contractor shall stake out the areas to be paved, using grade stakes on which the final finish elevations, base course and subgrade elevations are clearly marked. All such stakes and elevations shall be approved by The State before any work is done.
- B. Apply weed killer on the prepared subgrade of the concrete pavement in accordance with Section 02362 – SOIL TREATMENT FOR VEGETATION CONTROL.

3.2 INSTALLATION

- A. Install pavement in accordance with the applicable DPW Standard Specifications noted hereinbefore and as shown in Plans.
- B. Install pavement edging with a 3/8 inch space between sections for expansion. Anchor spikes shall be installed at 12-inch spacing with additional anchors as necessary to firmly secure the edging.
- C. Finish height of asphalt shall be approximately 1/2 inch over the top of the pavement edging.
- D. Deposit hot mix asphalt in a manner that minimizes segregation. Lay, spread, and strike off hot mix asphalt upon prepared surface. Avoid stop-and-go operation. Minimize changing forward speed of paver during paving operation.

3.3 FILL COMPACTION TESTING

- A. All subgrade and pavement section shall be tested by an independent testing agency retained by the Contractor and all test results submitted to The State for approval.

- B. All cost of testing shall be borne by the Contractor. Testing shall be made throughout the area for each 6-inch compacted layer. All test results may be approved before the Contractor can proceed with placing of base course or select borrow subbase course. Testing shall be in accordance with ASTM D1557.
- C. The Contractor shall be responsible for any corrective measure required as a result of inadequate compaction.

3.4 FINISHING

- A. Smoothness. The finished surface of the pavement shall be true to grade and cross section, free from depressions and grainy spots, and of uniform texture. It shall not vary more than 3/16 of an inch from any point along the bottom of a 10-foot straightedge laid in any direction except across the crown or swale.
- B. Finish pavement elevation shall not exceed 1/4 inch above the top of pavement edging.
- C. Surface Tolerance. Thickness of finished pavement shall be within 1/4 inch of thickness indicated in the contract documents. Correct pavement exceeding specified tolerances by methods accepted by The State, including removal and replacement, at no increase in contract price or contract time.
- D. Pavement shall be sloped to prevent ponding.

3.5 FINAL INSPECTION

- A. At the time of final inspection of the work performed under the Contract, the work covered by this section shall be complete in every respect and operating as designed. All surplus materials of every character, resulting from the work of this section, shall have been removed. Any defects discovered in the work, subsequent to this inspection, shall be corrected prior to final acceptance.
- B. Any existing asphaltic concrete pavements including roads and walkways that have been damaged by construction activities shall be repaired to the original condition and to the satisfaction of The State. Damage done by heavy equipment, especially on roads and yards not stable for such equipment, shall be repaired to the original condition and to the satisfaction of The State.

END OF SECTION

SECTION 02810

IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide a landscape irrigation system in the areas shown on the Drawings. All work indicated on the Drawings by notes shall be provided whether or not specifically mentioned in the Specifications. Items not specifically shown in the Drawings or specified, but normally required to conform to such intent, are considered part of the work.
- B. Make minor field adjustments required due to existing site conditions and revisions that are a result of project construction and not noted on the plans.
- C. The work in this Section includes, but is not limited to the following:
 - 1. Excavation and backfilling.
 - 2. Pipe sleeves and fittings.
 - 3. Valves and cross connection devices.
 - 4. Adjustments and instructions.
 - 5. Project record drawings.
 - 6. Warranty.

1.2 SUBMITTALS

- A. Substitutions:
 - 1. Requests for substitutions of any equipment or materials specified or indicated will be considered if the proposed substitution is judged to be equal or superior for the particular purpose or application specified; or if proof is established the materials specified or indicated are not available.
 - 2. Submit a written request to the Engineer during the submittal period after the award of contract.
 - 3. Approvals of substitution requests will be granted in writing.
- B. Construction Schedule: At the pre-construction meeting, provide a written copy of the projected construction schedule noting the estimated completion date, number of working days required and any special coordination requirements.
- C. As-Built Drawings: Provide a copy of the as-built drawings of the irrigation system.
- D. Instructions:
 - 1. Furnish the State with two copies of a complete set of operating instructions.
 - 2. After the system has been completed, instruct the State in the complete operation and maintenance of the system.

- E. Certificates of Warranty: Provide all certificates of warranty from the irrigation equipment manufacturers.

1.3 CODES AND STANDARDS

- A. Perform work in accordance with all applicable laws, codes and regulations required by authorities having jurisdiction over such work and provide for all inspections and permits required by Federal, State and Local authorities in furnishing, transporting and installing materials.

1.4 JOB CONDITIONS

- A. Acceptance of Previous Work: Inspect and accept the condition of the site relative to this Section before commencing with the work covered herein. If not acceptable, notify the Engineer in writing. By proceeding with the work under this Section, the Landscape Contractor indicates his acceptance of all previous related work.
- B. Meet on the Site: Prior to commencing work, meet with the Engineer and all other concerned parties on the site to review the work under this Section. Request this meeting one week prior to the desired meeting time.
- C. Underground Utilities and Obstructions: Verify the location of all underground utilities and other obstructions that may affect the work. Any obstructions encountered shall be reported to the Engineer. Repair all damage to any known utility line or other underground obstruction at Landscape Contractor's expense. Report damage to any unknown utilities to the Engineer.
- D. Protection:
 - 1. Provide necessary safeguards and exercise caution against injury or defacement of existing site improvements. Prevent vehicles of any kind from passing over sidewalks, curbs, etc. unless adequate protection is provided. Do not store materials or equipment, or operate equipment near or under the branches of any existing plants that are to remain, except as actually required for construction in those areas.
 - 2. Be responsible for damages caused by leaks in the piping systems being installed or during the warranty period due to the failure of workmanship or materials. Repair all damage to return the area to the previous condition at the Landscape Contractor's expense.
- E. Clean Up: Keep all areas of work clean, neat and orderly at all times during the period of the Contract. Clean all construction areas at the end of each day.
- F. Final Review:
 - 1. At the completion of all irrigation work request a final review. Notify the Engineer five (5) working days prior to the review so a mutually agreeable time for the review may be arranged.
 - 2. The Landscape Contractor and the Engineer shall be present at the review.

3. If, after the final review, the Engineer is of the opinion all the work has been performed in accordance with the Drawings and Specifications, a written notice of acceptance and completion of the project will be given. If all or certain portions of the work are not acceptable under the terms and intent of the Drawings and Specifications, a reasonable amount will be retained from the final payment and the defects in the work shall be corrected before the work is accepted by the Engineer.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Materials incorporated in the system shall be new, without flaws or defects and of the quality and performance specified. Material overages at the completion of the installation are the property of the Landscape Contractor and shall be removed from the site.

2.2 PIPE

- A. Pressure Mains: 1/2" through 3" Schedule 40 PVC, ASTM D-1785.
- B. Laterals: As noted on plans.
- C. Visible Pipe Fittings:
 1. General: Integral gray color or painted black.
 2. Threaded Risers and Nipples: Schedule 80 PVC.
 3. Other Risers and Fittings: Schedule 40 PVC, Type 1, solvent weld.
 4. Cement: ASTM D-2564 or as recommended by the manufacturer.
 5. Flexible Tubing: Toro 850-01 thick wall pipe or equal for flexible swing joints
- D. Sleeves: Schedule 40 PVC under driveways. Schedule 40 PVC under walks and in exterior walls.
- E. Conduit: Schedule 40 PVC.

2.3 BALL VALVES

- A. American made 200 WOG brass with threaded ends.

2.4 VALVE BOXES

- A. Plastic box with locking lid, black in color. Ametek, Brooks, Carson or equal. Round boxes for ball valves.

2.5 FLEX RISERS

- A. King Brothers, Global Water System, Excaliber or equal.

2.6 CONTROL WIRE

- A. Specifically designed for direct burial use, Type UF with copper conductor, #14 minimum size.
- B. Use white jacket for common and different color coded wires (as available) for individual control lines.
- C. Size of conductor shall meet all the requirements of the installation instructions of the manufacturer of the valves and controllers.

2.7 WIRE CONNECTORS

- A. 3M Scotch Lok 3570.

2.8 PLASTIC WARNING TAPE

- A. 'Christy's' underground marking tape, TA-DT-03-GI, or equal. Install as indicated on drawings.

PART 3 – EXECUTION

3.1 EXCAVATION

- A. Do all necessary excavation for the proper installation of the irrigation system.
- B. Trenches shall be of adequate width to lay pipe easily, with extra working space provided where necessary to make joints. Trench depth shall be as noted on plans.
- C. Boulders, roots and other obstructions shall be entirely removed or cut out to the width of the trench and a depth of 6" below the trench bottom. Such debris shall be disposed of off the site.
- D. Any rock over 2" in largest dimension excavated during trenching shall be removed and disposed of off the site.
- E. Over excavation shall be backfilled and carefully tamped to provide a smooth and firm bearing surface for laying the pipe.
- F. Barricade and/or light the excavated area to prevent undue hazard to the public.

3.2 PIPE FITTINGS AND ASSEMBLY

- A. All pipes shall be installed as dimensioned or approximately in the locations shown and shall be of the sizes indicated.

- B. Parallel piping shown on the Drawings may be installed in the same trench with all pipes at the same depth and 1" (minimum) horizontal separation between pipes. Parallel piping shall not cross in the trench.
- C. Piping shall be laid accurately to the line and grade required, with full bearing on the trench bottom. No pipe shall be laid on soft fill or other unstable material.
- D. Crossing pipes shall have 2" (minimum) vertical separation. No direct contact between other pipes or structures will be permitted.
- E. Work shall be performed in strict accordance with the manufacturer's installation instructions for the various type of pipe herein specified.
- F. Pipes shall be flushed out thoroughly to remove all debris and foreign matter.
- G. Prior to backfilling, pipes shall be inspected for leaks at the joints and fittings and repaired or replaced as required.
- H. Install plastic warning tape as indicated on drawings.

3.3 SPRINKLER HEADS

- A. Set heads plumb and level (or as detailed for slope conditions) at the locations indicated the Drawings.
- B. Thoroughly clean, adjust and inspect all heads for proper operation and performance.
- C. In turf areas, heads shall be initially installed on the risers 1/2" above the grade level. Prior to the final review of the landscape planting adjust all heads as necessary.

3.4 VALVES

- A. Valves connected directly to the main line shall be plumb with sufficient clearance for service and operation.
- B. Manual control valves or gate valves shall be installed in the location shown on the Drawings and shall be accessible for proper use.
- C. Thoroughly clean, adjust and inspect all valves for operation and performance.
- D. Remote control valves shall be centrally located among the sprinklers as practical, in accordance with the drawing. Adjust the flow control for proper operation and performance.

3.5 VALVE BOXES

- A. Where feasible, several valves shall be grouped together in a large valve box with 4" minimum clearance between valves and from the box.

- B. Position over the valves so all parts can be reached for service.
- C. Install above a 4" deep gravel pit for drainage. The box shall be reasonably free from dirt and debris.
- D. The top shall be installed as detailed.

3.6 CONTROL WIRE

- A. All work shall conform to the NEC.
- B. A minimum loop of 24" shall be left at each valve; at each splice; at each change in directions; at every 50 feet of straight run and at each controller for expansion and/or servicing.
- C. Wire shall be placed under the pipe in the trench and bundled and tied at 10 feet intervals.
- D. Splices and connections shall be watertight.
- E. Wire shall be within a protective conduit, for pavement crossings, or where other conditions make it necessary.

3.7 BACKFILLING

- A. As soon as the work has been installed and reviewed, all trenches shall be backfilled.
- B. Use only sand or soil backfill material within 2" of all pipes.
- C. No debris or rocks over 2" in largest dimensions shall be used to backfill the remainder of the trench. Install plastic warning tape as indicated on drawings.
- D. After backfilling, trenches shall be flush with, or slightly above, adjacent finished grade.
- E. Repair paving cuts with materials to match original surface.
- F. Replant the trenched areas as needed.
- G. Should the soil level of the trenches settle during the Warranty period, refill the trenches as needed at no additional cost.

3.8 ADJUSTING SYSTEMS

- A. Prior to the final review, adjust all sprinklers to provide adequate and uniform spray coverage within each planting area. Balance spray patterns by adjusting individual sprinkler heads with the adjustment screws.
- B. Adjust and balance each system at the listed water pressure for each type of sprinkler head.

3.9 REPAIR OF LEAKS

- A. All leaking joints whether discovered at the time of installation or at any time during the Warranty period, shall be remade with all new materials. Use of caulking or cement to repair leaks is prohibited.

END OF SECTION

SECTION 02820

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Chain-Link Fences: Industrial.
- 2. Gates: Motor operated swing and manual swing.

- B. Related Sections include the following:

- 1. Section 02740 "Flexible Pavement" for parking area surface where chain-link fences and gates are located.
- 2. Section 03300 "Cast-in-Place Concrete" for fence post footing.
- 3. Division 16 for electrical service and connections for motor operators, controls, limit and disconnect switches, and safety features and for system disconnect switches.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide chain-link fences and gates capable of withstanding the effects of gravity and wind loads and the following loads and stresses within limits and under conditions indicated:

- 1. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on mesh size and pattern specified, and on the following minimum design wind pressures and according to CLFMI WLG 2445:
 - a. Wind Speed: 105 mph (169 km/h).
 - b. Fence Height: 8 feet (2.4 m).
 - c. Line Post Group: IA, ASTM F 1043, Schedule 40 steel pipe.
 - d. Wind Exposure Category: B.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
 - 1. Fence and gate posts, rails, and fittings.
 - 2. Chain-link fabric, reinforcements, and attachments.
 - 3. Gates and hardware.
 - 4. Gate operators, including operating instructions.
 - 5. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.
 - 1. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
 - 2. Wiring Diagrams: Power and control wiring and access-control features.
 - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Product Certificates: For each type of chain-link fence, operator, and gate, signed by product manufacturer.
 - 1. Strength test results for framing according to ASTM F 1043.
- D. Qualification Data: For Installer.
- E. Field quality-control test reports.
- F. Maintenance Data: For the following to include in maintenance manuals:
 - 1. Polymer finishes.
 - 2. Gate operator.
- G. Manufacturer's Warranty for 12 years.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified. The contractor installing the fence shall possess a current, valid Hawaii "C-32" specialty license.
- B. Engineering Responsibility: Preparation of data for chain-link fences and gates, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. UL Standard: Provide gate operators that comply with UL 325.
- E. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators serving as a required means of access.

1.6 PRODUCT HANDLING AND STORAGE

- A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.
- B. Interruption of Existing Utility Service: Do not interrupt utility services to facilities occupied by The State or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify The State no fewer than seven days in advance of proposed interruption of utility services.
 - 2. Do not proceed with interruption of utility services without The State's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chain-Link Fences and Gates:

- a. Merchants Metals, web: www.merchantsmetals.com; email: Tech-Info@merchantsmetals.com; Phone: (888) 260-1600; Fax: (888) 261-3600.
- b. Master Halco, web: www.masterhelco.com; email: spec@fenceonline.com; Phone: (800) 883-8384.
- c. Approved equal.

2. Gate Operator:

- a. LiftMaster; 300 Windsor Drive; Oak Brook, IL 60523. ASD. Toll-Free: 800.282.6225. Email: specs@LiftMaster.com. Web: LiftMaster.com.
- b. Approved equal.

2.2 CHAIN-LINK FENCE FABRIC

- A. General: Height indicated on Drawings. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle and twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: Metallic-coated wire with a diameter of 0.192 inch (4.88 mm).
 - a. Mesh Size: 2 inches (50 mm).
 - b. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 2, 2.0 oz./sq. ft. (610 g/sq. m) with zinc coating applied after weaving.

2.3 INDUSTRIAL FENCE FRAMING

- A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:

1. Group: IA, round steel pipe, Schedule 40 or IC, round steel pipe, yield strength 50,000 psi (345 MPa) as determined by engineer.
2. Fence Height: 8 feet (2.44 m).
3. Strength Requirement: Heavy industrial according to ASTM F 1043.
4. Post Diameter and Thickness: According to ASTM F 1083.
 - a. Top Rail: 1-5/8" outside diameter (o.d.) at 10'-0" max spacing.
 - b. Brace Rail: 1-5/8" o.d. at 10'-0" max spacing.
 - c. Line Post: 2-3/8" o.d. at 10'-8" min overall length.

- d. End, Corner and Pull Post: 4" o.d. at 11'-0" min overall length.
- e. Swing Gate Post: According to ASTM F 900.
 - 1. Pedestrian Gate: 4" o.d. at 11'-0" min overall length.
 - 2. Vehicular/Enclosure Gate: 6-5/8" o.d. at 11'-0" min overall length.
- 5. Coating for Steel Framing:
 - a. Metallic Coating:
 - 1. Type A, consisting of not less than minimum 2.0-oz./sq. ft. (0.61-kg/sq. m) average zinc coating per ASTM A 123/A 123M or 4.0-oz./sq. ft. (1.22-kg/sq. m) zinc coating per ASTM A 653/A 653M.

2.4 INDUSTRIAL SWING GATES

- A. General: Comply with ASTM F 900 for single and double swing gate types.
 - 1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.
- B. Frames and Bracing: Fabricate members from round tubing with outside dimension and weight according to ASTM F 900 and the following:
 - 1. Gate Fabric Height: 2 inches (50 mm) less than adjacent fence height.
 - 2. Leaf Width: As indicated on drawings.
 - 3. Frame Members:
 - a. Tubular Steel: 1.90 inches (48 mm) round.
- C. Frame Corner Construction:
 - 1. Welded and 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.
- D. Hardware: Latches permitting operation from both sides of gate, hinges, center gate stops and keepers for each gate leaf more than 5 feet (1.52 m) wide. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.
 - 1. Double Gate Latch: DAC Industries, Inc; 600 Eleventh Street, N.W.; Grand Rapids, MI 49504; Phone No. (800) 888-9768.
 - a. Strong Arm #4000 latch, or approved equal.
 - 2. Walk Gate Latch: DAC Industries, Inc; 600 Eleventh Street, N.W.; Grand Rapids, MI 49504; Phone No. (800) 888-9768.

- a. Strong Arm #4250 latch, or approved equal.
- 3. Gate Wheel: Shepherd Hardware Products; 6961 US-12, Three Oaks, MI; Phone No. (269) 756-3830; customerservice@shepherdhardware.com.
 - a. 4-Inch Spring Loaded Gate Caster, 125-lb Load Capacity #9785, or approved equal
- 4. Hinges: Hot dip galvanized pressed steel or malleable iron, structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate swing to 180° (3.14 rad).
- 5. Gate Holdback: Provide galvanized gate hold back keeper for each gate leaf over 5'-0" wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.

2.5 FITTINGS

- A. General: Comply with ASTM F 626.
- B. Post and Line Caps: Provide for each post.
- C. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
 - 1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches (152 mm) long.
 - 2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.
- E. Tension and Brace Bands: Pressed steel.
- F. Tension Bars: Steel, length not less than 2 inches (50 mm) shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
 - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
 - a. Hot-Dip Galvanized Steel: 0.148-inch- (3.76-mm-) diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
- I. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. (366 g /sq. m) zinc.

2.6 GATE OPERATORS

- A. General: Provide factory-assembled automatic operating system designed for gate size, type, weight, and operation frequency. Provide operation control system with characteristics suitable for Project conditions, with remote-control stations, safety devices, and weatherproof enclosures; coordinate electrical requirements with building electrical system.
 1. Provide operator designed so motor may be removed without disturbing limit-switch adjustment and without affecting auxiliary emergency operator.
 2. Provide operator with UL approval.
 3. Provide electronic components with built-in troubleshooting diagnostic feature.
 4. Provide unit designed and wired for both right-hand/left-hand opening, permitting universal installation.
- B. Comply with NFPA 70.
- C. Gate Operators: LiftMaster CSW24UL Commercial High Traffic DC Swing Gate Operator, or approved equal.
 1. LiftMaster CSW24UL Swing Gate Operator, or approved equal.
 2. Compliance: UL Listed. Compliant to the UL 325, UL 991 and CSA C22.2 No. 247 standards.
 - a. This model is intended for use in Class I, II, III and IV vehicular swing gate applications.
 3. Monitored Safety Inputs: 3 inputs per board (main board and expansion board) totaling 6 inputs with any combination of up to:
 - a. Main Board:
 1. 1 Monitored Close Photo Eye input
 2. 1 Monitored Open Photo Eye input
 3. 1 Monitored Open Safety Edge or Open Photo Eye input
 4. Expansion Board
 - a. 2 Monitored Safety Edge or Photo Eye inputs (selectable for Open or Close).
 - b. 1 Monitored Photo Eye input (selectable for Open or Close).

5. 8 Monitored edges available when Transceiver is added.
6. Electrical Power Requirements:
 - a. 115V AC, single phase
7. Motor: 24V DC, with soft start/stop operation.
 - a. Duty cycle: Continuous duty.
8. Capacity: 12 foot (3658 mm) gate at 1,200 pounds (554 kg) or 18-foot (5486 mm) gate at 600 pounds (272 kg).
 - a. Recommended Cycles per Day: Continuous duty.
9. Gate Travel Speed: 90-degree opening in 13 to 15 seconds.
10. Warranty: 5 years for commercial applications.
11. Wormgear Reduction: 2 commercial oil bath gearboxes with 900:1 wormgear reduction running in synthetic oil bath. Hardened output shafts designed for high cycle applications with frequent loop reversals.
12. Battery Backup: Power Management system draws 14.8 mA when gate is idle with remote controls programmed. Provides 146 cycles on Battery Backup with two 7 Ah batteries or 876 cycles with two 33 Ah batteries.
 - a. Standby Time: Provides up to 24 days of standby power in the event of a power loss with two 7 Ah batteries or 105 days with two 33 Ah batteries (excluding accessories).
13. Accessory Electrical Power Requirements: 24V DC 500 mA output, switched and unswitched power.
14. Chassis: Constructed with 1/4 inch (6mm) gold zinc-plated steel for rust prevention.
15. Cover: High-density, UV-resistant polycarbonate two-piece cover.
16. Receiver:
 - a. Security+ 2.0 3-channel on-board receiver, holds up to 50 remote controls (unlimited with use of 811LM/813LM), HomeLink compatible
 - b. Transmits 310 MHz, 315 MHz, 390 MHz.
17. Inherent Reversing Sensor: Detects obstructions or increased loads. Reverses gate when closing or stops/reverses the gate when opening.
18. Electronic Limits: Maintains accurate limit position throughout travel, even after using the manual release handle.

19. Soft Stop & Start during mid-travel reversal extends operator life under high-cycle, heavy gate use.
20. LED Diagnostic Display: Simplifies installation and troubleshooting.
21. Colored Terminal Blocks: Provides easy identification of safety and fire department inputs.
22. Programmable Auxiliary Relays: 2 programmable relays with 6 settings each
 - a. Pre-warning or gate-in-motion sounder.
 - b. Switch on/off devices at open or Close Limits or while gate is in motion..
 - c. Tamper detection if gate is pushed off Close Limit.
 - d. Cycle quantity feedback.
 - e. Red/Green light to control gate traffic.
23. Quick Close, Anti-Tailgate: Quickly secures property, preventing unauthorized access.
24. Sequenced Access Management: Capable of sequentially controlling the operator in tandem with barrier gate.
25. Plug-in Loop Detector Inputs: Programmed inputs for shadow, interrupt and exit.
26. Alarm Reset Button: Instantly resets the built-in safety alarm siren.
27. Fire Department Compliant: Selectable settings allow gate to auto open on power failure or battery depletion.
28. Surge Suppression: Industrial strength on high and low voltage outputs. Protects against lightning strikes at a 50-foot (15240 mm) radius.
29. Emergency Release: Simple-to-use release handle allows gate to be operated manually and maintain limit position once re-engaged.
30. MyQ Enabled Accessories:
 - a. LiftMaster 828LM Internet Gateway: Allows remote monitoring from Internet-enabled computer or smartphone, or approved equal.
 - b. LiftMaster 829LM Garage and Gate Monitor: Allows remote monitoring and operation, or approved equal.
 - c. LiftMaster 823LM Remote Light Switch: Controls light remotely, or approved equal.
 - d. LiftMaster 825LM Remote Light Control: Allows remote monitoring and operation, or approved equal.

31. Accessories: Safety Monitoring Devices:

- a. Monitored Photo Eyes and Wireless Edge Kits.
 - 1. LiftMaster LMRRUL Reflective Photo Eyes.
- b. Wired Monitored Edges (all require use of LMWEKITU)

32. Accessories: Provide the optional accessories listed below.

- a. LiftMaster LOOPDETLTM Plug-in Loop Detector, or approved equal.
- b. Liftmaster Minikey Access Control System; SN700255, self-contained keypad system, or approved equal.
- c. LiftMaster Remote: Provide twelve (12) single button remote for gate operator, or approved equal.
- d. LiftMaster MG1300 Maglock. 1,300 pound (590 kg) holding force, or approved equal.
- e. LiftMaster 811LM 1-Button Encrypted DIP Remote Control, or approved equal.
- f. LiftMaster IPAC – Internet Protocol Access Control Entry System, or approved equal.
- g. LiftMaster Star1000 Commercial Access Control Receiver, or approved equal.
- h. LiftMaster PPWR Passport Receiver with Security+ 2.0 Technology, or approved equal.
- i. LiftMaster PPV1 Passport 1-Button Remote, or approved equal.
- j. LiftMaster PPK1 Passport 1-Button Mini Remote, or approved equal.
- k. LiftMaster KPR2000 Single Access Remote Control Keypad and Proximity Reader, or approved equal.
- l. LiftMaster MPEL: Mounting plate for post mount, or approved equal.

2.7 CAST-IN-PLACE CONCRETE

- A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water.
 - 1. Concrete Mixes: Normal-weight concrete with not less than 3000-psi (20.7- MPa) compressive strength (28 days), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum size aggregate.

2.8 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 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance.
 - 1. Do not begin installation before final grading is completed, unless otherwise permitted by State.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

- A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
 - 1. Install fencing on established boundary lines inside property line.

3.4 CHAIN-LINK FENCE INSTALLATION

- A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
 - 1. Tone area prior to excavation for presence of underground utilities.
- B. 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. Concealed Concrete: Top below grade as indicated on Drawings to allow covering with surface material.
- C. 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.
- D. Line Posts: Space line posts uniformly at 10 feet (2.44 m) o.c.
- E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.
 1. Locate horizontal braces at mid-height of fabric 4 feet (1.22 m) or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- F. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- G. Bottom Rails: Install, spanning between posts.
- H. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1 inch (25.4 mm) between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches (380 mm) o.c.
- J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
 1. Maximum Spacing: Tie fabric to line posts at 12 inches (300 mm) o.c. and to braces at 24 inches (610 mm) o.c.
- K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.5 GATE INSTALLATION

- A. 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.

3.6 GATE OPERATOR INSTALLATION

- A. General: Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.
- B. Excavation for Concrete Bases/Pads: Hand-excavate holes for bases/pads, in firm, undisturbed soil to dimensions and depths and at locations as required by gate-operator component manufacturer's written instructions and as indicated.
 - 1. Tone area prior to excavation for presence of underground utilities.
- C. Concrete Bases/Pads: Cast-in-place or precast concrete, depth not less than 12 inches (300 mm), dimensioned and reinforced according to gate-operator component manufacturer's written instructions and as indicated on Drawings.
- D. Vehicle Loop Detector System: Cut grooves in pavement and bury and seal wire loop according to manufacturer's written instructions. Connect to equipment operated by detector.
- E. Comply with NFPA 70 and manufacturer's written instructions for grounding of electric-powered motors, controls, and other devices.

3.7 GROUNDING AND BONDING

- A. Fence Grounding: Install at maximum intervals of 1500 feet (450 m) except as follows:
 - 1. Fences within 100 Feet (30 m) of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 500 feet (225 m).
 - a. Gates and Other Fence Openings: Ground fence on each side of opening.
 - 1. Bond metal gates to gate posts.
- B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet (45 m) on each side of crossing.
- C. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches (150 mm) below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location, including the following:
- D. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

- E. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- F. Bonding to Lightning Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning protection down conductor or lightning protection grounding conductor complying with NFPA 780.

3.8 ADJUSTING

- A. Gate: Adjust gate 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.
- B. Automatic Gate Operator: Energize circuits to electrical equipment and devices. Adjust operators, controls, safety devices, and limit switches.
 - 1. Hydraulic Operator: Purge operating system, adjust pressure and fluid levels, and check for leaks.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Lubricate hardware, gate operator, and other moving parts.

3.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain gates.

END OF SECTION

SECTION 02930

EXTERIOR PLANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide landscape plantings in the areas shown on the Drawings with plants in a healthy, vigorous growing condition. All work indicated on Drawings by notes shall be provided whether or not specifically mentioned in this Specification. Any items not specifically shown in the Drawings or specified, but normally required to conform to such intent, are considered part of the work.
- B. The work of this Section includes but is not limited to the following:
 - 1. Clearing and grubbing.
 - 2. Imported screened soil.
 - 3. Pre-planting weed control.
 - 4. Soil preparation.
 - 5. Fine grading.
 - 6. Planting operations.
 - 7. Maintenance.
 - 8. Warranty.

1.2 CODES AND STANDARDS

- A. Perform work in accordance with all applicable laws, codes and regulations required by authorities having jurisdiction over such work and provide for all inspections and permits required by Federal, State and Local authorities in furnishing, transporting and installing materials.

1.3 SUBMITTALS

- A. Substitutions:
 - 1. If any plant specified is not obtainable, submit a written substitution to the Engineer during the bidding period. This request may present either a different size of the same species or a similar alternate species with the proposed adjustments to the price for each.
 - 2. Substitutions of plant materials will not be permitted unless authorized in writing by the

Engineer.

- B. Construction Schedule: At the pre-construction meeting, provide a written projected planting schedule noting the estimated completion date, number of working days required and any special coordination requirements.
- C. Selection, Tagging and Ordering Plant Material:
 - 1. Submit a request for review and documentation to the Engineer at least one month prior to the start of work under this Section that all plant material has been ordered.
 - 2. Plants shall be subject to review and rejection by the Engineer at place of growth and after delivery for conformity to the Specifications.
- D. Imported Screened Soil:
 - 1. After the Contract is awarded, furnish the source of the imported screened soil to the Engineer.
 - 2. Take representative soil samples from the proposed source area. Submit samples to the University of Hawaii Agricultural Extension Service (or other approved laboratory) for analysis for required fertilizers.
 - 3. Submit test results and schedule of fertilizers and soil conditioners as recommended by the soil analysis to the Engineer for review.
 - 4. Include in the bid Proposal the cost of all fertilizer, labor and equipment required to place, amend and fine grade the soil.

1.4 JOB CONDITIONS

- A. Acceptance of Previous Work: Inspect and accept the condition of the site relative to this Section before commencing with the work covered herein. If not acceptable, notify the Engineer in writing. By proceeding with the work under this Section, the Landscape Contractor indicates his acceptance of all previous related work.
- B. Meet on Site: Prior to commencing work, meet with the Engineer and all other concerned parties on the site to review the work under this Section. Request this meeting one week prior to the desired meeting time.
- C. Underground Utilities and Obstructions: Verify the location of all utilities and other obstructions that may affect the work. Any obstructions encountered shall be reported to the Engineer. Repair all damages to any known utility line or other underground obstructions at Landscape Contractor's expense. Report damage to any unknown utilities to the Engineer.
- D. Protection:
 - 1. Provide necessary safeguards and exercise caution against injury or defacement of existing

- site improvements. Prevent vehicles of any kind from passing over sidewalk, curbs, etc., unless adequate protection is provided.
2. Be responsible for any damage resulting from landscape planting operation. Repair all damage to return the area to the previous condition at Landscape Contractor's expense.
- E. Clean Up: Keep all areas of work clean, neat and orderly at all times during the period of the Contract. Clean all construction areas at the end of each day.
- F. Samples and Tests: The Engineer reserves the right to take and evaluate samples of materials for conformity to the Specifications at any time. Furnish samples upon request by the Engineer. Rejected materials shall be immediately removed from the site at the Landscape Contractor's expense.
- G. Pre-Maintenance Review and Final Review:
1. At the completion of all landscape planting operations and prior to the beginning of the formal maintenance period, the Pre-Maintenance Review shall be held. At the completion of the formal maintenance period, the Final Review shall be held.
 2. Request these reviews of the Engineer five (5) working days prior to the completion of the work in order that a mutually agreeable time for the review may be arranged.
 3. The Landscape Contractor and the Engineer shall be present at the review.
 4. At the time of the review, the Landscape Contractor shall have all the areas under the contract free of weeds, dead leaves and trash, neatly cultivated raked. All stakes, guys and plant basins shall be in good order. At the Final Review, all lawns shall be neatly cut and all clippings removed.
 5. If, after the Pre-Maintenance Review, the Engineer is of the opinion that all work has been performed in accordance with the Drawings and Specifications, written notice of preliminary acceptance will be given. This report will note any items which must be corrected, and state the date of commencement and completion of the formal maintenance period.
 6. If, after the Final Review, the Engineer is of the opinion that all work has been performed in accordance with the Drawings and Specifications, written notice of acceptance and completion of the Project will be given. If all or certain portions of the work are not acceptable under the terms and intent of the Drawings and Specifications, a reasonable amount will be retained and the final payment and the formal maintenance period for the unacceptable work and any related items shall be extended at no cost to the State until the defects in the work have been corrected and the work is accepted by the Engineer.

1.5 WARRANTY

- A. Plant Material:

1. Plant materials furnished or relocated under this Section shall be warranted in writing, for a period of one year from the date of final acceptance against improper installation, defective, unsound or diseased conditions that may appear.
2. Upon receipt of written notice from the Engineer of the death of any warranted plant materials during the warranty period, the subject plant materials shall be promptly replaced with the same species as originally planted and shall be of a size closely approximating the size of the plant if normal growth had occurred since the original planting. Replacement shall be subject to all the requirements of the Specifications.
3. When the plants are replaced, advise the Engineer, in writing, of the necessary establishment maintenance which must be performed. If this information is not provided, the Landscape Contractor will be liable for the total cost of replacement should the replaced plant die.
4. The expense of replacement shall be borne by the Landscape Contractor if replacement is necessary during the maintenance period, or shall be evenly shared by the State and the Landscape Contractor if replacement is necessary after the maintenance period but during the remainder of the warranty period.
5. The Landscape Contractor shall not be held liable for loss of plant materials after the final acceptance due to lack of care, vandalism, acts of God or accidents. The State must show that the plants have been maintained properly.

B. Special Warranty:

1. All plant materials furnished under this Section shall be warranted as to the species, hybrid, flower color and/or variety specified.
2. If after acceptance of the project, any warranted plant material proves to be of a different species, hybrid, flower color and/or variety not initially determinable, replace that plant with a new plant of the originally specified species, hybrid, flower color and/or variety. The new plant shall be equal in size to that of the incorrect plant at the time of its removal. The new plant shall meet the quality standards, be subject to the warranty, and be installed according to the specifications.
3. There is no time limit to this warranty, although it does not include plants reverting to the general species. The Engineer will determine the nonconformance of the plant materials, and notify the Landscape Contractor in writing of the required replacement work. All materials and work shall be at the expense of the Landscape Contractor. All work shall be completed within 15 working days from the date of the Engineer's letter.

- C. Liability: The liability under the warranty shall include the repair of damage to the work of other contractors, or damage to the State's property caused by the failure of the work performed under this section. All of the provisions of this Section apply to work performed to satisfy the requirements of the warranty.

PART 2 - PRODUCTS

2.1 IMPORTED SOIL

- A. Natural, fertile, friable soil free from stones, noxious seeds, weeds (especially nut grass), roots, subsoil or other material detrimental to normal plant growth.
- B. Red Humic latasol soils or similar materials will not be accepted.

2.2 FERTILIZER

- A. N-K-P as recommended by the soil analysis, uniform in composition, free-flowing and suitable for application with approved equipment, delivered to the site in unopened containers, each fully labeled, conforming to the applicable fertilizer laws, and bearing the name or mark of the manufacturer.
- B. Maintenance Period Fertilizer: 10-30-10 fertilizer, uniform in composition, free flowing and suitable for application with approved equipment, delivered to the site in unopened containers, each fully labeled, conforming to the applicable fertilizer laws, and bearing the name or mark of the manufacturer. Apply at a rate of 10 lbs. per 1,000 square feet.
- C. Plant Tablet: Agriform 21 tablet.

2.3 ORGANIC SOIL CONDITIONER

- A. Peat moss, koa saw dust, macnut husk or nitrogen stabilized redwood compost and as recommended by the soil analysis.

2.4 PLANT MATERIAL

- A. Quantities: Provide sufficient quantities of plant materials needed to complete the work as shown on the Planting Plans and indicated on the Drawings. Quantities indicated on the plant list are approximate only and are provided for the convenience of the Landscape Contractor.
- B. Nomenclature: Names of plants shall conform to names generally accepted in the local nursery trade, and as interpreted by the Engineer.
- C. Condition:
 - 1. All trees, shrubs, vines and groundcovers shall have a normal habit of growth and shall be sound, healthy, vigorous and free from insect infestations.
 - 2. The minimum acceptable size of all trees and shrubs measured after pruning, with branches in normal positions, shall conform to measurements specified on the Planting Plans.
 - 3. Plants that meet the measurements specified, but do not possess a normal configuration or balance of height and spread will be rejected.
 - 4. Trees and shrubs larger in size than specified may be used, but the use of larger plant

materials will make no change in the Contract price.

5. Trees and shrubs shall have been grown in containers of the size stated on the Drawings, and shall have sufficient roots to hold the root ball together after removal from the containers without being root bound.
6. Specimen, field grown and field stock palms and trees shall have a root ball of sufficient size to support the plant's recovery from transplanting. Palms and trees delivered with small or inadequate root balls will be rejected.
7. Any tree or shrub with a weak, thin trunk not capable of supporting itself when planted in the open will be rejected.
8. Trees will be straight and of uniform shape without damage, crooked, or multiple leaders, unless specified. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 1/2" which have not been pruned or completely calloused, will be rejected.

2.5 WATER

- A. Unless noted otherwise, water will be readily available to the Landscape Contractor at no expense to the Landscape Contractor.

PART 3 - EXECUTION

3.1 MISCELLANEOUS MATERIALS

- A. Wood Tree Stakes: 2 x 2 x 8 ft. rough construction grade redwood or eucalyptus with no paint or stain.
- B. Tree Guys: As specified on the drawings.
- C. Marker: Plastic surveyor tape. bright color, minimum 18" long. Use same color throughout the project.

3.2 CLEARING

- A. Clear all planting areas of existing vegetation not specified to remain and all other debris and foreign material considered a hindrance to planting operations and/or unsightly in appearance. Maintain previously established grades and swales.

3.3 PRE-PLANTING WEED CONTROL

- A. Apply pre-planting herbicide to all visible weeds, before and after soil placement.

3.4 IMPORTED SCREENED SOIL

- A. Provide an even 12" layer of imported screened soil over all planting areas. Soil shall be

premixed off the site with fertilizers and soil conditioners as recommended by the soil analysis.

3.5 FINE GRADING

- A. Adjust the finish grading with imported screened soil as necessary. Grades shall be smooth and even on a uniform plane with no abrupt changes or pockets, and shall slope away from all buildings. Verify the surface drainage of all planting areas, and notify the Engineer of any discrepancies, obstructions, or other conditions considered detrimental to proper execution of the work.
- B. Landscape work shall be tied to existing conditions and controls such as existing trees and landscape features, utility lines, pavement and curbs, etc. Finished grades shall bear proper relationship to such controls. Adjust all new work as necessary to meet the conditions and fulfill the intention of the Drawings.
- C. After the initial settlement, the finish grade shall be lower than adjacent walks, curbs and headers by 1".
- D. Immediately prior to planting operations, all planting areas shall be cleaned of weeds, debris, rocks over 1" in diameter and clumps of earth that will not break up.

3.6 SOIL AND DRAINAGE CONDITIONS

- A. Notify the Engineer in writing of all soil or drainage conditions encountered during planting operations which the Landscape Contractor considers detrimental to the growth of plant material. Include a cost proposal for the correction of the problem for approval before proceeding with the work.
- B. If the drainage conditions of the plant pits appear unsatisfactory, test the drainage by filling them with water. Conditions permitting the retention of water in planting pits for an excessive period of time shall be brought to the attention of the Engineer.

3.7 PLANTING OPERATIONS

- A. Handling Plants:
 - 1. Handle plants in a manner to avoid any damage to the plants.
 - 2. Protect plants at all times from sun or drying winds. Plants that cannot be planted immediately on delivery shall be kept in the shade, well protected, and adequately watered.
- B. Plant Pits: All trees and shrubs shall be installed in round pits with vertical sides.
- C. Setting Container and Larger Plants:
 - 1. Plants shall be centered and set on the appropriate compacted backfill mix that has been puddled and settled.
 - 2. Plants shall be set with the soil level even with the finish grade and planted to give the best

appearance in relationship to the adjacent structures or surroundings.

3. Use appropriate backfill mix to continue filling the plant pits. Set plant plumb and brace rigidly in position until backfill mix has been tamped solidly around the rootball. When 3/4 of the pit is backfilled, water thoroughly, saturating the rootball.
4. Evenly distribute planting tablets per manufacturer's instructions. Continue filling the pit to finish grade with backfill mix.
5. When the plant pit is filled, form a saucer berm around the plant as noted on the details.
6. Water all plants immediately after planting.

D. Staking: Immediately after planting, stake all 15 gal. and smaller trees. Support larger trees.

3.8 PLANTING MAINTENANCE

- A. Maintain all plants and planted areas in optimum growing condition and appearance.
- B. Maintenance, as specified below, shall coincide with the delivery of the first plant materials to the site and shall continue 120 days after commencement of the formal maintenance period or until the approval of the final review. Care of plant materials during installation is not considered part of the formal maintenance period.
- C. Maintenance shall include, but is not limited to:

1. Protect areas susceptible to traffic by erecting barricades immediately after planting.
2. Irrigate planting areas as required to ensure active growth keeping areas moist but not saturated. Regulate irrigation as necessary to avoid erosion and gullyng.
3. Fertilize all planting areas as follows:
 - a. After initial planting and at least five (5) days prior to the prefinal review.
 - b. Monthly during the maintenance period at least five (5) days prior to final review.
4. Keep planting free of weeds and undesirable grasses through daily weeding if required. Remove the entire root system. Dispose of all weeds in appropriate trash containers.
5. Inspect all plants, including lawn, for disease or insect damage weekly. Treat affected material immediately.
6. Remove damaged or diseased growth from trees and shrubs.
7. Immediately remove any dead or dying plants not in a vigorous thriving condition. Replacement shall be the same species and size as originally planted.

8. Restake, tighten, and reset to proper grades or upright position any plants that are not in their proper growing position.
9. Mow lawn to a 1" height whenever the average height exceeds 1-1/2". Remove clippings.

END OF SECTION

DIVISION 03 – CONCRETE
SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.
- B. Related Sections include the following:
 - 1. SECTION 02100 - SITE PREPARATION
 - 2. SECTION 02200 - EARTHWORK
 - 3. SECTION 02500 - CONCRETE CURBS
 - 4. SECTION 09900 - PAINTING

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.3 SUBMITTALS

- A. Submit in accordance with SECTION 01300 - SUBMITTALS.
- B. Product Data:
 - 1. Reinforcing steel: Certified mill test results or laboratory test results. Indicate bar size, yield strength, ultimate tensile strength, elongation and bend test.
- C. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mix water to be withheld for later addition at project site.
- D. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material,

grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures. Also include location, sizes, and layout of any conduit to be placed within concrete. Shop Drawings shall be originally produced by the contractor. Any reproduction of the contract Drawings being used for shop drawings will be rejected.

- E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - 1. Form materials and form-release agents.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Bonding agents.
 - 5. Adhesives.
 - 6. Vapor retarders.
 - 7. Joint-filler strips.
 - 8. Repair materials.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- D. ACI Publications: Comply with the following, unless more stringent provisions are indicated and maintain a copy at the field office.
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

3. ACI 347R "Guide to Formwork for Concrete.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Avoid damaging coatings on steel reinforcement.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Comply with ACI 347R. Provide new or good finish form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other ACI 347R approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4" by 3/4", minimum.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Form oils or waxes shall not be used for concrete surfaces intended to be painted.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than one inch to the plane of the exposed concrete surface.
2. Furnish ties that, when removed, will leave holes not larger than 1 1/2" in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed, unless otherwise noted on the drawings.
- B. Plain-Steel Wire: ASTM A 82, as drawn.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place that will not puncture the vapor retarder. Use plastic straps or brightly colored tie wires to secure reinforcing. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports. Refer to paragraph 3.06 for chair support spacing.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II.
- B. Pozzolans
 - 1. Fly ash: ASTM C 618, Class C or F.
 - 2. Blended hydraulic cement: ASTM C 595M.
 - 3. Ground granulated blast-furnace slag: ASTM C 989, Grade 100 or 120.
- C. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Class: Moderate weathering region, but not less than 3M.
 - 2. Aggregate size: No. 57 (One inch to No. 4).
 - 3. Aggregate size: No. 67 (3/4 inch to No. 4).
- D. Size of Coarse Aggregate: Except when otherwise specified or permitted, maximum size of coarse aggregate shall not exceed three-fourths of the minimum clear spacing between reinforcing bars (or bundled bars), one-fifth of the narrowest dimension between the sides of forms, or one-third of the thickness of slabs or toppings.

- E. Water: Potable and complying with ASTM C 94 or non potable meeting ASTM C 94 Acceptance Criteria for Questionable Water Supply. Use only potable water for job site mixing.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1% water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Water-Reducing Admixture: ASTM C 494, Type A.
- C. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- D. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- E. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.8 VAPOR RETARDERS

- A. Vapor Retarder: ASTM E 1745, Class A except as modified in subparagraph 1. below, nylon or polyester-cord-reinforced three-ply high-density polyethylene sheet, or one ply extruded polyolefin sheet; 15-mil minimum thickness. Compliance to ASTM standards shall be confirmed by an independent testing agency. Vapor barrier shall be Stego Wrap Vapor Barrier by Stego Industries, LLC or approved equal.

- 1. Permeance rating: ASTM E 96, ASTM E 154 not exceeding 0.01 grains/ft²/hr

2.9 CURING MATERIALS AND EVAPORATION RETARDERS

- 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 dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18% to 22% solids.

- G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.10 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy-Bonding Adhesive: ASTM C 881, 2-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
 - 2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
 - 3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Cementitious Coatings: Cement based polymer modified concrete finishing material, ProFinish by Bonded Materials or approved equal.
- E. Reglets: Fabricate reglets of not less than (0.0217") thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8" and that can be feathered at edges to match adjacent floor elevations. Products shall contain no added gypsum.
 - 1. Cement binder: ASTM C 50, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8" to 1/4" or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4000 psi (27.6 MPa) at 28 days when tested according to ASTM C 109/C 109M.

- B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4". Products shall contain no added gypsum.
 - 1. Cement binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8" to 1/4" or coarse sand as recommended by topping manufacturer.
 - 4. Compressive strength: Not less than 5500 psi (39 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
- B. Footings and footing repairs: Proportion normal-weight concrete mix as follows:
 - 1. Compressive strength (28 Days): 3000 psi.
- C. Slabs-on-Grade and slab-on-grade repairs: Proportion normal-weight concrete mix as follows:
 - 1. Compressive strength (28 Days): 3000 psi.
 - 2. No fly ash shall be used in mixes for interior concrete floor slabs.
- D. Electrical Ducts, Conduit Encasements; Sidewalks, Equipment Pads on Grade; Thrust Blocks and Trench Encasements:
 - 3. Compressive strength (28 Days): 3000 psi.
- E. Slab Vapor Emissions Rates: At the time of finished flooring installation, vapor emissions shall not exceed a maximum of 5 lbs per 1000 square feet per 24 hours or the maximum emission established by the flooring manufacturer whichever is less. If the vapor emission rate exceeds the limit specified, take measures specified in paragraph 3.17 to reduce the emissions to an acceptable level without delaying the project.
- F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
 - 1. Combined fly ash and pozzolan: 10%

2. Combined fly ash or pozzolan and ground granulated blast-furnace slag: 50% Portland cement minimum, with fly ash or pozzolan not exceeding 10%.
- G. Maximum Water-Cementitious Materials Ratio: 0.45 for concrete required to have low permeability, interior slabs with vapor sensitive floor coverings.
- H. Do not add air entrainment to concrete of trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3%.
- I. Limit water-soluble, chloride-ion content in hardened concrete per ACI 318 Chapter 4 for corrosion protection of reinforcing steel.
- J. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) 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, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.13 FABRICATING REINFORCEMENT

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

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and ASTM C 1116 and furnish batch ticket information. Batch ticket information shall include design mix reference, water that can be added at the job site, and admixtures. For transit mixing, complete not less than 70 revolutions of the drum at the manufacturer's rated mixing speed. Discharge concrete into its final position within 90 minutes after introduction of batch water to the cement. If a retarder admixture is used, the discharge time limit of 90 minutes may be increased by the time specified for retardation by the admixture manufacturer or the concrete supplier. Mix concrete a minimum of one minute at mixing speed immediately prior to discharge.

2.15 MATERIAL SELECTION FOR LEED COMPLIANCE

- A. Provide products that contain the highest percentage available of post-consumer and/or post-industrial recycled content as defined by LEED-NC 2009.
- B. Provide material that contains the highest percentage available of locally harvested, extracted,

and manufactured materials as defined by LEED-NC 2009.

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 concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8", for surfaces prominently exposed to public view, where appearance is especially important.
 - 2. Class B, 1/4", for coarse-textured surfaces to receive plaster, stucco or wainscoating.
 - 3. Class C, 1/2", for permanently exposed surfaces without additional finish.
 - 4. Class D, one inch, for surfaces, usually permanently concealed, where roughness is not objectionable.
- D. Construct forms to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
 - 1. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds. Maintain the integrity of the vapor retarder membrane.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads

required in the work. Determine sizes and locations from trades providing such items.

- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

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.
 - 1. Install anchor bolts, accurately located, to elevations required.
 - 2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.
 - 4. Install inserts, hangers, metal ties, nailing strips, blocking, grounds and other fastening devices needed for attachment of other work.
- B. Locate electrical or mechanical conduits and fittings so that the strength of the concrete member is not impaired. "Conduits" include pipes, ducts, and electrical conduits. Unless required otherwise on the drawings, conform to the following:
 - 1. Concrete columns: Do not embed conduits columns unless otherwise indicated on the drawings.
 - 2. Concrete beams: Do not embed conduits larger than 1 1/2" outside diameter vertically in any beam. Place conduits in the middle third of the beam depth and space a minimum of 10 times their outside diameter. Do not embed conduits horizontally in beam lengthwise. Provide sleeve for conduits passing through beams.
 - 3. Concrete slabs-on-grade: Do not embedded conduits within the thickness of any concrete slab on grade. Place conduits in the subgrade below the concrete slabs.
- C. Obtain Engineer's approval to install conduit or pipe penetrations that may unduly impair the strength of the structural member (for example, multiple pipe penetrations near the face of a column).

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F (10 degrees C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained. The 24-hour period may be reduced to 12 hours in compliance with ACI 347R with prior approval from the Engineer.
- B. Leave formwork, for beam soffits and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 - 1. 28-day design compressive strength.
- C. Clean and repair surfaces of forms to be reused in the work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318, ACI 318M, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

- A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 “Standard Practice for Installation of Water Vapor Retarders” and manufacturer’s written instructions. The more stringent shall apply.
 - 1. Use the greatest widths and lengths practical to minimize lap joints. Seal laps joints and edges with tape or materials compatible with the vapor retarder. Remove and replace torn, punctured, or damaged vapor barrier materials, except when minor repairs or patches are allowed by manufacturer’s instructions.
 - 2. Do not cut or puncture vapor retarder. No penetrations of the vapor barrier allowed except for reinforcing steel and permanent utilities. Seal all penetrations including pipes and reinforcing. Repair damage and reseal vapor retarder before placing concrete.
 - 3. Do not leave the vapor retarder exposed to ultraviolet radiation for more than a few days

prior to the concrete pour. Remove standing water from the vapor retarder prior top concrete pour.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

- 1. Support slab reinforcing bars and welded wire fabric (WWF) as follows:

BAR SIZE	MAXIMUM DISTANCE BETWEEN SUPPORTS
#3	2 feet
#4	3 feet
#5	4 feet
#3 at 12" E.W.	4'-6" o.c. each way

- C. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- D. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 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 Engineer.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 3. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

4. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
1. Grooved joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8". Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8" wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2" or more than one inch below finished concrete surface where joint sealants, specified in SECTION 07920 – JOINT SEALANTS, are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Provide one day notification to Engineer for each scheduled pour.
- B. Do not add water to concrete during delivery, at project site, or during placement, unless approved by Engineer.
- C. Convey concrete from mixer to the place of final deposit rapidly by methods that prevent segregation or loss of ingredients and will insure the required quality of concrete. Use

conveying equipment, conveyors, hoppers, baffles, chutes, pumps that are sized and designed to prevent cold joints from occurring and prevent segregation in discharged concrete. Clean conveying equipment before each placement.

- D. Deposit concrete continuously or in 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 specified. Deposit concrete to avoid segregation.
- E. Deposit concrete in forms in horizontal layers with proper consolidation into previous layers and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints. For high wall pours (above 12 feet), Contractor must show its experience and demonstrate its proficiency before Engineer will permit pours in excess of 12 feet.
 - 1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
 - 3. Make construction joints only where located on drawings unless otherwise approved by the Engineer. Plan pours to continuously place concrete from one construction joint to another.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleed-water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 degrees F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.9 CONCRETE SLABS-ON-GRADE

- A. For interior areas, unless specified elsewhere, place concrete floor slabs directly over vapor retarder overlain atop granular fill-capillary barrier and reinforce slabs with grade 60, No. 10 (#3) steel bars at 12 inches on center each way.
 1. Place floor slabs in alternate panels, long strip pattern, and following construction or contraction joints. "Keyed Kold Joint" may be used in lieu of placement in alternate panels in areas where floor covering is specified provided all shrinkage cracks are sealed prior to installation of floor covering.
 2. Provide a bond-break filler strip, between concrete slab and abutting vertical surfaces and as detailed.
- B. For exterior areas, unless specified elsewhere, place concrete floor slabs directly over granular fill and reinforce slabs with synthetic fibers. Provide isolation and contraction joints where detailed and, at intersections, corners and at abutments. Place contraction joints not more than 40 feet apart, unless detailed otherwise.
 1. Finish concrete true to grade, section and cross slope for sloped or crowned walks at 1.5% (1% minimum and 2% maximum). Round edges to 1/8" radius except saw-cut joints. Finish steps in connection with walks with same finish as walks.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8" in height.
 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing,

veneer plaster, or painting.

2. Do not apply rubbed finish to smooth-formed finish.

- 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.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.
1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quart tile, Portland cement terrazzo, and other bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low sports. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
- D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:
- a. Specified overall values of flatness, F(F) 35; and levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and levelness, F(L) 17; for slabs-on-grade.
3. Finish and measure surface so gap at any point between concrete surface and an unlevelled freestanding 10-foot-long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed he following:
- a. 1/8 inch.

- E. Broom Finish: Apply a broom finish to exterior concrete platforms, walkways, steps, and ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.
- F. Slip-Resistive Aggregates Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
 - 1. Uniformly spread 25 lb/100 sq ft of dampened slip-resistive aggregate over surface in one or 2 applications. Tamp aggregate flush with surface, but do not force below surface.
 - 2. After broadcasting and tamping, apply float finish.
 - 3. After curing, lightly work surface with a steel wire brush or an abrasice stone, and water to expose slip-resistive aggregate.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- D. Electrical Work: Use 3/4" maximum size of aggregates for duct encasement. Unless detailed otherwise, encase underground ducts or conduits as follows:
 - 1. Provide 3 inches minimum concrete cover around ducts or conduits. Use spacers to place and hold ducts. Provide 18 inches minimum earth cover over top of concrete encasement unless otherwise detailed.
 - 2. For future connections, provide a one foot section of ducts or conduits to extend beyond concrete encasement and terminate with a coupling or end cap.
- E. Concrete for Drainage, Sewer and Plumbing Systems:

1. Do not use calcareous coarse aggregates in sewerage structures or components
2. Unless specified elsewhere, construct sewer manholes in accordance with the latest adopted/amended edition of SECTION 23 SEWER MANHOLES of the “STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION”.

3.13 CONCRETE PROTECTION 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 with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces before and during finishing operations. Apply according to manufacturer’s written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the curing methods listed in paragraph 3.13.D.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
 1. Moisture curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-retaining-cover curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than 7 days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moist cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moist cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover

or a curing compound that the manufacturer recommends for use with floor coverings.

3. Curing compound: Apply uniformly in continuous operation by spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and sealing compound: Apply uniformly to floors and slabs indicated in a continuous operation by spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application where recommended by the manufacturer. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions. Defer joint filling as long as possible. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 (1.2-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2" in any dimension in solid concrete but not less than one inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than

surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01" wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4" to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes one-inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes one-inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Engineer's

approval.

3.16 DRYING CONCRETE SLABS TO LIMIT MOISTURE VAPOR EMISSIONS AND ALKALINITY

- A. For concrete slabs (on grade or suspended) receiving floor finish susceptible to vapor emissions, protect, dry or seal concrete slabs to meet the required vapor emission level(s) of the intended floor finish systems. If choosing to use a floor sealing system, furnish submittals for approval.
 - 1. Once slab drying has started, protect it from getting wet prior to floor finish installation. Test floor for moisture and alkalinity in accordance with SECTION 01450 - MOISTURE VAPOR AND ALKALINITY TESTING, Quality Requirements.
 - 2. Test floor for vapor emission at locations and quantities recommended by the test kit manufacturer. Test pH levels of concrete.
 - 3. If the concrete slab does not meet the vapor emission or alkalinity level(s), use other means such as mechanical drying or floor sealing system(s) (penetrants, coatings, or membranes) to achieve the required levels.
 - 4. If the concrete floor slab does not meet the required alkalinity level, neutralize, cure, dry or seal concrete to bring the concrete to an acceptable alkalinity level.
 - 5. Be aware that no additional time or costs will be granted to meet the required vapor emission levels or alkalinity levels of the concrete surfaces.
- B. Floor Vapor Emission Control System:
 - 1. Acceptable products: Subject to compliance with requirements, products that may be incorporated into the work include the following. Other products must be specifically approved by the Engineer for use in this project.
 - a. Koster VAP I 2000 by Koster American Corporation
 - b. VaporSeal 309 by Floorseal Technology, Inc.
 - c. VapoSeal-DB by Dependable Floor Products.
 - 2. Install per manufacturer's requirements to achieve a guaranteed vapor emission rate that meets the finished flooring recommended rates. Treatment shall not provide detrimental conditions to the concrete slab or floor covering materials. Make sure flooring adhesives are compatible with the treatment materials.
 - 3. Installer shall provide proof of installer's certification by the treatment manufacturer.
 - 4. Guarantee:

- a. Manufacturer's guarantee: Warrant against bond failure with concrete and failure of the system due to vapor emission and alkalinity levels. Guarantee Period: Ten (10) years. This guarantee period supersedes the guarantee provisions of the Interim General Conditions.
- b. Project guarantee: Replace original finished flooring materials and vapor emission control system due to failure of the vapor emission control system to control vapor emission and prevent unacceptable alkalinity levels. Provide extended warranty that is covered by a separate material and installation bond or by the manufacturer's product liability insurance policy specifically covering the work on this project. The Engineer shall have final approval of accepting the bond or manufacturer's insurance policy.

3.17 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu yd (4 cu m), but less than 25 cu yd (19 cu m), plus one set for each additional 50 cu yd (38 cu m) or fraction thereof.
 - 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - 3. Air content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees F (4.4 degrees C) and below and when 80 degrees F (27 degrees C) and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 - a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
 - 6. Compressive-strength tests: ASTM C 39; test 2 laboratory-cured specimens at 7 days and 2 at 28 days.
 - a. Test 2 field-cured specimens at 7 days and 2 at 28 days.

- b. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at age indicated.
- C. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix will be satisfactory if every average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- E. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by the Engineer but will not be used as sole basis for approval or rejection of concrete.
- G. Moisture Vapor Emission Test: Standard test method meeting ASTM F 1869.
- H. Alkalinity (pH Level) Testing: Standard test required for floor slabs and all wall and ceiling surfaces to receive painted finishes. Testing of concrete to receive paint finish may be conducted under SECTION 09900 - PAINTING.
- I. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by the Engineer.

END OF SECTION

SECTION 03350

CONTROLLED LOW STRENGTH MATERIAL (CLSM)

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. This Section covers the furnishing and placing CLSM in utility trenches and is required only for trenching work performed within the County of Hawaii right-of-way.
- B. Related Sections include the following:
 - 1. Section 02200 "Earthwork."
 - 2. Section 02225 "Trenching And Backfilling."

1.2 REFERENCES

- A. The "Standard Specifications for Public Works Construction", dated September 1986, as revised, except as amended in the plans and/or specifications herewith, of the Department of Public Works, as applicable to the City and County of Hawaii, hereafter referred to as the "DPW Standard Specifications", or as herein specified. (Paragraphs concerning Measurement and Payment are not applicable to this project.)
- B. The "Standard Details for Public Works Construction", September 1984, of the Department of Public Works, including all revisions, as applicable to the County of Hawaii, hereafter referred to as the DPW "Standard Details", or as herein specified.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 – Submittals.
- B. Mix Design: At least 30 days prior to CLSM placement, submit a mix design for CLSM.
- C. Certificates
 - 1. Manufacturer's certification that all materials meet the standards stated herein and that required factory tests have been successfully performed.
 - 2. Submit mill certificates for all cement.
- D. Test Reports
 - 1. 28-day Compression Strength.
 - 2. Submit additional test reports as directed by The State. Contractor shall verify all requirements prior to the start of trenching operations.

PART 2 - PRODUCTS

2.1 CONTROLLED LOW STRENGTH MATERIAL (CLSM)

- A. CLSM is a mixture of Portland cement, fine aggregate, and water. The Contractor shall proportion the CLSM to produce a backfill material that is self-compacting and capable of being excavated later with hand tools. The proportions of the CLSM shall:
 - 1. Produce a uniform, flowable mixture that is essentially self-leveling when placed. CLSM shall have a flow of 6 to 8 inches tested in accordance with ASTM D6103;
 - 2. Have a 28-day compressive strength of approximately 100 psi to 150 psi in accordance with ASTM D4832 "Preparation and Testing of Controlled Low Strength Material Test Cylinders"; and
 - 3. Have a wet unit weight sufficient enough to displace groundwater and achieve the required compressive strength.
- B. Materials shall be in accordance with the below-listed sections of the DPW Standard Specifications, including all revisions, and shall govern all work except for the subsections of Measurement and Payment which shall not be applicable.

Portland Cement Concrete Section 39

- C. Aggregates shall be from a source acceptable to The State and conform to DPW Standard Specifications Subsection 39.2 – Materials for Fine Aggregate. Aggregate shall stay in suspension in the CLSM to the extent required for proper flow.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. Provide CLSM backfill within utility trench as indicated on the Plans.
- B. CLSM shall not free fall for more than 2 feet.
- C. If standing water is present, Contractor shall employ the tremie method to emplace the CLSM below the water level.
- D. Pave or restore the pavement section no earlier than eight (8) hours after backfilling unless otherwise allowed by the State. Protect the backfill material from traffic during the period before restoration of the pavement section.

END OF SECTION

DIVISION 04 – MASONRY
SECTION 04810
UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units.
2. Mortar and grout.
3. Reinforcing steel.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Miscellaneous masonry accessories.

B. Related Sections include the following:

1. SECTION 02361 - TERMITE CONTROL
2. SECTION 07920 – JOINT SEALANTS
3. SECTION 09900 - PAINTING

1.2 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Product Data: For each different masonry unit, strength classification, additive, accessory, and other manufactured product specified.

1. Reinforcing steel: Certified mill test results or laboratory test results. Indicate bar size, yield strength, ultimate tensile strength, elongation and bend test. Provide chemical

composition for rebars that are to be welded.

2. Sealers and Admixtures
- C. Shop Drawings: Show fabrication and installation details for the following:
1. Reinforcing steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
 2. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
- D. Samples for Initial Selection: For the following:
1. Colored mortar samples showing the full range of colors available.
 2. Sample of Masonry Unit (Full block not required)
- E. List of Materials Used in Constructing Sample Panels: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- G. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
1. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
 2. Grout mixes. Include description of type and proportions of ingredients to assure compliance with the compressive strength in IBC Table 2105.2.2.1.2
 3. Each material and grade indicated for reinforcing bars.
 4. Each type and size of joint reinforcement.
 5. Each type and size of anchor, tie, and metal accessory.
- H. Test Reports: Manufacturer's tests shall be in accordance with ASTM C 140 for conformance with the requirements of ASTM C 90.
- I. Quality Control Inspection Documents: Provide one copy of the following industry documents for use by Engineer.
1. NCMA TEK 8-2A (1998): Removal of Stains from Concrete Masonry Walls

1.4 QUALITY ASSURANCE

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
 - 1. Block plant shall maintain a quality control program to monitor and control block chloride ion content. Soluble chloride ion content should not exceed 0.30% by volume of the cement material in the block, based on ACI 318-02 Table 4.4.1.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. Carefully stack and handle masonry units so as to prevent chipping, marring or cracking of corners, edges and faces.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

- A. Protection of Masonry: In rainy locations and conditions, cover tops of walls, projections and sills with waterproof sheeting to repel water.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

- C. Stain Prevention: Protect to prevent stain damage to mar final finish or finishing techniques. Prevent grout, mortar, and soil from staining the face of masonry to be left exposed, stained or painted
- D. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
 - 1. When ambient temperature exceeds 90 degrees F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows:
 - 1. Provide special shapes for lintels, corners, jambs, sash, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners, unless indicated as bullnose.
 - 3. Provide "H" blocks for below grade foundation walls and scheduled to be fully grouted.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
 - 1. Unit compressive strength: Provide load bearing units with minimum average net-area compressive strength of 1900 psi.
 - 2. Size (width): Manufactured to the following dimensions within variations in dimensions only as permissible per ASTM C 90:
 - a. 6 inches nominal; 5 5/8" actual.
 - b. 8 inches nominal; 7 5/8" actual.
 - 3. Admixture: Rheopel Plus or approved equal
- C. Concrete Block Admixture: Water repellent and efflorescence control admixture.
 - 1. Rheopel Plus by BASF or approved equal.

2.2 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type II. Provide natural color or white cement as required

to produce mortar color indicated.

- B. Mortar Cement: ASTM C-1329. Type as scheduled in mix designs in Article 2.09.
- C. Masonry Cement: ASTM C-91. Type as scheduled in mix designs in Article 2.09.
- D. Aggregate for Mortar: ASTM C 144.
- E. Aggregate for Grout: ASTM C 404.
- F. Plasticizer Additive:
 - 1. Acceptable for use in ASTM C-1329 Mortar Cement as a substitute for hydrated lime in masonry mortar.
 - a. Powder type: Proprietary pozzolanic mortar plasticizer.
 - b. Liquid Type: Proprietary mixture of resins.
- G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- H. Water for use in mixing Mortar and Grout: Potable and complying with ASTM C 94. Clean and free from injurious amounts of oils, acids alkalis, salts, organic materials or other substances that may be deleterious to both mortar and reinforcement.
- I. Mortar Block Admixture: Water repellent and efflorescence control mortar admixture.
 - 1. Rheopel Plus Mortar Admixture by BASF or approved equal.

2.3 REINFORCING STEEL

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, deformed, Grade 60 unless otherwise indicated on the drawings or specified herein.

2.4 MASONRY JOINT REINFORCEMENT

- A. General: IBC Sections 2103.13.2, 2104, 2106; ASTM A 951, A 82; and ACI 530. 2.4C and as follows:
 - 1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
 - 2. Wire size for side rods: No. 9, 0.14-inch diameter.
 - 3. Wire size for cross rods: No. 9, 0.14-inch diameter.

4. Provide in lengths of not less than 10 feet. Provide prefabricated corner and tee units in lengths not less than 2 feet where indicated.
- B. For masonry walls, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches on center.

2.5 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this article, unless otherwise indicated.
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.

2.6 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.
- B. Post-installed Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 1. Type: Chemical anchors.
 2. Corrosion protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35%; of width and thickness indicated.
- B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
 1. Styrene-butadiene-rubber compound: ASTM D 2000, Designation M2AA-805, or
 2. PVC: ASTM D 2287, Type PVC-65406.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Commercial plastic or wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142" steel wire, hot-dip galvanized after fabrication. Commercial plastic units are fabricated for the intended purpose.

1. Provide units with either 2 loops or 4 loops as needed for number of bars indicated.
 2. Other suitable devices: Other suitable devices may be used, upon proper submittal to and approval by Engineer.
- E. Adhesive: Type recommended by insulation board manufacturer for application indicated.
- F. Color Enhancer: Water based protective treatment for horizontal masonry.
1. Color Enhancer WB by Prosoco or approved equal.

2.8 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of 1/2 cup dry measure tetrasodium polyphosphate and 1/2 cup dry measure laundry detergent dissolved in one gallon of water.
- B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar or grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to the job site.
- C. Mortar for Unit Masonry:
1. The proportioning of materials for mortar and grout shall be by volume and done in such manner that the specified proportions can be controlled and accurately maintained. Measure fine aggregate in a damp loose condition. Mix materials in a mechanical batch mixer for at least 3 minutes for mortar and 5 minutes for grout, but do not mix more than 10 minutes. Hand mixing is permitted only for small batches of 3 cubic feet or less.
 2. Prepare Mortar Mix Design 1 with sufficient water to provide a workable consistency. Use and place mortar within 1 1/2 hours after mixing.
 3. Prepare Mortar Mix Designs 2 through 5 strictly in accordance with the admixture manufacturer's instructions. Place mortar within 2 1/2 hours after mixing. No materials which start to set shall be retempered.

4. Mortar shall attain not less than 2,500 psi 28-day compressive strength per ASTM C 270 unless noted otherwise on drawings.
- D. Mortar Mix Designs: Mortar shall be freshly prepared and uniformly mixed in one of the following proportions unless directed otherwise by manufacturer of plasticizer additive:
1. Mortar Mix 1:
Type M Mortar
1 part masonry cement
2 1/2 to 3 parts mortar aggregate
 2. Mortar Mix 2:
Type M Mortar
2 sacks Portland cement
1/2 to 1 bag powdered plasticizer additive (7 pound bag)
6 cu ft mortar aggregate
 3. Mortar Mix 3:
Type M Mortar:
1 sack Portland cement
3 ounces liquid plasticizer additive
2 1/4 to 2 3/4 cu ft mortar aggregate
 4. Mortar Mix 4:
Type S Mortar:
2 sacks Portland cement
1 bag powdered plasticizer additive (7 pound bag)
9 cu ft mortar aggregate
 5. Mortar Mix 5:
Type S Mortar
1 sack Portland cement
3 ounces liquid plasticizer additive
2 1/2 to 3 cu ft mortar aggregate
- E. Grout for Unit Masonry: Sufficient water shall be used to produce a consistency just fluid enough for pouring or pumping without segregation. Grout shall be used and placed in final position within 90 minutes after mixing, but shall in no case be used after initial set has occurred. This time limitation is permitted to be waived, if the grout is of such slump that it can be placed without addition of water.
1. Grout shall attain not less than 2,500 psi 28-day compressive strength per ASTM C 1019 unless noted otherwise on drawings.
 2. Use plasticizers additives for below grade foundation walls scheduled to be grouted to ensure full dispersal of mix.

- F. Grout Mixes: Conform to ASTM C 476 for grout mixed on-site. Prepare and uniformly mix grout in the following proportion:
- | | |
|-----------------|---|
| 1. Fine grout | |
| 1 part | Portland cement |
| Fine aggregate: | 2 1/4 to 5 times the sum of the volumes of the cementitious materials |
2. Ready-mix grout: Conform to ASTM C 476 for grout designed by ready-mix suppliers.
- G. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's directions.
- H. Mortar Block Admixture: Water repellent and efflorescence control mortar admixture.
1. Rheopel Plus Mortar Admixture by BASF or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 2. Verify that floor levels, footing levels or foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

- A. General: All masonry units shall be clean and handled to protect and minimize chipping, spalling and cracking. All bed on which masonry is to be laid shall be clean.
- B. Masonry units shall not be wetted prior to use. Units which have become wet shall be allowed to dry thoroughly before laying. If water is splashed on the block and a color difference does not occur (from the water) then the block units are too wet to be laid. (Source: Reinforced Concrete Masonry Construction Inspector's Handbook, Fourth Edition, paragraph 12.3.4)

- C. Build chases and recesses to accommodate items specified in this section and in other sections of the specifications.
- D. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- E. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- F. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with the tolerances in the national concrete masonry association Specification for Structures ACI 530-02/ASCE 6/TMS 602 as applicable to climate indigenous to Hawaii and as noted.
- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4" in 20 feet, nor 1/2" maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4" in 10 feet, nor 1/2" maximum.
- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4" in 20 feet, nor 1/2" maximum.
- E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8", with a maximum thickness limited to 1/2". Do not vary from bed-joint thickness of adjacent courses by more than 1/8".
- F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8". Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8".

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. When foundation is at specified levels, lay first course masonry units in a mortar bed not exceeding 3/4" thick. Bed webs of adjoining cells that contain reinforcement in mortar to

prevent escape of grout.

- C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal horizontal face dimensions at corners or jambs.
 - 1. One-half running bond with vertical joint in each course centered on units in courses above and below unless otherwise indicated on drawings.
- D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4 inches horizontal face dimensions at corners or jambs.
- E. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- F. Built-in Work: As construction progresses, build in items specified under this and other sections of the specifications. Fill in solidly with masonry around built-in items.
- G. Grout space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
 - 1. Grout mix: Use one of the following:
 - a. One of the mortars mixed specified in Part 2 above.
 - b. One of the grout mixes specified in Part 2 above.
 - 2. Gypsum board joint compound or other gypsum containing compounds are not permitted.
- H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- I. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated or directed.
- J. Fill cores in hollow concrete masonry units with grout for foundation walls and below grade walls up to underside of floor slab unless otherwise indicated.
- K. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with firestopping provisions of the construction drawings and specifications.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 1. With full mortar coverage on horizontal and vertical face shells.
 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
 4. Bed cross webs.
- B. Lay horizontal-cell units with full bed joints, unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
- C. Maintain joint thicknesses indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4" to 3/8" thick joints.
- D. Where epoxy-mortar pointed joints are indicated, rake out setting mortar to a uniform depth of 1/4" and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.
- E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
- F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.6 BONDING OF MASONRY

- A. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
 1. Provide individual metal ties not more than 16 inches on center.
 2. Provide continuity with masonry joint reinforcement by using prefabricated "T" units.

3.7 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8" on exterior side of walls, 1/2" elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches on center.
 - 2. Space reinforcement not more than 8 inches on center in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
 - a. Reinforcement above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 - 1. Provide an open space not less than one inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
 - 2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches on center vertically and 36 inches on center horizontally.

3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 - 1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake joints in exposed faces.

2. Install preformed control-joint gaskets designed to fit standard sash block.
 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake joint.
 4. Install temporary foam-plastic filler in head joints and remove excess filler and seal joint when unit masonry is complete.
- C. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in SECTION 07920 – JOINT SEALANTS.
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.10 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 24 inches for block-size units are shown without structural steel or other supporting lintels.
1. Provide built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured.
- B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.11 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
1. Construct formwork to conform to shape, line, and dimensions shown. Make it tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements ACI 530 Sec 3.4/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
1. Comply with requirements of ACI 530 Sec. 3.5/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.12 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Engineer's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
 - 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.13 MOCK-UP

- A. The Contractor shall complete a mock-up of the exterior concrete masonry wall. The concrete masonry block and mortar shall represent the same material and color used in the project. The mock-up shall be 10'-0" x 10'-0" minimum and fully grouted. It will be the Contractor's prerogative to complete the mock-up as a separate entity or as part of the project. Acceptance from the Engineer is required prior to continuing work. If the mock-up is acceptable to the Engineer, the mock-up may be incorporated as part of the project if the Contractor elected to do so. The location of the mock-up will be left up to the Contractor.

END OF SECTION

DIVISION 05 – METALS

SECTION 05120

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:

1. Structural steel.
2. Grout.

B. Related Sections:

1. SECTION 05310 - STEEL DECKING
2. SECTION 09900 - PAINTING

1.2 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, “Code of Standard Practice for Steel Buildings and Bridges.”

1.3 SUBMITTALS

- A. Submit in accordance with SECTION 01300 - SUBMITTALS.

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

- C. 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 slip-critical high-strength bolted connections.

- D. Qualification Data: For qualified Installer, fabricator, testing agency.
- E. Welding certificates.
- F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- G. Mill test reports for structural steel, including chemical and physical properties.
- H. Product Test Reports: For the following:
 - 1. Threaded rods, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Shop primers.
- I. Source quality-control reports.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.5 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 Contractor'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.

1.6 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 STRUCTURAL-STEEL MATERIALS

- A. Angles-Shapes: ASTM A 36/A 36M.
- B. Plate and Bar: ASTM A 36/A 36M.
- C. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- D. Welding Electrodes: E70XX and comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. Threaded Rods: ASTM F 1554, Grade 36.
 1. Nuts: ASTM A 563/A 563M heavy-hex carbon steel.
 2. Washers: ASTM A 36/A 36M carbon steel.
 3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
 4. Manufacturers: Subject to compliance with requirements.

2.3 PRIMER

- A. Primer: Comply with SECTION 09900 - PAINTING.
- B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.4 GROUT

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

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 - 1. Mark and match-mark materials for field assembly.
 - 2. 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. 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 SHOP CONNECTIONS

- A. 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.

2.7 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 (50 mm).
2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 5. Galvanized surfaces.
- 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."
- 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 (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Apply 2 coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
1. Fill vent and drain holes that will be exposed in the finished work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Contractor shall engage and pay for an independent testing and inspecting agency to perform shop tests and inspections, and prepare and submit test reports.
1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in work that test reports and inspections indicate does not comply with the

contract documents.

- C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections shall be tested and inspected 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 will not be accepted.
 - 3. Ultrasonic inspection: ASTM E 164.
 - 4. Radiographic inspection: ASTM E 94.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- 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. Base Bearing Plates: Clean concrete- and masonry-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. Weld plate washers to top of baseplate.
 3. 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.
 4. 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's "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.

3.4 FIELD CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1/D1.1M 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. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor shall engage and pay for a qualified independent testing and

inspecting agency to test and inspect field welds and high-strength bolted connections, and prepare and submit test reports.

- B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, field welds shall be tested and inspected 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 will not be accepted.
 - c. Ultrasonic inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. Correct deficiencies in work that test reports and inspections indicate does not comply with the contract documents.

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. Touch-up 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.

END OF SECTION

SECTION 05310
STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following
 - 1. Steel Roof Decking.
- B. Related Sections include the following:
 - 1. SECTION 05120 - STRUCTURAL STEEL FRAMING
 - 2. SECTION 09900 - PAINTING

1.2 SUBMITTALS

- A. Submit in accordance with SECTION 01300 - SUBMITTALS.
- B. Product Data: For each type of deck, accessory, and product indicated.
- C. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- D. Product Certificates: For each type of steel deck, signed by product manufacturer.
- E. Welding certificates.
- F. Field quality-control test and inspection reports.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
 - 2. Acoustical roof deck.
- H. Research/Evaluation Reports: For steel deck.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.
- B. Welding: Qualify procedures and personnel according to AWS D1.3, “Structural Welding Code - Sheet Steel.”
- C. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's “North American Specification for the Design of Cold-Formed Steel Structural Members.”

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements.

2.2 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with “SDI Specifications and Commentary for Steel Roof Deck,” in SDI Publication No. 30, and with the following:
 - 1. Galvanized steel sheet: ASTM A 653 SS Grade 33, G90 zinc coating.
 - 2. Deck profile: As indicated on the contract drawings.
 - 3. Profile depth: As indicated on the contract drawings.
 - 4. Design uncoated-steel thickness: As indicated on the contract drawings.
 - 5. Span condition: Triple span or more.
 - 6. Side laps: Interlocking seam.

2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359" (0.91 mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile indicated.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747" (1.90 mm) thick, with factory-punched hole of 3/8" (9.5 mm) minimum diameter.
- I. Galvanizing Repair Paint: ASTM A 780.
- J. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

2.4 MATERIAL SELECTION FOR LEED COMPLIANCE

- A. Provide products that contain the highest percentage available of post-consumer and/or post-industrial recycled content as defined by LEED-NC 2009.
- B. Provide material that contains the highest percentage available of locally harvested, extracted, and manufactured materials as defined by LEED-NC 2009.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by with self-drilling screws of diameter indicated, and as follows:
 - 1. Screw diameter: Minimum No. 12 or as indicated.
 - 2. Screw spacing: Fasten edge and interior ribs of deck units with screw pattern as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches (450 mm), and as follows:
 - 1. Mechanically fasten with self-drilling, minimum No. 12 (4.8 mm) diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1 1/2" (38 mm) long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1 1/2" (38 mm), with end joints as follows:
 - 1. End joints: Lapped 2 inches (51 mm) minimum.

- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.
- E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: The Contractor shall engage and pay for a qualified independent testing and inspecting agency to perform field tests and inspections, and prepare and submit test reports.
- B. All field welds shall be inspected.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Engineer.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

DIVISION 06 – WOOD AND PLASTICS

SECTION 06070

WOOD TREATMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Plant preservative and insecticide treatment of lumber and other wood products specified in other Sections of this Specification by pressure and dip methods.
- B. Field treatment of field cut or drilled lumber.

1.2 RELATED SECTIONS

- A. Section 06100 “Rough Carpentry”: Lumber products and fire retardant treatment of lumber products.
- B. Section 06402 “Interior Architectural Woodwork”: Factory termiticide treated board products suitable for application of high pressure laminate veneers.

1.3 REFERENCES

- A. American Wood-Preservers' Association
 - 1. AWWA C2-00: Lumber, Timber, Bridge Ties and Mine Ties-Preservative Treatment by Pressure Processes.
 - 2. AWWA C9-00: Plywood-Preservative Treatment by Pressure Processes.
 - 3. AWWA C31-00: Lumber Used out of Contact with the Ground and Continuously Protected from Liquid Water-Treatment by Pressure Processes.
 - 4. AWWA M4-01: Care of Preservative-Treated Wood Products.
 - 5. AWWA C20-99: Structural Lumber- Fire Retardant Treatment by Pressure Process.
 - 6. AWWA N1-01: All millwork, Preservative Treatment by Non-Pressure Process.
 - 7. AWWA N2-00: Composite Wood Products, Preservative Treatment by Non-Pressure Process.

1.4 SUBMITTALS

- A. Product Data: Provide data on all treatment products, including field application instructions if applicable.

1. Provide manufacturer's Material Safety Data Sheets on all products, and hazardous materials.

B. Preserver Certifications:

1. Provide a Certificate of Treatment showing compliance with these specifications for the following:
 - a. Kiln drying
 - b. Method of treatment performed, including dip treatment.

- C. Contractor's Certification: Provide a certification letter stating that all wood used on this job including cuts and penetration were treated and coated with preservatives in compliance with requirements of this contract.

- D. Guarantee: Guarantee form for written guarantee.

1.5 REGULATORY REQUIREMENTS

- A. Comply with State OSHL (Occupancy Safety and Health Law) and pollution controls regulations of the State Department of Health and EPA.

1.6 QUALITY ASSURANCE

- A. Source Limitations for Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.
- B. Comply with the American Wood-Preservers' Association standards as described in the applicable building or residential code. Preservatives shall be EPA registered.
- C. Do not use preservatives containing arsenic or other EPA banned chemicals.
- D. Do not use Perma-Clear 65 or other zinc naphthanate and permethrin products.

1.7 DELIVERY STORAGE AND HANDLING

- A. Protect AWWA C31 inorganic boron treated wood from contact with the ground, rain or other sources of liquid water until permanent installation of covering construction.

1.8 GUARANTEE

- A. Provide a two year guarantee to replace all treated wood which is attacked by subterranean termites .
- B. Provide a five year guarantee to replace all treated wood which is attacked by dry wood termites or deteriorates due to dry rot. This guarantee period supersedes the guarantee provisions of the Interim General Conditions (IGC). The Surety shall not be held liable beyond two years of the project acceptance date.

- C. Guarantee periods shall commence on Project Acceptance date.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Mill lumber to finish size and shape prior to treating, and treat before assembly. Plywood may be treated in regular panel sizes.
- B. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece, or omit marking and provide certificates of treatment compliance issued by inspection agency.

2.2 PRESSURE TREATMENT WITH WATER-BORNE PRESERVATIVES

- A. Treating solutions:
 - 1. Copper azole, Type A (CBA-A).
 - 2. Inorganic boron (SBX).
- B. Treatment Methods:
 - 1. General:
 - a. All water-borne treatment methods require incising of lumber of nominal 2 inch thickness (1-1/2 inches actual dimension).
 - b. Choice of treatment method and conditions of use of each treating solution shall conform to the treatment schedule contained in Part 3.
 - 2. CBA-A: Treatment methods, depth of penetration and treating solution retention shall conform to AWPA C2 for lumber and C9 for plywood.
 - 3. SBX: Treatment method shall conform to AWPA C31. Treating solution retention shall be a minimum of 0.28 pounds per cubic foot (equivalent to 0.42 DOT).
- C. Drying:
 - 1. Before Treatment:
 - a. CBA-A Treatment: Wood shall be air dried or kiln-dried before treatment to an average moisture content of 28 percent or less per AWPA standards.
 - b. SBX Treatment: Wood having a moisture content higher than 28% is acceptable when treating with SBX.

2. After Treatment:

- a. All 1 inch and 2 inch lumber and all plywood shall be dried to a moisture content of 19 percent or less after treatment.

2.3 PRESSURE TREATMENT WITH OIL-BORNE PRESERVATIVES

A. Treating Solution:

1. 0.50 percent by weight chlorpyrifos, 0.75 percent by weight 3-iodo-2-propynyl butyl carbamate (IPBC). The solvent used in formulating the preservative solution shall meet the requirements of AWWA hydrocarbon solvent Type C, Standard P9, Paragraph 3.1.
2. For interior application use low odor mineral spirits as solvent.

B. Treatment Methods:

1. Treated wood shall attain the following net retention requirements: 0.0175 pounds of Chlorpyrifos per cubic foot of wood, 0.035 pound of 3-Iodo-2 propynyl butyl carbamate per cubic foot of wood.

C. Drying:

1. Before Treatment: All wood treated with oil-borne preservatives shall be kiln-dried to an average moisture content of 12% to 15% per AWWA standards.
2. After Treatment: Wood shall be thoroughly dried and virtually odor-free prior to installation.

2.4 PRESERVATION BY DIP TREATMENT

A. Treating Solution:

1. Any of the Oil-Borne Preservatives listed above.
2. A solution of 1 quart chlorpyrifos in 55 gallons of a 0.50 percent IPBC solution.

B. Treatment Methods:

1. Immersion treat for a minimum period of 15 minutes.
2. Do not incise lumber scheduled to be left unpainted or receive a clear finish.

C. Drying:

1. After Treatment: Wood shall be thoroughly dried and virtually odor-free prior to installation.

2.5 FIELD TREATMENT

A. Treatment Method:

1. Treat in accordance with AWP Standard M4-98 using two heavy brush coats of a treating solution.

PART 3 - EXECUTION

3.1 SCHEDULE OF TREATMENTS

A. Species:

1. Treat all wood species except all-heart redwood.
2. All water-borne and oil-borne treatment solutions are applicable to douglas-fir and hem-fir species except for CBA-A treatment which is acceptable for hem-fir species only.

B. Application:

1. Pressure Treatment:

- a. General: Unless otherwise stipulated, all lumber and plywood shall be pressure treated.
- b. Hardwood flooring and exposed lumber 1-1/2" (net thickness) and over that will be unpainted or receive a clear finish shall be and pressure treated with oil-borne preservative. Do not incise lumber.
- c. SBX treated wood shall not be used in areas exposed to direct precipitation (e.g. exposed decking, trellises, fencing, etc.) unless painted or covered with a finish material.

2. Dip Treatment: All finish lumber under 1-1/2 inch net thickness (except hardwood flooring); finish plywood; and mill work items, such as for cabinet work, shelving and similar wood work that will be exposed to view in the finished work.

3. Field Cuts: Treat end cuts, notches and penetrations into treated lumber or plywood. Exception: Cuts and penetrations made in SBX treated wood 2 inches or less in nominal thickness need not be field treated.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking, cants, and nailers.
4. Wood furring and grounds.
5. Wood sleepers.
6. Utility shelving.
7. Plywood backing panels.

- B. Related Sections include the following:

1. Sections 06160 "Sheathing" and "Wood Treatment".
2. Section 02361 "Termite Control".

1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.
- C. Timber: Lumber of 5 inches nominal (114 mm actual) or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 2. NLGA: National Lumber Grades Authority.

3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 1. Wood-preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Power-driven fasteners.
 4. Powder-actuated fasteners.

5. Expansion anchors.
6. Metal framing anchors.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.
- B. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
 1. Dimension lumber framing.
 2. Miscellaneous lumber.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, [mark grade stamp on end or back of each piece] [or] [omit grade stamp and provide certificates of grade compliance issued by grading agency].
 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWP C31 with inorganic boron (SBX).
 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no

arsenic or chromium.

2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
1. For exposed lumber indicated to receive a stained or natural finish, [mark end or back of each piece] [or] [omit marking and provide certificates of treatment compliance issued by inspection agency].
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPAC20 (lumber) and AWPAC27 (plywood).
1. Use Exterior type for exterior locations and where indicated.
 2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
 3. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
1. For exposed lumber indicated to receive a stained or natural finish, [mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by

inspection agency.

- C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- D. Application: Treat all rough carpentry, unless otherwise indicated:
 - 1. Framing for raised platforms.
 - 2. Concealed blocking.
 - 3. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Cants.
 - 5. Furring.
 - 6. Grounds.
 - 7. Utility shelving.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 15 percent maximum moisture content of any species.
 - 1. Hem-fir (north); NLGA.
 - 2. Mixed southern pine; SPIB.
 - 3. Spruce-pine-fir; NLGA.
 - 4. Hem-fir; WCLIB, or WWPA.
 - 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- C. For exposed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
 - 1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Standard or

- No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
2. Mixed southern pine, No. 2 grade; SPIB.
 3. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 4. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine, No. 2 grade; SPIB.
 2. Hem-fir or hem-fir (north), Construction or 2 Common grade; NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 4. Eastern softwoods, No. 2 Common grade; NeLMA.
 5. Northern species, No. 2 Common grade; NLGA.
 6. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.

- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.7 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Do not splice structural members between supports, unless otherwise indicated.
- C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- D. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or

optimum joint arrangement.

- E. Comply with AWP M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- G. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.
- H. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06160

SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Subflooring.
 - 2. Building paper.
- B. Related Sections include the following:
 - 1. Section 06100 "Rough Carpentry" for plywood backing panels.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 - 3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory," or GA-600, "Fire Resistance Design Manual."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

- A. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWA C9.
 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Comply with performance requirements in AWWA C27.
 1. Use treatment that does not promote corrosion of metal fasteners.

2. Use Exterior type for exterior locations and where indicated.
 3. Use Interior Type A, High Temperature (HT) for roof sheathing and where indicated.
 4. Use Interior Type A, unless otherwise indicated.
- B. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
 - C. Identify fire-retardant-treated plywood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - D. Application: Treat plywood indicated on Drawings, and the following:
 1. Subflooring and underlayment for equipment platforms.
- ## 2.4 WALL SHEATHING
- A. Plywood Wall Sheathing: **Exterior** sheathing.
 1. Span Rating: Not less than **16/0**.
 2. Nominal Thickness: Not less than **1/2 inch (13 mm)**.
- ## 2.5 SUBFLOORING AND UNDERLAYMENT
- A. Plywood Combination Subfloor-Underlayment: DOC PS single-floor panels.
 1. Span Rating: Not less than 16" o.c.
 2. Nominal Thickness: Not less than 3/4 inch (19 mm).
 3. Edge Detail: Square.
 4. Surface Finish: Fully sanded face.
 - B. Underlayment, General: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 1/4 inch (6.4 mm) over smooth subfloors and not less than 3/8 inch (9.5 mm) over board or uneven subfloors.
 - C. Plywood Underlayment for Resilient Flooring: DOC PS 1, Exterior B-C with fully sanded face.
- ## 2.6 FASTENERS
- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. For floor and wall sheathing, provide fasteners of Type 304 stainless steel.
 - B. Nails, Brads, and Staples: ASTM F 1667.
 - C. Power-Driven Fasteners: NES NER-272.
 - D. Wood Screws: ASME B18.6.1.
 - E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
 1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 1. For steel framing less than 0.0329 inch (0.835 mm) thick, attach sheathing to comply with ASTM C 1002.
 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, attach sheathing to comply with ASTM C 954.
- 2.7 WEATHER-RESISTANT SHEATHING PAPER
- A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.
- 2.8 MISCELLANEOUS MATERIALS
- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 1. Use adhesives that have a VOC content of low as calculated by EPA Method 24.
 - B. Adhesive/vapor barrier: Urethane adhesive and moisture vapor control for adhering plywood sheathing to concrete.
 1. Manufacturer: Bostick, Inc or approved equal.
 2. Model: Bostick's Best.
 3. Apply adhesive per manufacturer's instructions.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
 - 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's "Uniform Building Code."
 - 4. Table 2305.2, "Fastening Schedule," in BOCA's "BOCA National Building Code."
 - 5. Table 2306.1, "Fastening Schedule," in SBCCI's "Standard Building Code."
 - 6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
 - 7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's "International One- and Two-Family Dwelling Code."
- D. Retain first paragraph below if wood framing is used. Revise to indicate other kinds of nails if required.
- E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Subflooring:

- a. Glue to concrete floor.
- b. Space panels 1/8 inch (3 mm) apart at edges and ends.

2. Wall Sheathing:

- a. Screw to cold-formed metal framing.
- b. Space panels 1/8 inch (3 mm) apart at edges and ends.

END OF SECTION

SECTION 06402

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Specifications, Special Provisions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior frames and jambs.
 - 2. Plastic-laminate cabinets.
 - 3. Solid-surfacing-material countertops.
 - 4. Closet and utility shelving.
 - 5. Shop finishing of interior woodwork.
- B. Related Sections include the following:
 - 1. Section 06100 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

- A. Product Data: For high-pressure decorative laminate, adhesive for bonding plastic laminate, solid-surfacing material, fire-retardant-treated materials, cabinet hardware and accessories and finishing materials and processes.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details at a minimum scale of $1\text{'-}1/2'' = 1\text{'-}0''$.
 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets and other items installed in architectural woodwork.
 4. Apply WI-certified compliance label to first page of Shop Drawings.
- C. Samples for Initial Selection:
1. Shop-applied opaque finishes.
 2. Plastic laminates.
 3. PVC edge material.
 4. Solid-surfacing materials.
- D. Samples for Verification:
1. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.
 2. Edge banding: 6" strip for each type, color and pattern.
 3. Solid-surfacing materials, 6 inches (150 mm) square.
 4. Exposed cabinet hardware and accessories, one unit for each type and finish.
- E. Product Certificates: For each type of product, signed by product manufacturer.
- F. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.
- G. Qualification Data: For fabricator.
- H. Manufacturer's Warranty.
- 1.5 QUALITY ASSURANCE
- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a licensee of WI's Certified Compliance Program.
 - B. Installer Qualifications: Fabricator of products.
 - C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork.

- D. Quality Standard: Unless otherwise indicated, comply with WI's "Manual of Millwork" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

- 1. Provide WI-certified compliance certificates indicating that woodwork complies with requirements of grades specified.

- E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)" to fabricator of

architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species for Opaque Finish: Eastern white pine, sugar pine, or western white pine.
- C. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Softwood Plywood: DOC PS 1.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
 - a. Abet Laminati, Inc.
 - b. Arborite; Division of ITW Canada, Inc.
 - c. Formica Corporation.
 - d. Lamin-Art, Inc.
 - e. Nevamar Company, LLC; Decorative Products Div.
 - f. Panolam Industries International Incorporated.
 - g. Westinghouse Electric Corp.; Specialty Products Div.
 - h. Wilsonart International; Div. of Premark International, Inc.
- E. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. ABA Industries.
 - b. Avonite, Inc.
 - c. E. I. du Pont de Nemours and Company.
 - d. Formica Corporation.
 - e. LG Hsusys America, Inc.
 - f. Nevamar Company, LLC; Decorative Products Div.
 - g. Samsung; Cheil Industries Inc.
 - h. Wilsonart International; Div. of Premark International, Inc.
- 2. Type: Standard type, unless Special Purpose type is indicated.
 - 3. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.
 - 1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPAC20 (lumber) and AWPAC27 (plywood). Use the following treatment type:
 - 1. Type: Organic-resin-based formulation thermally set in wood by kiln drying.
 - 2. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking plant certified by testing and inspecting agency.
 - 3. Kiln-dry materials before and after treatment to levels required for untreated materials.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening[, self-closing].
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.
- E. Catches: Magnetic catches, BHMA A156.9, B03141.
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.
 - 1. Manufacturer: Knappe and Vogt Manufacturing Company; 2700 Oak Industrial Dr. NE; Grand Rapids, MI 49505-6026, or approved equal.
 - 2. Model: 82/182 Series Heavy Duty Standard and Bracket System.
 - a. Standard: 82BP WH, length as required.
 - b. Bracket: 182BP WH 14.5
 - 3. Color: White
 - 4. Accessories
 - a. Bookend: 182BE WH 10.5
 - b. Shelf Joiner: 182 DP LCTR/JNR
 - c. Bracket Lock: 182DP LOCK
- G. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- H. Drawer Slides: BHMA A156.9, B05091.
 - 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-overtravel-extension type; zinc-plated steel ball-bearing slides.
 - 2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches (150 mm) high and 24 inches (600 mm) wide.
 - 3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches (150 mm) high or 24 inches (600 mm) wide.

- I. Door Locks: BHMA A156.11, E07121.
- J. Drawer Locks: BHMA A156.11, E07041.
- K. Grommets for Cable Passage through Countertops: 2-inch (51-mm), black, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Product: Subject to compliance with requirements, provide "SG series" by Doug Mockett & Company, Inc.
- L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
- M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Contact Adhesive: 250 g/L.
- E. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
 - C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
 - D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1/16 inch (1.5 mm).
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).
 - E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.
 - 2. as finished.
- 2.6 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH
- A. Grade: Custom.
 - B. Wood Species: Any closed-grain hardwood.
 - C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- 2.7 INTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH
- A. Grade: Custom.
 - B. Wood Species: Any closed-grain hardwood.
- 2.8 PLASTIC-LAMINATE CABINETS
- A. Grade: Custom.
 - B. WI Construction Style: Style A, Frameless.

- C. WI Construction Type: II, single-length sections to fit access openings.
 - D. WI Door and Drawer Front Style: Flush overlay.
 - E. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.
 - 4. Edges: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
 - F. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Hardwood plywood.
 - G. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
 - H. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. See drawings for material and color.
- 2.9 SOLID-SURFACING-MATERIAL COUNTERTOPS
- A. Grade: Custom.
 - B. Solid-Surfacing-Material Thickness: 1/2 inch (13 mm).
 - C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
 - 1. See drawings for material and color.

- D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate tops with shop-applied edges of materials and configuration indicated.
 - 2. Fabricate tops with loose backsplashes for field application.
- E. If required, install integral sink bowls in countertops in shop.
- F. Drill holes in countertops for plumbing fittings.

2.10 OPEN SHELVING AND UTILITY SHELVING

- A. Grade: Custom.
- B. Shelf Material: Grade B, 3/4-inch (19-mm) veneer-faced panel product with half-round solid-lumber edge
- C. Wood Species:
 - 1. Plywood Veneer: Poplar.
 - 2. Solid –lumber Edge: Maple.
- D. Finish:
 - 1. Shelf: Plastic laminate as scheduled.
 - 2. Solid-lumber Edge: Clear wood stain, color as scheduled.

2.11 SHOP FINISHING

- A. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches (900 mm) long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).
- H. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.

2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- I. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 1. Install countertop support brackets as indicated on the drawings and comply with manufacturer's instructions.
 2. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 3. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 4. Secure backsplashes to walls with adhesive.
 5. Caulk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
 - J. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- 3.3 ADJUSTING AND CLEANING
- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
 - B. Clean, lubricate, and adjust hardware.
 - C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 07210

BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Includes: The extent of building insulation work is shown on the drawings, by the generic name.
- B. The type of building insulation specified in this section include, but are not limited to, the following:
 - 1. Acoustical batt insulation for walls and partitions.

1.2 QUALITY ASSURANCE

- A. Fire and Insurance Ratings: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Surface Burning Characteristics: ASTM E 84.
 - 2. Fire Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.3 SUBMITTALS

- A. Submit under the provisions of Section 01300 – Submittals.
- B. Manufacturer's Data: Submit manufacturer's specifications and installation instructions for types of insulation required. Include data substantiating that materials comply with specified requirements.
- C. Material Safety Data Sheets (MSDS): Submit MSDS for each material.
- D. Manufacturer's Warranty.

1.4 SAFETY PRECAUTIONS

- A. Respirators and Other Concerns: Comply with OSHA 29 CFR 1910.134, "Respiratory Protection, ASTM C 930, Potential Health and Safety Concerns Associated with Thermal

Insulation Materials and Accessories”, and other Federal, State and local regulations governing safety. Provide workers with dust/mist respirators, training in their use, and protective clothing as approved by the National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA).

- B. Smoking: Do not smoke during installation of blanket insulation.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in original sealed wrapping bearing manufacturer’s name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled or crushed. Comply with manufacturer’s recommendations for handling, storing, and protecting of materials before and during installation.
- B. Storage: Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer’s original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. CertainTeed Corporation
 - 2. Johns Manville
 - 3. Owens-Corning

2.2 MATERIALS

A. FOAM-PLASTIC BOARD INSULATION

- 1. Board Insulation: Extruded-polystyrene board insulation complying with ASTM C 578, square edged.
- 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Diversifoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.

- d. Pactiv Building Products.
- e. T. Clear Corporation.
- 3. Type IV, 25-psi (173-kPa) minimum compressive strength.
- 4. Flame Spread Rating: Class B per ASTM E 84; <75.
- 5. Smoke Development: ASTM E 84; <450
- 6. "R" Value: R-20.
- B. Sound Attenuation Batts: ASTM C 665, Type I, unfaced, except a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the procedures of ASTM E 84 fiberglass insulation batt for noise control in partitions where shown; friction fit, sized to fit framing spacing. Noise Reduction Coefficient (NRC) shall be not less than 0.90 for 2-1/2 inch metal stud wall, and not less than 1.05 for 3-5/8 inch metal stud wall unless partitions ratings indicated otherwise. NRC values as determined in accordance with ASTM C 423.
- C. Recycled Materials: Provide insulation containing recycled materials to the extent practicable, provided the materials meet all other requirements of this section. The minimum required recycled materials content by weight are:
 - Rock Wool: 75 percent slag
 - Fiberglass: Minimum 25 percent glass cullet

2.3 ACCESSORIES

- A. Mechanical Fasteners: Corrosion resistant fasteners as recommended by the insulation manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's instructions for the particular conditions of installation in each case. If printed instructions are not available or do not apply to the project conditions, consult the manufacturer's technical representative for specified recommendations before proceeding with the work.
 - 2. Extend wall insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

3. Apply a single layer of insulation of the required thickness, unless otherwise shown of required to make up the total thickness.
4. Insulation shall be installed after construction has advanced to a point that the installed insulation will not be damaged by remaining work.
5. Space insulation from heat producing devices as recommended by the manufacturer, but not closer than 3 inches.
6. Electrical Wiring: Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

B. Acoustical Batt Wall Insulation: Install as specified in Section 09290 – GYPSUM BOARD.

3.2 PROTECTION

- A. Protect installed insulation and facing from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or, where that is not possible, by temporary covering or enclosure.

END OF SECTION

SECTION 07242

DIRECT-APPLIED FINISH SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes materials and installation of exterior direct-applied cement board stucco backed with drainage mat and fluid applied air/moisture barrier, for frame walls.

1.2 RELATED SECTIONS

- A. Section 04810 "Unit Masonry Assemblies."
- B. Section 06160 "Sheathing."
- C. Section 07540 "Thermoplastic Membrane Roofing."
- D. Section 07620 "Sheet Metal Flashing And Trim."
- E. Section 07920 "Joint Sealants."

1.3 REFERENCED DOCUMENTS

- A. ASTM International (ASTM)
 - 1. C 150 Specification for Portland Cement
 - 2. C 297 Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions
 - 3. C 578 Specification for Preformed, Cellular Polystyrene Thermal Insulation
 - 4. C 1177 Specification for Glass Mat Gypsum for Use as Sheathing
 - 5. C 1325 Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets
 - 6. D 4541 Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
 - 7. E 84 Test Method for Surface Burning Characteristics of Building Materials
 - 8. E 96 Standard Test Methods for Water Vapor Transmission of Materials
 - 9. E 283 Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
 - 10. E 330 Test Method for Structural Performance of Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

11. E 331 Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
 12. E 779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
 13. E 2178 Standard Test Method for Air Permeance of Building Materials
 14. E 2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
 15. E 2430 Standard Specification for Expanded Polystyrene (“EPS”) Thermal Insulation Boards for Use in Exterior Insulation and Finish Systems (EIFS)
- B. APA Engineered Wood Association
1. PS 1 Voluntary Product Standard, Structural Plywood
 2. PS 2 Performance Standard for Wood-Based Structural-Use Panels
 3. E 30 APA Engineered Wood Construction Guide
- C. ICC (International Code Council)
1. 2006 and 2012 IBC (International Building Code)
- D. ICC ES (International Code Council Evaluation Service)
1. AC 59 Acceptance Criteria for Direct Applied Exterior Finish Systems (DEFS)
 2. ICC ESR 1233 StoGuard with Gold Coat, StoGuard with EmeraldCoat, and StoGuard VaporSeal Water-Resistive Barriers and StoEnergy Guard (StoGuard with Continuous Insulation)
 3. ICC ESR 1510 PermaBase Brand Cement Board
 4. ICC ESR 2536 StoQuik Silver I, StoQuik Silver II, and StoQuik Silver NExT Cement Board Stucco Systems
- E. National Fire Protection Association (NFPA) Standards
1. NFPA 285 Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus
 2. NFPA 268 Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source
- F. South Coast Air Quality Management District (SCAQMD)
1. Rule 1113 (2007) Architectural Coatings

G. USEPA (United States Environmental Protection Agency)

1. 40 CFR Part 59 (Code of Federal Regulations Title 40 Part 59 – National Volatile Organic Compound Emission Standards for Consumer and Commercial Products)

1.4 DESIGN REQUIREMENTS

A. Structural (wind and axial loads)

1. Design for maximum allowable deflection, normal to the plane of the wall of L/360
2. Design for wind load in conformance with code requirements using framing members designed to comply with the standards, strength, and stiffness requirements of the applicable code.
3. Maximum stud spacing: 16 inches (406 mm) on center
4. Sheathing: minimum ½ inch (13 mm) Exposure I plywood sheathing in compliance with US DOC PS-2
5. Drainage mat: maximum ¼ or 3/8 inch (6 or 10 mm) thick tangled filament nylon core with fabric facing.
6. Screw fasteners for cement board:
 - a. Steel framing – minimum #8 Type S-12 corrosion resistant screws with minimum 0.395 inch (10 mm) wafer head diameter and minimum 3/8 inch (9.5 mm) and three thread penetration into framing
 1. Cement board fastener spacing: maximum 8 inches (203 mm) vertically along studs
 2. Ultimate wind load resistance capabilities:
 - a. Metal framing capable of achieving +166 psf, -94 psf (+7.94 kPa, -4.50 kPa): minimum 16 gage or heavier, minimum 6 inch (152 mm) depth and 2 inch (50.8 mm) flange width, cold formed C-shaped steel stud framing spaced 16 inches (406 mm) on center maximum.

B. Moisture Control

1. Prevent the accumulation of water into or behind the cement board stucco, either by condensation or leakage into the wall construction, in the design and detailing of the wall assembly:
 - a. Provide corrosion resistant flashing to protect exposed elements and to direct water to the exterior, including, above window and door heads, beneath window and door sills, at floor lines, at roof/wall intersections, decks, abutments of lower walls with higher walls, above projecting features, and at the base of the wall.

- b. Vapor Diffusion and Condensation – perform a dew point analysis of the wall assembly to determine the potential for accumulation of moisture in the wall assembly as a result of water vapor diffusion and condensation. Adjust wall assembly components accordingly to minimize the risk of condensation. Avoid the use of vapor retarders on the interior side of the wall in warm, humid climates.
 - c. Provide StoGuard Air & Moisture Barrier and Sto DrainScreen over sheathing.
 - d. At through wall expansion joints and at joints formed with back-to-back casing beads, back joints with StoGuard Transition Membrane. Refer to Sto Guide Details at www.stocorp.com.
 - e. Seal cement board stucco accessory butt joints with appropriate sealant. Seal all cement board stucco terminations and penetrations through the cement board stucco wall assembly with appropriate sealant, or backer rod and sealant, as dictated by joint type.
- C. Grade Condition
 - 1. Do not specify cement board stucco for use below grade or on surfaces subject to continuous or intermittent water immersion or hydrostatic pressure. Provide minimum 6 inch (150 mm) clearance above grade. Provide increased clearance in freeze/thaw climate zones.
- D. Sloped surfaces, and Projecting Architectural Features attached to cement board.
 - 1. Avoid the use of cement board stucco on build-outs or weather exposed sloped and horizontal surfaces (refer to 2 and 3 below).
 - 2. Build out trim and projecting architectural features from the cement board wall surface with code compliant EPS foam. All foam trim and projecting architectural features must have a minimum 1:2 [27°] slope along their top surface. All foam horizontal reveals must have a minimum 1:2 [27°] slope along their bottom surface. Increase slope for northern climates to prevent accumulation of ice/snow and water on surface. Where trim/feature or bottom surface of reveal projects more than 2 inches (51 mm) from the face of the wall plane, protect the top surface with waterproof base coat. Limit foam thickness to a maximum of 4 inches (102 mm). Periodic inspections and increased maintenance may be required to maintain surface integrity of finishes on weather exposed sloped surfaces. Limit projecting features to easily accessible areas and limit total area to facilitate maintenance and minimize maintenance burden. Refer to Sto Guide Details at www.stocorp.com
 - 3. Do not use foam on weather exposed projecting ledges, sills, or other projecting features unless supported by framing or other structural support and protected with metal coping or flashing. Refer to Sto Guide Details at www.stocorp.com
- E. Joints and Accessories
 - 1. Provide back-to-back casing beads in the cement board stucco assembly where building movement is anticipated: at joints in the substrate or supporting construction, where the

system is to be installed over dissimilar construction or substrates, at changes in building height, at floor lines, at columns and cantilevered areas. Back the joint with StoGuard Transition Membrane.

2. Provide one piece control joints at no greater than 25 ft (7.6 m) intervals and 625 ft² (58 m²) for light colors (LRV \geq 70), and at no greater than 16 ft (4.68 m) and every 256 ft² (23.5 m²) for dark colors (LRV $<$ 70 and \geq 30). Do not exceed length to width ratio of 2-1/2:1 in expansion joint layout.
3. Provide one piece control joints at through wall penetrations, for example, at corners above and below windows, above doors, and similar penetrations through the wall. Alternatively use minimum 9 inch (229 mm) wide diagonal mesh reinforcement at corners over cement board sheathing that is cut in an "L" shape around the corner of the opening.
4. Provide minimum 3/8 inch (9 mm) wide joints where the system abuts windows, doors and other through wall penetrations.
5. Provide appropriate accessories at cement board stucco terminations and joints.
6. Avoid the use of channel reveal accessories which can interfere with proper drainage and proper stress relief.
7. Provide appropriate sealant at cement board stucco terminations and at stucco accessory butt joints.
8. Indicate location of joints, accessories and accessory type on architectural drawings.

F. Color Limitations

1. Select colors with a lightness reflectance value (LRV) of \geq 30 and as dictated by allowable joint spacing (1.04 E2). Refer to Sto Color Chart for LRVs.

1.5 PERFORMANCE REQUIREMENTS

A. Air & Moisture Barrier

1. Compliant with ICC ES Acceptance Criteria AC 212 (refer to ICC ESR 1233)
2. Water Vapor Permeance, ASTM E 96, Method B: greater than 10 perms [573 ng/(Pa·s·m²)]
3. Surface Burning, ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A Building Material
4. Tensile Adhesion, ASTM C 297:
5. Gypsum Sheathing, exceeds strength of substrate
6. Plywood, $>$ 85 psi (590 kPa)

7. OSB, > 30 psi (206 kPa)

8. VOC, calculation:

a. Less than 100 g/L

b. Compliant with US EPA 40 CFR 59 for waterproofing/sealer

c. Compliant with South Coast AQMD Rule 1113 for waterproofing/sealer

B. Drainage Mat

1. Surface Burning, ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A Building Material

2. Flame Propagation, NFPA 285: meets requirements for use on noncombustible (Types I, II, III, and IV) construction. Refer to ICC ESR 1233

C. Direct-Applied Cement Board Stucco Finish System and Components

1. Compliant with ICC ES AC 59.

2. Surface Burning, ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A building material

3. VOC: less than 50 g/L, compliant with South Coast AQMD Rule 1113 for architectural coatings

1.6 SUBMITTALS

A. Manufacturer's specifications, details, installation instructions and product data

B. Manufacturer's code compliance report for air barrier and water-resistive barrier

C. Manufacturer's code compliance report for cement board stucco

D. Manufacturer's standard warranty

E. Samples for approval as directed by the State

F. Fastener manufacturer's pull-out or withdrawal capacity testing for frame construction

G. Prepare and submit project-specific details (when required by contract documents)

1.7 QUALITY ASSURANCE

A. Manufacturer Requirements

1. Cement board stucco and air barrier products manufacturer for a minimum of twenty five (25) years.
2. Cement board stucco finish products and air/moisture barrier products manufactured under ISO 9001:2008 Quality System and 14001:2004 Environmental Management System.

B. Contractor Requirements

1. Licensed, insured and engaged in application of stucco for a minimum of three (3) years.
2. Knowledgeable in the proper use and handling of Sto materials.
3. Employ skilled mechanics who are experienced and knowledgeable in stucco application, and familiar with the requirements of the specified work.
4. Successful completion of minimum of three (3) projects of similar size and complexity to the specified project.
5. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with Sto's published specifications and details and the project plans and specifications.

C. Cement Board Manufacturer Requirements

1. Manufacturer of ASTM C 1325 compliant cement board
2. Cement board listed in a current ICC ES evaluation report

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.
- B. Protect foam plastic insulation materials from prolonged UV exposure, keep away from sources of heat, sparks, flame, flammable or volatile materials. Store on a clean, flat surface, off the ground in a dry area.
- C. Store cement board materials inside and protect from damage by the elements. Protect ends, edges, and faces of cement boards from damage.
- D. Protect coatings (pail products) from freezing and temperatures in excess of 90°F (32° C). Store away from direct sunlight.

- E. Protect portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.
- F. Handle and store all products as directed on labeling.

1.9 PROJECT/SITE CONDITIONS

- A. Maintain ambient and surface temperatures above 40°F (4°C) during application and for 24 hours after application of air/moisture barrier and cement board stucco finish materials.
- B. Provide supplementary heat for installation in temperatures less than 40°F (4°C) such that material temperatures are maintained as in 1.09A. Prevent concentration of heat on wet cement board stucco finish materials and vent fumes and other products of combustion to the outside to prevent contact with materials.
- C. Prevent uneven or excessive evaporation of moisture from base coat during hot, dry or windy weather. Do not install base coat or finish coat if ambient temperatures are expected to rise above 100°F (38°C) within a 24 hour period.
- D. Provide protection of surrounding areas and adjacent surfaces from application of materials.

1.10 COORDINATION/SCHEDULING

- A. Protect sheathing from climatic conditions to prevent weather damage.
- B. Coordinate installation of foundation waterproofing, roofing membrane, windows, doors and other wall penetrations to provide a continuous air barrier and continuous moisture protection. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall and provide sill flashing. Coordinate installation of air/moisture barrier components with window and door installation to provide weather proofing of the structure and to prevent moisture infiltration and excess air infiltration.
- C. Install diverter flashings wherever water can enter the wall assembly to direct water to the exterior.
- D. Install window and door head flashing immediately after windows and doors are installed.
- E. Splice-in head flashing, floor line flashing, diverter flashing, and similar flashing with air/moisture barrier detail component to provide a shingle lap that directs water to the exterior.
- F. Protect air/moisture barrier with cement board stucco cladding assembly within 180 days of installation.
- G. Protect drainage mat with cement board or other protection within 30 days of installation.
- H. Commence the cement board stucco installation after completion of all floor, roof construction and other construction that imposes dead loads on the walls to prevent excessive deflection (and potential cracking) of the cement board stucco.

- I. Sequence interior work such as drywall installation prior to cement board stucco installation to prevent stud distortion (and potential cracking) of the cement board stucco.
 - J. Provide site grading such that the stucco terminates above earth grade minimum 6 inches (152 mm). Provide increased clearance in freeze/thaw climate zones.
 - K. Install copings and sealant immediately after installation of the cement board stucco finishes and when finish coatings are dry.
 - L. Attach penetrations through cement board stucco to structural support and provide air tight and water tight seals at penetrations.
- 1.11 WARRANTY
- A. Provide manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Air/Moisture Barrier, Drainage Mat, Cement Board Stucco Base Coat, Primers, Finishes
 - 1. Sto Corp., 3800 Camp Creek Parkway, Building 1400, Suite 120. Atlanta, GA 30331.
 - 2. Approved equal.
- B. Cement Board
 - 1. National Gypsum Company, Inc., 2001 Rexford Road, Charlotte, NC 28211.
 - 2. Approved equal.
- C. Cement Board Stucco Accessories
 - 1. Plastic Components, Inc., 9051 NW 97th Terrace, Miami, Florida 33178.
 - 2. Approved equal.

2.2 AIR/MOISTURE BARRIER

- A. StoGuard-- fluid applied air/moisture barrier for sheathing, concrete, and concrete masonry substrates consisting of multiple compatible components, or approved equal:
 - 1. Sto Gold Fill -- ready mixed acrylic based flexible joint treatment for rough opening protection, joint treatment of wall sheathing, CMU crack repair, and detail component for shiplap connections with flashing, starter track, and similar ship lap details.
 - 2. Sto EmeraldCoat -- ready mixed flexible waterproof coating for wall sheathing, concrete and CMU wall surfaces

3. StoGuard Mesh-- nominal 4.2 oz/yd² (142 g/m²), self-adhesive, flexible, symmetrical, interlaced glass fiber mesh, with alkaline resistant coating for compatibility with Sto materials, used with Sto Gold Fill to reinforce rough openings, inside and outside corners, sheathing joints, and shiplap connections with flashing, starter track, and similar ship lap details
4. StoGuard Fabric – nonwoven cloth reinforcement used with Sto EmeraldCoat for rough opening protection, joint treatment of wall sheathing, and detail component for shiplap connections with flashing, starter track, and similar ship lap details
5. StoGuard RediCorner – a preformed fabric piece used in the corners of rough openings in tandem with StoGuard Fabric for quicker installation
6. StoGuard Transition Membrane – flexible air barrier membrane for continuity at transitions: sheathing to foundation, dissimilar materials (CMU to frame wall), wall to balcony floor slab or ceiling, flashing shingle lap transitions, floor line deflection joints, masonry control joints, and through wall joints in masonry or frame construction.
7. Sto RapidGuard - one component STPE rapid drying gun-applied treatment for sheathing joints, rough openings, seams, cracks, penetrations and other static transitions in above grade wall construction such as: shingle lap over flashing, wall to balcony floor slab or ceiling, and through wall penetrations – pipes, electrical boxes, and scupper penetrations

2.3 ACCESSORIES FOR CEMENT BOARD STUCCO

- A. Starter Track – Starter Track Drip Edge (Product No. STDE-xx) or i Drip Track (Product No. iDT-xx), rigid PVC (polyvinyl chloride) plastic tracks with weepholes as furnished by Plastic Components, Inc., for use at terminations such as base of wall, floor lines, roof lines, and similar weep termination lines, or approved equal.
- B. Casing Bead – Starter Trac (Product No. ST-xx), a rigid PVC (polyvinyl chloride) plastic accessory as furnished by Plastic Components, Inc., for use at terminations such as windows, doors, and similar through wall penetrations, and used back-to-back at movement joints such as dissimilar materials, through wall expansion joints, and floor line deflection joints. May also be used back-to-back in lieu of a single piece control joint, or approved equal.
- C. Outside Corners – Sto-Mesh Corner Bead Standard, one component PVC (polyvinyl chloride) accessory with integral reinforcing mesh for outside corner reinforcement, or approved equal.
- D. Drip Edge - Sto Drip Edge Profile, one component PVC (polyvinyl chloride) accessory with integral reinforcing mesh that creates a drip edge and plaster return, or approved equal.
- E. Control Joint – “V” Control Joint (Product No. PL 093), rigid PVC (polyvinyl chloride) plastic single piece control joint as furnished by Plastic Components, Inc., for use at intervals in the field of the wall, and at corners of penetrations such as windows, doors, and similar through wall penetrations, or approved equal.

2.4 DRAINAGE MAT

- A. Sto DrainScreen 6mm – nominal ¼” (6 mm) tangled filament nylon core drainage mat with fabric facing, or approved equal.

2.5 CEMENT BOARD

- A. Cement Board – minimum ½ inch (13 mm) thick cement board in Compliance with ASTM C 1325

2.6 MECHANICAL FASTENERS FOR CEMENT BOARD

- A. Corrosion resistant screw fasteners:
 - 1. Steel Framing – minimum #8 Type S-12 corrosion resistant wafer head fasteners with minimum 3/8 inch (9.5 mm) and three thread penetration into framing and minimum 0.395 inch (10 mm) head diameter

2.7 JOB MIXED INGREDIENTS

- A. Water: clean and potable.
- B. Portland cement: Type 1 in compliance with ASTM C 150

2.8 CEMENT BOARD STUCCO JOINT REINFORCEMENT

- A. StoGuard Mesh with Sto base coat, or approved equal.

2.9 CEMENT BOARD STUCCO BASE COAT

- A. Base Coat (select one)
 - 1. Sto BTS Xtra – one component high build lightweight polymer modified portland cement-based base coat material, or approved equal.

2.10 CEMENT BOARD STUCCO REINFORCING MESH

- A. Sto Mesh--nominal 4.5 oz./yd² (153 g/m²), symmetrical, interlaced open-weave glass fiber mesh treated with alkaline resistant coating for compatibility with Sto materials (*achieves Standard Impact Classification over foam insulation board*) , or approved equal.

2.11 PRIMER

- A. StoPrime Sand—acrylic based tinted, sanded primer for base coat surfaces, or approved equal.

NOTE: Priming is recommended to provide uniform substrate absorption and finish color, to improve adhesion and water resistance, and to retard efflorescence.

2.12 FINISH COAT

- A. Stolit Finish – integrally colored, factory blended, acrylic textured wall finish with graded marble aggregate, or approved equal.

2.13 MIXING

- A. StoGuard, or approved equal.
 - 1. Sto Gold Fill – mix with a clean, rust-free electric drill and paddle to a uniform consistency. Do not thin, or dilute with water.
 - 2. Sto EmeraldCoat – mix with a clean, rust-free electric drill and paddle to a uniform consistency. Do not thin, or dilute with water.
- B. Adhesive and Base Coats for Cement Board Stucco and Foam Build-outs:
 - 1. Refer to applicable Sto [Product Bulletin](#) for selected adhesive/base coat material(s).
- C. Primer--mix with a clean, rust-free high speed mixer to a uniform consistency.
- D. Finish--mix with a clean, rust-free high speed mixer to a uniform consistency. A small amount of water (up to 12 ounces [0.4 L]) may be added to adjust workability. Limit addition of water to amount needed to achieve the finish texture.
- E. Mix only as much material as can readily be used.
- F. Do not add lime, anti-freeze compounds, or other additives to any of the materials.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS

- A. Pre-qualify under Quality Assurance requirements of this specification (section 1.h7.B).

3.2 EXAMINATION

- A. Inspect sheathing surfaces for:
 - 1. Damage and deterioration.
 - 2. Moisture damage – record any areas of moisture damage.
- B. Inspect sheathing application for compliance with applicable requirement:
 - 3. Exterior Grade and Exposure 1 wood based sheathing – APA Engineered Wood Association E 30.
- C. Report deviations from the requirements of project specifications or other conditions that might adversely affect the air/moisture barrier, or cement board stucco installation to the General

Contractor. Do not proceed with air/moisture barrier, or cement board stucco installation until deviations are corrected.

3.3 SURFACE PREPARATION

A. Sheathing

1. Remove surface contaminants and replace damaged sheathing.
2. All sheathing must be handled and installed in compliance with applicable building code and/or manufacturer requirements. Installed sheathing must be clean, dry and free from damage, frost, and all bond-inhibiting materials. Abut gypsum sheathing joints. Gap wood sheathing 1/8 inch (3 mm) at joints. Should gaps exceed 1/8 inch (3 mm) up to 1/2 inch (13 mm) wide, use StoGuard RapidGuard to fill joints, or apply low expanding urethane foam into joints and rasp or shave flush with sheathing surface in preparation for installation of StoGuard joint treatment.
3. Spot surface defects in sheathing with joint treatment (Sto Gold Fill, StoGuard RapidGuard, StoGuard RapidGuard, or Sto EmeraldCoat).

3.4 AIR/MOISTURE BARRIER INSTALLATION

A. The following instructions are applicable to:

1. Exterior or Exposure I Plywood in compliance with PS-1

B. Transition Detailing

1. Detail transition areas with Sto RapidGuard or StoGuard Transition Membrane, or approved equal to achieve air barrier continuity. For illustrations of installation, refer to Sto Guide Details and Sto RapidGuard Installation Guide or StoGuard Transition Membrane Installation Guide (www.stocorp.com).

C. Rough Opening Protection (select 1, 2, 3, or 4 for frame construction; for concrete or concrete masonry rough openings with wood bucks and similar openings with complex 3-dimensional geometry, select no. 3 or 4, Sto RapidGuard or StoGuard RapidGuard):

1. Sto Gold Fill with StoGuard Mesh, or approved equal: apply 9 inch (229 mm) wide StoGuard Mesh at rough openings. Immediately apply Sto Gold Fill by spray or trowel over the mesh and spread smooth with a trowel to completely cover the mesh. For deep section studs use minimum 4 inch (102 mm) wide strips of StoGuard Mesh to seal sill and head to jamb corners. Crease and center the mesh at the sill/head to jamb intersection, press into place and apply Sto Gold Fill over the mesh (refer to Sto Detail 20.20M).
2. Sto EmeraldCoat with StoGuard Fabric, or approved equal: apply Sto EmeraldCoat liberally by spray or roller to corners of openings, immediately place StoGuard RediCorners in the wet coating, and apply additional coating over the RediCorners to completely embed them. For deep section studs cut minimum 4 inch (102 mm) strips of StoGuard Fabric to seal sill and head to jamb corners. Crease and center the fabric strips at

the sill/head to jamb intersection and embed the fabric strips in Sto EmeraldCoat. After all corners have been completed apply Sto EmeraldCoat liberally to the entire rough opening, immediately place StoGuard Fabric in the wet coating, smooth any wrinkles with a brush or roller, and apply additional coating over the fabric to completely embed it. Overlap all seams minimum 2 inches (51 mm). Once completed, top coat with additional coating as needed to completely seal the surface. Allow to dry and inspect for pinholes or voids. If pinholes or voids are present, seal with additional coating or Sto RapidGuard.

3. Sto RapidGuard, or approved equal: apply a fillet bead of material with a caulking gun at interior corners inside the opening to seal jamb/sill and jamb/head seams. Apply material in a zig-zag pattern along sill, jambs, and head to form a generous bead of material along the surface to be covered. Use a 6 inch (152 mm) wide plastic drywall knife to spread the material to a uniform thickness of 12-20 mils (0.3-0.5 mm) before the material skins. Treat the entire rough opening surface in this manner and overlap onto the face of the sheathing 2 inches (51 mm) minimum all the way around
4. StoGuard RapidGuard, or approved equal: apply a generous bead of StoGuard RapidGuard with a caulking gun in a zig-zag pattern along the inside and outside surface of the rough opening. Spread with a 6 inch (152 mm) wide plastic spreader all the way around the opening

D. Sheathing Joint Treatment

1. Sto Gold Fill with StoGuard Mesh, or approved equal: place 4 inch (102 mm) wide mesh centered along sheathing joints and minimum 9 inch (229 mm) wide mesh centered and folded at inside and outside corners. Immediately apply Sto Gold Fill by spray or trowel and spread smooth with a trowel to completely cover the mesh.

E. Air/Moisture Barrier Coating Installation

1. Plywood Sheathing: apply waterproof coating by spray or roller over sheathing surface, including the dry joint treatment, rough opening protection, and transition areas, to a uniform wet mil thickness of 10 mils in one coat. Use ½ inch (13 mm) nap roller. Inspect surface and touch up areas (such as where OSB wood strands are raised) with a second coat of Sto EmeraldCoat, or approved equal to completely seal the surface. Protect from rain and freezing until completely dry.

F. Air /Moisture Barrier Connections and Shingle Laps

1. Coordinate installation of connecting air barrier components with other trades to provide a continuous air tight membrane.
2. Coordinate installation of flashing and other moisture protection components with other trades to achieve complete moisture protection such that water is directed to the exterior, not into the wall assembly, and drained to the exterior at sources of leaks (windows, doors and similar penetrations through the wall assembly).

3. Splice-in head flashings above windows, doors, floor lines, roof/sidewall step flashing, and similar locations with StoGuard detail component, or approved equal to achieve shingle lap of the air/moisture barrier such that water is directed to the exterior.

3.5 STARTER TRACK AND BACK MOUNT CASING BEAD ACCESSORY INSTALLATION

- A. Strike a level line at the base of the wall to mark where the top of the starter track terminates.
- B. Attach the starter track even with the line onto the structure a maximum of 16 inches (406 mm) on center with the proper fastener: Type S-12 corrosion resistant screws for steel framing with minimum 3/8 inch (9 mm) penetration, and galvanized or zinc coated nails for wood framing with minimum 3/4 inch (19 mm) penetration. Blocking installed between the studs may be necessary to secure the track flat against the wall surface. For solid sheathing attach directly into sheathing at 12 inches (305 mm) on center maximum.
- C. Butt sections of starter track together. Miter cut outside corners and abut. Snip front flange of one inside corner piece (to allow the cement board to be seated inside of track) and abut.
- D. Install Starter Track at other cement board system terminations as designated on detail drawings: above windows and doors, at floor lines, above roof along dormers or gable end walls, and beneath window sills with concealed flashing.
- E. Install casing beads similarly at cement board stucco termination points—window and door jambs and other through wall penetrations. Install back-to-back casing beads at building expansion joints, thru-wall joints, where the cement board stucco abuts dissimilar construction or substrates, at changes in building height, at floor lines, columns, and cantilevered areas. Install full accessory pieces where possible and avoid small pieces. Where casing bead is used back-to-back as an expansion joint back the membrane with StoGuard Transition Membrane, or approved equal.
- F. Splice-in starter track at base of wall, above windows, doors, floor lines, roof/sidewall step flashing, and similar locations with StoGuard detail component, or approved equal to achieve shingle lap of the air/moisture barrier such that water is directed to the exterior.

3.6 DRAINAGE MAT INSTALLATION

- A. Place drainage mat against the wall surface and unroll horizontally with the fabric facing out. Staple into place with corrosion-resistant fasteners. Use as few fasteners as needed to hold the mat in place, starting from the bottom of the wall at the starter track and working up. Do not fasten through flashing. Shingle lap fabric at horizontal courses. Shingle lap drainage mat over starter track and flashing at floor lines, decks, roof lines, window heads, and other areas where flashing is required, to direct water to the exterior. Butt ends of rolls and vertical seams. Trim at accessories around windows, doors, vents, or other penetrations through the wall. Do not install behind window nail flanges or accessories. Lap over back leg of installed accessories. Immediately follow installation of drainage mat with cement board stucco installation. Where cement board stucco installation will not immediately follow installation of drainage mat, use corrosion-resistant cap nails, cap staples, or cap screws every 16 inches (406 mm) on center

along framing for more secure attachment. Cover drainage mat with cement board within 30 days of installation.

3.7 CEMENT BOARD STUCCO INSTALLATION

- A. After satisfactory inspection of surfaces and correction of any deviations from specification requirements commence the cement board stucco installation as described below. Ensure the installed cement board surface is straight and true within ¼ inch in 10 feet (2 mm/m), and is clean, dry and free from damage, frost, and all bond-inhibiting materials before application of coatings or accessories to cement board surface. Ensure the installed base coat or primed base coat surface is clean, dry, free from damage, frost, and all bond inhibiting materials, including dust, dirt, salts, oil, grease, or laitance, before application of finish.
- B. Cement Board Installation
 - 1. Install cement board horizontally or vertically. Offset joints from sheathing joints by minimum six inches (152 mm). Insert bottom edge of board into the starter track, and then attach the board through the sheathing to studs/framing members with fasteners spaced 8 inches (203mm) on center maximum at the perimeter and in the field of the board, making sure that the fasteners seat flush with the surface of the cement board and do not penetrate the surface of the cement board.
 - 2. Install cement boards with vertical joints staggered and with ends and edges closely butted but not forced together and flush at the surface. Cut boards in an “L” shape around openings such as windows, doors, and similar penetrations.
 - 3. Provide for expansion joints and control joints in cement board layout (see Design Requirements, Section 1.04).
 - 1. Install one piece control joints at wall penetrations, for example, above and below windows and doors. Refer to Sto Tech Hotline No. 0307-S. Install control joints in accordance with the following guidelines:
 - a. Light colors ($LRV \geq 70$) – at no greater than 25 ft (7.6 m) intervals and 625 ft² (58 m²)
 - b. Dark colors ($LRV < 70$ and ≥ 30) – at no greater than 16 ft (4.68 m) intervals and every 256 ft² (23.5 m²)
 - c. Do not exceed length to width ratio of 2-1/2:1 in expansion joint layout.
 - 2. Inside Corners: install corner bead accessory at inside corners adhesively or mechanically. Refer to Sto Tech Hotline No. 0307-S.
 - 3. Outside Corners: install corner bead accessory adhesively by completely embedding the accessory in the base coat material. Refer to Sto Tech Hotline No. 0307-S

4. Drip Edge: install drip edge accessory by completely embedding the accessory in the base coat material. Refer to Sto Tech Hotline No. 0307-S.

C. Cement Board Joint Reinforcement, Accessory Overlaps, and Corners of Wall Penetrations

1. Install StoGuard Mesh, or approved equal centered over cement board joints. After placing mesh over joints skim coat the surface with base coat to completely cover the mesh.
2. Install StoGuard Mesh, or approved equal over perforated accessory flanges up to the “stop bead” on the accessory – starter tracks, casing beads, corner beads, and control joints. After placing mesh over flanges skim coat the surface up to the “stop bead” on the accessory with base coat to completely cover the mesh.
3. At corners of wall penetrations where no control joint is used embed 9 x 12 inch (230 x 305 mm) detail mesh diagonally in base coat.

D. Foam Trim and Build-Outs

1. Where foam build-outs terminate at a dissimilar material such as a window, door or other non-cement board stucco surfaces, backwrap the foam build-out by installing detail mesh onto the terminating edge of the cement board. Embed the mesh in the base coat. Allow the mesh to dangle until the backwrapping procedure is completed (B4).
2. Install foam build-outs directly over cement board with foam trim adhesive. Apply adhesive with the appropriate size notched trowel to the back of the insulation board and immediately place build-out in the proper location on the wall. Press firmly into place and trim or tool excess adhesive from ends and edges of foam trim for a smooth void-free connection to the cement board substrate.
3. After the adhesive has cured sufficiently to hold the build-out firmly in place, rasp the entire foam surface smooth.
4. Complete the backwrapping procedure by applying the foam trim base coat to the exposed edges of the foam build-out and minimum 2-1/2 inches (64 mm) onto the face. Pull the backwrap mesh around the foam build-out and fully embed it into the base coat. Use a corner trowel for neat straight corners.
5. Apply the base coat to the build-out and approximately 3 inches (76 mm) onto the adjacent cement board surfaces to an approximate thickness of 1/8 inch (3 mm). Immediately embed the reinforcing mesh in the wet base coat. Trowel from the center to the edges of the mesh to avoid wrinkles and remove excess base coat. Overlap mesh seams minimum 2-1/2 inches (64 mm). Overlap mesh onto adjacent cement board wall surfaces minimum 2-1/2 inches (64 mm) at terminations of the foam build-out and feather onto the cement board wall surface.

E. Reinforced Base Coat Installation

1. Apply base coat over the cement board, with a stainless steel trowel to a uniform thickness of approximately 1/8 inch (3 mm). Work horizontally or vertically in strips of 40 inches (1016mm), and immediately embed the mesh into the wet base coat by troweling from the center to the edge of the mesh. Overlap mesh not less than 2-½ inches (64 mm) at mesh seams and fully overlap mesh at accessories to the accessory “stop bead.” Feather seams and edges. Double wrap all inside and outside corners with minimum 8 inch (203 mm) overlap in each direction where mesh is used in lieu of a corner bead accessory. Avoid wrinkles in the mesh. The mesh must be fully embedded so that no mesh color shows through the base coat when it is dry. Re-skim with additional base coat if mesh color is visible or if necessary to correct planar irregularities in the wall surface. Allow base coat to thoroughly dry before applying primer or finish.
2. Sloped Surfaces: for reveals, aesthetic bands, cornice profiles, sills or other architectural features that project beyond the vertical wall plane more than 2 inches (51 mm) apply waterproof base coat with a stainless steel trowel to the weather exposed sloped surface and minimum four inches (100 mm) above and below it. Embed standard mesh or detail mesh in the waterproof base coat and overlap mesh seams a minimum of 2-½ inches (65 mm). Allow base coat to thoroughly dry before applying primer or finish.

F. Primer Installation

1. Apply primer evenly by brush or roller to the dry base coat surface.

G. Finish Installation

1. Apply finish by spraying or troweling with a stainless steel trowel, depending on the finish specified, to the dry base coat (or primed base coat) surface. Follow these general rules for application of finish:
 - a. Avoid application in direct sunlight.
 - b. Apply finish in a continuous application, and work a wet edge towards the unfinished wall area. Work to an architectural break in the wall before stopping to avoid cold joints.
 - c. Weather conditions affect application and drying time. Hot or dry conditions limit working time and accelerate drying. Adjustments in the scheduling of work may be required to achieve desired results; cool or damp conditions extend working time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing. Adjust work schedule and provide protection.
 - d. Float “R” (rilled or swirl texture) finishes with a plastic float to achieve their rilled texture.
 - e. Do not install separate batches of finish side-by-side.

- f. Do not apply finish into or over sealant joints. Apply finish to outside face of wall only.
- g. Do not apply finish over irregular or unprepared surfaces, or surfaces not in compliance with the requirements of the project specifications.

3.8 PROTECTION

- A. Provide protection of installed materials from water infiltration into or behind them.
- B. Provide protection of installed materials from dust, dirt, precipitation, and freezing.
- C. Provide protection of installed primer and finish from dust, dirt, precipitation, freezing and continuous high humidity until fully dry.
- D. Provide sealant and backer material at cement board stucco terminations and at fixture penetrations through the cement board stucco to protect against air, water and insect infiltration. Provide weeps at floor lines, window and door heads, and other areas to conduct water to the exterior.

3.9 CLEANING, REPAIR AND MAINTENANCE

- A. Clean and maintain the cement board stucco finish for a fresh appearance and to prevent water entry into and behind the assembly. Repair cracks, impact damage, spalls or delamination promptly.
- B. Maintain adjacent components of construction such as sealants, windows, doors, and flashing, to prevent water entry into the wall assembly.
- C. Refer to Sto reStore Repair and Maintenance Guide ([reStore Program](#)) for detailed information on restoration – cleaning, repairs, recoating, resurfacing and refinishing, or re-cladding.

END OF SECTION

SECTION 07540

THERMOPLASTIC MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Adhered membrane roofing system.
 - 2. Roof insulation.
- B. Related Sections include the following:
 - 1. Section 05310 "Steel Decking" for roof substrate.
 - 2. Section 06100 "Rough Carpentry" for wood nailers, curbs, and blocking [and for wood-based, structural-use roof deck panels].
 - 3. Section 07210 "Building Insulation" for insulation beneath the roof deck.
 - 4. Section 07620 "Sheet Metal Flashing and Trim" for roof penetration flashings, flashings, and counterflashings.
 - 5. Section 07920 "Joint Sealants."

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," before multiplication by a safety factor.
- C. Factored Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," after multiplication by a safety factor.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.
 - 1. Fire/Windstorm Classification: Class 1A-105.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
 - 1. Base flashings and membrane terminations.
 - 2. Tapered insulation, including slopes.
 - 3. Insulation fastening patterns.
- C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of meeting performance requirements.
- E. Qualification Data: For Installer and manufacturer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.
- G. Research/Evaluation Reports: For components of membrane roofing system.
- H. Maintenance Data: For roofing system to include in maintenance manuals.
- I. Warranties: Special warranties specified in this Section.

- J. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
- B. Manufacturer Qualifications: A qualified manufacturer that has FMG approval for membrane roofing system identical to that used for this Project.
- C. Source Limitations: Obtain components for membrane roofing system from roofing membrane manufacturer.
- D. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
 - 1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, cover boards and other components of membrane roofing system.
 - 2. Warranty Period: 30 years from date of Substantial Completion.
 - 3. Warranty to include edge metal flashing (refer to Section 07620 Sheet Metal Flashing and Trim)

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: Uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced and as follows:
 - 1. Manufacturers:
 - a. Carlisle SynTec Incorporated.
 - b. Approved equal.
 - 2. Product: Sure-Weld TPO membrane, 80 mil thick.
 - 3. Exposed Face Color: White.
 - 4. Physical Properties:
 - a. Breaking Strength: 350 lbf (1.6 kN); ASTM D 751, grab method.
 - b. Elongation at Break: 25 percent; ASTM D 751.

- c. Tearing Strength: 55 lbf (130 N) minimum; ASTM D 751, Procedure B.
- d. Brittleness Point: Minus -50 deg F (-46 deg C).
- e. Ozone Resistance: No cracks after sample, wrapped around a 3-inch- (75-mm-) diameter mandrel, is exposed for 168 hours to a temperature of 104 deg F (40 deg C) and an ozone level of 100 pphm (100 mPa); ASTM D 1149.
- f. Resistance to Heat Aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 32 weeks at 240 deg F (116 deg C); ASTM D 573.
- g. Water Absorption: Less than 0.90 percent mass change after 166 hours' immersion at 158 deg F (70 deg C); ASTM D 471.
- h. Linear Dimension Change: Plus or minus -0.2 percent; ASTM D 1204.

2.3 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
 - 1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as sheet membrane.
- C. Bonding Adhesive:
 - 1. Manufacturer: Carlisle SynTec Incorporated, or approved equal.
 - 2. Product: CAV Grip III Low VOC Adhesive/Primer.
- D. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

2.4 ROOF INSULATION

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Composite Polyisocyanurate Board Insulation: ASTM C 1289, faced with insulation board on one major surface, as indicated below by type, and felt or glass-fiber mat facer on the other.
 - 1. Manufacturer: Carlisle Syntec Systems, or approved equal.

2. Foam Core: Closed Cell Polyisocyanurate Insulation with Sure-Seal EPS crickets: Grade 2, 20 PSI
3. Flame Spread Rating: Class A per UL 790, 263 and 1256.
4. FM Standard: FM 4450/4470, Class 1 approval for steel roof-deck construction.
5. Flute Spanability: 4-3/8".
6. "R" Value: 3.5" for R-20.5.

C. Cover Board:

1. Manufacturer: Carlisle Syntec Systems, or approved equal.
2. SecureShield HD, 1/2 inch (13 mm) thick high density polyiso Grade 1 (109 PSI max).
3. R-2.5.

D. Bonding Adhesive:

1. Manufacturer: Carlisle SynTec Incorporated, or approved equal.
2. Product: Flexible FAST Dual Cartridge Adhesive.

2.5 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Bonding Adhesive:
 1. Manufacturer: Carlisle SynTec Incorporated, or approved equal.
 2. Product: Flexible FAST Dual Cartridge Adhesive.

2.6 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads, approximately 3/16 inch (5 mm) thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck and/or parapet wall, at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck comply with requirements in Division 05 Section "Steel Decking."

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.
- C. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- D. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- E. Adhered Insulation and Cover Board: Install each insulation panel and adhere to substrate as follows:
 1. Set insulation in Carlisle FAST and Flexible FAST Adhesive directly onto metal decking.
 2. Set cover board in Carlisle FAST and Flexible FAST Adhesive directly onto insulation.

3.4 ADHERED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
 - 1. Install sheet according to ASTM D 5036.
- B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Bonding Adhesive: Membrane shall be adhered to insulation cover board with CAV-Grip III Low-VOC Adhesive/Primer, applied adhesive per manufacturer's instructions. Roll membrane into the adhesive coated substrate while avoiding wrinkles. Immediately brush down the bonded portion of the sheet with a soft-bristle push broom.
- D. Apply roofing membrane with side laps shingled with slope of roof deck where possible. Comply with manufacturer's instructions.
- E. Roll the membrane with a 150 pound segmented steel roller to set the membrane into the adhesive.
- F. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
- G. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.5 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply CAV-Grip III Low-VOC Adhesive/Primer to substrate at required rate and allow to foamed up approximately 1/8" and begins to "string" when touched with an HP Splice Wipe. Do not apply bonding adhesive to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with sheet flashing.

- D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
 - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
- B. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.9 ROOFING INFORMATION CARD

- A. **Information Card:** For each roof project, furnish a typewritten information card for facility records and a card laminated in plastic, attached to the underside of the roof hatch, or as directed by the State. Cards shall be 8-1/2 inches x 11 inches. Information card shall identify facility name and/or facility designation (letter or number), contract number, type of roof system installed, including deck type, type of membrane, number of plies, method of application, manufacturer; manufacturer's representative contact information, insulation and cover board system and thickness; date of completion; installer's warranty expiration date;

installing contractor and contact information; membrane manufacture's material warranty expiration date; warranty reference number, and warranty contact information. See Roofing Information Card on next page.

ROOFING INFORMATION CARD

FACILITY

Building Name _____ Bldg.design/No. _____

DAGS Job. No. _____

ROOF

Type of Roof System _____ Type of Deck _____

MEMBRANE

Type of Membrane _____ No. of Plies _____

APPLICATION

Method of Application _____ (nailed, heat applied, self-adhered, etc.)

INSULATION

Type of Insulation _____ Cover Board _____

Thickness _____

Thickness _____

INSTALLER (Roofing Contractor)

Company _____ Contact person _____

Contact No. _____

MANUFACTURER

Company _____ Representative _____

Contact No. _____

COMPLETION DATE _____

DATE INSTALLER'S WARRANTY EXPIRES _____

DATE MANUFACTURER'S WARRANTY EXPIRES _____

Warranty Reference No. _____ Warranty Contact person _____

Contact No. _____

END OF SECTION

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Formed Products:

- a. Formed roof scupper sheet metal fabrications.
 - b. Formed leader box.
 - c. Formed wall sheet metal fabrications.
 - d. Prefabricated wall coping.

- B. Related Sections:

- 1. Section 06100 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 07540 "Thermoplastic Membrane Roofing" for installing sheet metal flashing and trim integral with membrane roofing.
 - 3. Section 07920 "Joint Sealant" for sealing joints in sheet metal flashing and trim.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Fabricate and install copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 2. Details for forming sheet metal flashing, coping, scupper and leader box, including profiles, shapes, seams, and dimensions.
 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 4. Details of termination points and assemblies, including fixed points.
 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
 6. Details of special conditions.
 7. Details of connections to adjoining work.
 8. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.
- D. Qualification Data: For qualified fabricator.
- E. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.
- F. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.
 - 2. Surface: Smooth, flat.
 - 3. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat, minimum

1.5 mil total thickness. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

4. Color: As selected by State from manufacturer's full range.
5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.2 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- B. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

- H. Do not use graphite pencils to mark metal surfaces.

2.5 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof to Wall Transition: Fabricate from the following materials:
 - 1. Aluminum-Zinc Alloy-Coated Steel: **0.034 inch (0.86 mm)** thick.
- B. Base Flashing: Fabricate from the following materials:
 - 1. Aluminum-Zinc Alloy-Coated Steel: **0.028 inch (0.71 mm)** thick.
- C. Counterflashing: Fabricate from the following materials:
 - 1. Aluminum-Zinc Alloy-Coated Steel: **0.022 inch (0.56 mm)** thick.

2.6 PREFABRICATED COPING

- A. Manufacturer: Carlisle Syntec Systems, or approved equal.
- B. SecurEdge 300 Coping: A snap-on coping system that incorporates anchor cleats with pre-slotted holes, a concealed joint cover and 12' continuous sections of coping cap consisting of 63-mil thick Kynar 500, colored anodized finish. ANSI/SPRI/FM-4435 ES-1 certified. Contractor to verify wind pressure and supply the appropriate anchor cleats.
- C. Material: Aluminum, 0.050 inch.
- D. Color: SR 27, Dark Bronze
- E. Included as part of the Carlisle Golden Seal Total System Warranty (refer to section 07540 Thermoplastic Membrane Roofing).

2.7 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
 - 1. Fabricated Hanger Style: SMACNA figure designation 1-35H.
 - 2. Fabricate from the following materials:
 - a. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
- B. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof.[Fasten gravel guard angles to base of scupper.] Fabricate from the following materials:
 - 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.

- C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes exterior flange trim. Fabricate from the following materials:
 - 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. General: Install underlayment as indicated on Drawings.
- B. Self-Adhering Sheet Underlayment: Install high temperature self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
- C. Manufacturer: APOC
- D. APOC Weather-Armor® FT3 Fleece-Top® underlayment is a state of the art, high temperature premium roof underlayment and leak barrier that is ideally suited for tile and metal roofing systems, as well as where conditions require a mechanically fastened roof system.
- E. Thickness (ASTM D1970): 60 mils minimum
- F. Tear Resistance (ASTM D1970): (lbf/inc): >60
- G. Moisture Vapor Permeability (ASTM E96): <0.1

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 5. Install sealant tape where indicated.
 6. Torch cutting of sheet metal flashing and trim is not permitted.
 7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of uncoated aluminum sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood nailer not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.
- E. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.
 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.
 2. Provide elbows at base of downspout to direct water away from building.
 3. Connect downspouts to underground drainage system indicated.
- C. Splash Pans: Install where downspouts discharge on grade.
- D. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 1. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.
 2. Loosely lock front edge of scupper with conductor head.
 3. Seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.
- E. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch (25 mm) below scupper discharge.
- F. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches (100 mm) in direction of water flow.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where

possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

- B. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.

1. Install in accordance with manufacturer's installation instructions.
2. Use provided fasteners consistent with manufacturer's instructions.
3. Install water cut-off mastics and sealants, as recommended by manufacturer.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07841

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
 - 1. Fire-resistance-rated walls including fire walls, and fire partitions.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:
 - 1. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside wall cavities.
 - b. Penetrations located outside fire-resistance-rated shaft enclosures.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For Installer.
- C. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
- D. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.
- E. Manufacturer's Warranty.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installation Responsibility: Assign installation of through-penetration firestop systems in Project to a single qualified installer.
- C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
 - 1. UL in its "Fire Resistance Directory."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened

containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by the State and building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application on Drawings that are produced by one of the following manufacturers:
 - 1. A/D Fire Protection Systems Inc.
 - 2. Grace, W. R. & Co. - Conn.
 - 3. Hilti, Inc.
 - 4. Johns Manville.

5. Nelson Firestop Products.
6. NUCO Inc.
7. RectorSeal Corporation (The).
8. Specified Technologies Inc.
9. 3M; Fire Protection Products Division.
10. Tremco; Sealant/Weatherproofing Division.
11. USG Corporation.

2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.

2.3 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials

indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

- B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

2.4 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration

firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop

systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: The State will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION

SECTION 07920
JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED SECTIONS

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

1.2 SUMMARY

- A. This Section includes joint sealants for the following applications:
- B. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - 1. Joints in exterior insulation and finish systems.
 - 2. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
 - 3. Control and expansion joints in ceilings, and other overhead surfaces.
- C. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - 1. Vertical joints on exposed surfaces of walls and partitions.
 - 2. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - 3. Joints between plumbing fixtures and adjoining walls, floors, and counters.
- D. Related Sections include the following:
 - 1. Section 07242 "Direct-Applied Finish System."
 - 2. Section 07620 "Sheet Metal Flashing and Trim."
 - 3. Section 08110 "Hollow Metal Doors and Frames."
 - 4. Section 08120 "Aluminum Doors and Frames."
 - 5. Section 08411 "Aluminum-Framed Storefront."
 - 6. Section 08800 "Glazing."

1.3 GENERAL REQUIREMENTS

- A. Work Included: Completely close with sealants all joints indicated or specified to be sealed to a watertight condition.

1.4 SUBMITTALS

- A. Manufacturer's Data: Submit copies of manufacturer's product data and specifications for type of sealant required.
- B. Color Samples: If applicable, submit color finish samples of sealants.
- C. Manufacturer's Warranty.

1.5 JOB CONDITIONS

- A. Examine joint surfaces and backing, and their anchorage to the structure, and conditions under which joint sealer work is to be performed, and notify Contractor in writing of conditions detrimental to proper completion of the work and performance of sealers. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength.

1.6 PRODUCT HANDLING

- A. Delivery: Deliver sealants to the job site in sealed containers labeled to show the designated name, formula, or specification number, lot number, color, date of manufacture, shelf life, curing time, manufacturer's directions, and name of manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Sealant Backer Rod: Compressible rod stock of polyethylene foam, polyethylene-jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable, non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer to control the joint for sealant placement, to break bond of sealant at bottom of joint, to form optimum shape of sealant bead on back side, and to provide a highly compressible which will minimize the possibility of sealant extrusion when joint is compressed.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer.
- C. Primer for Sealants: Non-staining, as recommended by the sealant manufacturer.

D. Sealant:

1. At Exterior Vertical and Overhead Joints: One-part polyurethane-based sealant, conforming to ASTM C 920, Type S, Grade NS, Use NT, Class 25 as applicable. Provide one of the following, or approved equal.
 - a. Dymonic; Tremco
 - b. Chem-Calk 900; Bostic Construction Products Div.
 - c. Sikaflex 1a; Sika Corp.
2. At Interior Vertical and Overhead Joints: Non-Elastomeric Sealant; acrylic-emulsion type, conforming to ASTM C 834. Provide one of the following, or approved equal:
 - a. Rubber Calk 280; PRC.
 - b. Acrylic Latex Caulk; Tremco
 - c. Chem-Calk 600; Bostik Construction Products Div.
3. At Horizontal Joints: Two-part polyurethane-based sealant, conforming to ASTM C 920, Type M, Grade P, Use T, Class 25. Provide one of the following, or an approved equal:
 - a. THC-900; Tremco
 - b. Sikaflex 2c SL; Sika Corp.
4. Acoustical Sealant: Resilient, non-staining, non-shrinking, non-hardening, non-skinning, non-drying, non-sag sealant intended for interior sealing of concealed construction joints; complying with ASTM C 834. Provide one of the following or approved equal.
 - a. BA-98; Pecora Corp.
5. Tremco Acoustical Sealant; Tremco
 - a. "Sheetrock" Acoustical Sealant; U.S. Gypsum Co.
6. Silicone Sealant: Mildew-resistant; Type S; Grade NS; Class 25; Use NT, formulated with fungicide; intended for sealing interior joints between plumbing fixtures and wall surfaces. Provide one of the following or approved equal:
 - a. Dow Corning 786; Dow Corning Corp.
 - b. SCS 1702 Sanitary; General Electric Co.
 - c. Proglaze White; Tremco

- d. Omni Plus; Sonneborn

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine joints indicated to receive joint sealer, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealers until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
 - 1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; water; and surface dirt.
 - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Remove laitance and form release agents from concrete.
 - 4. Clean metal, glass; and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint surfaces.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturer's printed installation instructions applicable to products and application indicated, except where more stringent requirements apply.

- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.
- D. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 19 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- E. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant move capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.
 - 2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.
 - 3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.
- F. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant applications and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 - 1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - 2. Provide flush joint configuration per Figure 5B in ASTM C 1193, where indicated.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers by joint sealers and of products in which joint occur.

3.5 PROTECTION

- A. Protect joint sealers during and after curing period from contact with contaminating substances or form damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Project Acceptance. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new material to produce joint sealer installations with repaired areas indistinguishable from original work.

END OF SECTION

DIVISION 08 – DOORS AND WINDOWS

SECTION 08113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Standard and custom hollow metal doors and frames.
- 2. Fire rated doors.

B. Related Sections:

- 1. Section 04810 "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
- 2. Section 08200 "Flush Wood Doors".
- 3. Section 08710 "Door Hardware".
- 4. Sections 09900 "Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
- 2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
- 3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
- 4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
- 6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Shop Drawings: Include the following:
 1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of anchorages, joints, field splices, and connections.
 6. Details of accessories.
 7. Details of moldings, removable stops, and glazing.
 8. Details of conduit and preparations for power, signal, and control systems.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.
 - 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 - 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than above ambient after 30 minutes of standard fire-test exposure.
 - 3. Smoke Control Door Assemblies: Comply with NFPA 105.
- C. Pre-Submittal Conference: Conduct conference with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
 - 1. CECO Door Products (C).
 - 2. Curries Company (CU).
 - 3. Pioneer Industries (PI).

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, and ANSI/SDI A250.4 for physical performance level.
 - 1. Design: Flush panel.

2. Core Construction: Foamed in place polyurethane and steel reinforced core with no stiffener face welds.
 - a. Fire Door Core: As required to provide fire-protection ratings indicated.
 - b. Provide 18 gauge steel vertical reinforcements 6 inches apart and welded in place. Foamed in place polyurethane core is chemically bonded to all interior surfaces. No face welding is permitted.
 - c. Thermal properties to rate at a fully operable minimum U-Factor 0.374 and R-Value 2.53, including insulated door, Mercury thermal-break frame and threshold.
 - d. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.378 and R-Value 2.5, including insulated door, kerf type frame, and threshold.
 3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
 4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
 5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
 6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
 7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Design: Flush panel.
 2. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
 3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
 4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.

5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

2.4 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 3. Manufacturers Basis of Design:
 - a. Curries Company (CU) – M Series.
- C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 3. Manufacturers Basis of Design:
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
- D. Hollow Metal Frames:
 - 1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
 - 3. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
 - 4. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
 - 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

- b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
- 7. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.7 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. At fire-protection-rated openings, install frames according to NFPA 80.
 - 2. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 3. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 5. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.

6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
 - C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- ### 3.4 ADJUSTING AND CLEANING
- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
 - B. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION

SECTION 08120
ALUMINUM DOORS AND FRAMES

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Aluminum Doors and Frames

- B. Related Sections:

1.2 REFERENCES

- A. American Architectural Manufacturers Association (AAMA)
- B. American Society for Testing and Materials (ASTM)
- C. Aluminum Association (AA)

1.3 SYSTEM DESCRIPTION

- A. General: In addition to requirements shown or specified, comply with:
 - 1. Applicable provisions of AAMA Aluminum Storefront and Entrance Manual for design, materials, fabrication and installation of component parts.
- B. Design Requirements: Arcadia MS362 HD Series Heavy Duty Medium Stile Entrance is a single source package of door, doorframe and hardware that is engineered for massive traffic abuse.
- C. Performance Requirements: Each assembly tested by a recognized testing laboratory or agency in accordance with specified test methods.
 - 1. Tested by the dual moment corner joint strength test.
 - 2. Air infiltration tested in accordance with ASTM E283 (offset pivot or butt hung entrances).
 - 3. Water penetration tested in accordance with ASTM E 331 (offset pivot or butt hung entrances).
 - 4. Structural uniform load tested in accordance with ASTM E 330.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
- C. Other Action Submittals:
 - 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- D. Delegated-Design Submittal (to provide, if required by Architect): For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of aluminum-framed systems.
 - 2. Include design calculations.
- E. Qualification Data: For qualified Installer.
- F. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- G. Welding certificates.
- H. Source quality-control reports.
- I. Field quality-control reports.
- J. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- K. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility:

1. Obtain entrances, storefronts, ribbon walls, window walls, curtain walls, window systems, and finish through one source from a single manufacturer.

B. Provide test reports from AAMA accredited laboratories certifying the performances as specified in 1.03.

C. Field measure all related openings prior to ordering aluminum framed system.

1.6 WARRANTY

A. Door warranted against failure and/or deterioration of metals due to manufacturing process for a period of two (2) years.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Arcadia, Inc., 3225 East Washington Blvd., Vernon, CA. Telephone 323/269-7300, Fax 323/269-7390, or approved equal.

B. Acceptable Products:

1. Arcadia, Inc., MS362 HD Series, Heavy Duty Door 1-3/4".
 - a. Vertical Stiles: 3-1/2 inches.
 - b. Top Rail: 3-5/8 inches.
 - c. Bottom Rail: 10/12 inches.
 - d. Glazing Stops: Beveled snap-in type for 1 inch infill.
1. Major portions of the door stiles a nominal .188 inches and glass stops .050 inches thick.

2.2 MATERIALS AND ACCESSORIES

A. Door members: Extruded 6063-T6 aluminum alloy (ASTM B221-Alloy G.S. 10a T6).

B. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc plated steel in accordance with ASTM A-164. Shall be aluminum or steel, providing the steel is properly isolated from aluminum.

C. Glazing Gasket compression-type design.

2.3 HARDWARE

- A. Hardware furnished and installed by the door manufacturer, and the following including manufacturer's standard hardware. Hardware finish to match frame color.

1. Door 1

Continuous Hinge	32138		
1 Keypad Trim	E-Plex 3000	744	KABA
1 Latch Lock	AR-4900		
1 Cylinder	26-098 w/ IC core	613	SC
Paddle	AR-4590		
Sill Sweeps - Concealed			
Weather Stripping			
½ x 4 T-407 Threshold			
Closure - Surface	LCN-4041-XP-18PA		LCN
1 Door Stop	471 EXP	US10B	RO

2. Door 3

Continuous Hinge	32138		
1 Lock Set	MS-1950 SS		
1 Cylinder	26-098 Exterior w/ IC core	613	SC
1 Thumb Turn - Interior			
1 Offset Wire Pulls BTB	34053-10		
CTC			
Sill Sweeps - Concealed			
Weather Stripping			
½ x 4 T-407 Threshold			
Closure - Surface	LCN-4041-XP-18PA		LCN
1 Door Stop	471 EXP	US10B	RO

2.4 FINISH

- A. Finish all exposed areas of aluminum and components as indicated.

1. An Architectural Class II or I color anodic coating conforming with AA-M12C22A34/AA-M12C22A44.

- a. Anodized finish color shall be Colornodic AB6 Dark Bronze.

2.5 DOOR FABRICATION

- A. Stiles and rails shall be tubular sections accurately joined, flush and hairline at corners with heavy concealed reinforcement brackets secured with machine bolts, with optional MIG weld. Exposed screws not permitted.
- B. Each door leaf equipped with an adjusting mechanism, located in the top rail near the lock stile.

- C. Prepare internal reinforcement for door hardware.
- D. Custom hardware templates and physical hardware must be submitted prior to any fabrication.

PART 3 – EXECUTION

3.1 EXAMINATIONS

- A. Examine conditions and verify substrate conditions are acceptable for product installation.

3.2 INSTALLATION

- A. Install in accordance with approved shop drawings and manufacturers installation instructions.

3.3 FIELD QUALITY CONTROL

- A. Make all necessary final adjustments to attain normal operation of each door and its mechanical hardware.

END OF SECTION

SECTION 08200

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Solid core doors with wood veneer faces.

- B. Related Sections:

- 1. Section 08110 "Hollow Metal Doors and Frames".
 - 2. Section 08710 "Door Hardware".

- C. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ANSI A208.1 – Wood Particleboard.
 - 3. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
 - 4. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
 - 5. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
 - 6. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
 - 7. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.

1.3 SUBMITTALS

- A. Product Data: For each type of door indicated. Include details of core and edge construction, trim for openings, and WDMA I.S.1-A classifications. Include factory finishing

specifications.

B. Shop Drawings shall include:

1. Indicate location, size, and hand of each door.
2. Indicate dimensions and locations of mortises and holes for hardware.
3. Indicate requirements for veneer matching.
4. Indicate location and extent of hardware blocking.
5. Indicate construction details not covered in Product Data.
6. Indicate dimensions and locations of cutouts.
7. Indicate doors to be factory finished and finish requirements.
8. Indicate fire protection ratings for fire rated doors.
9. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

C. Samples:

1. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.
 - a. Provide samples for each species of veneer and core material.
 - b. Finish veneer faced door samples with same materials proposed for factory finished doors.
2. Frames for light openings, 6 inches long, for each material, type, and finish required.

C. Warranty: Provide sample of manufacturer's warranty.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors'.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.

- B. Package pre-finished doors individually in plastic bags and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION – GENERAL

- A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.
 - 1. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60, and 90 minute rated doors. Comply with specified requirements for exposed edges.
 - 2. Pairs: Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

2.2 CORE CONSTRUCTION

- A. Particleboard Core Doors:
 - 1. Particleboard: Wood fiber based materials complying with ANSI A208.1 Particleboard standard. Grade LD-2.

2. Adhesive: Fully bonded construction using Polyurethane (PUR) glue.
3. Blocking: As indicated under article “Blocking”.

2.3 VENEERED DOORS FOR TRANSPARENT FINISH

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Graham (GR): GPD Series, or approved equal.
- B. Interior Solid Core Doors:
 1. Grade: Premium.
 2. Faces: Veneer grades as noted below; veneer minimum 1/50-inch (0.5mm) thickness at moisture content of 12% or less.
 - a. Plain Sliced Select White Birch, A grade faces.
 3. Match between Veneer Leaves: Book match.
 4. Assembly of Veneer Leaves on Door Faces:
 - a. Running Match.
 5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 6. Transom Match: Continuous match.
 7. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.
 8. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors
 9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.
 10. Finish: See drawings for color.

2.4 FABRICATION

- A. Factory fit doors to suit frame opening sizes indicated.
 1. Undercut: As required per manufacturer’s templates and sill condition.

- B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.
- C. Openings: Cut and trim openings through doors in factory.

2.2 FACTORY FINISHING

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Installation Instructions: Install doors and frames to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

3.4 ADJUSTING

- A. Operation: Re-hang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08411

ALUMINUM-FRAMED STOREFRONT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Aluminum-Framed Storefront

- a. Arcadia, Inc., AG451T Series, 2" x 4-1/2" Thermally broken; center glazed system, screw spline, shear block, compensating stick or punched opening fabrication for 1" glass, or approved equal.

B. Related Sections:

- 1. Section 04810 "Unit Masonry Assemblies."
- 2. Section 07620 "Sheet Metal Flashing And Trim."
- 3. Section 07920 "Joint Sealants."
- 4. Section 08710 "Door Hardware."
- 5. Section 08800 "Glazing."

1.2 REFERENCES

- A. American Architectural Manufacturers Association (AAMA)
- B. American Society for Testing and Materials (ASTM)
- C. Aluminum Association (AA)

1.3 SYSTEM DESCRIPTION

A. General: In addition to requirements shown or specified, comply with:

- 1. Applicable provisions of AAMA Aluminum Storefront and Entrance Manual for design, materials, fabrication and installation of component parts.

B. Design Requirements: Arcadia AG451T Series is a framing system that provides for flush glazing on all sides without projected stops, with glass in the center of the frame. Framing system suitable for outside or inside glazing.

C. Performance Requirements:

1. Limit air leakage through assembly to 0.06 CFM/min/sq. ft. (.00003 m³/sm²) of wall area at 6.24 PSF (300 Pa) as measured in accordance with ASTM E283.
2. Water Resistance: No water leakage when measured in accordance with ASTM E331 with a static test pressure of 8 PSF(383 Pa).
3. Limit mullion windload deflection of L/175 with full recovery of glazing materials, when measured in accordance with ASTM E 330.
4. System shall not deflect more than 1/8” at the center point, or 1/16” at the center point of a horizontal member, once deadload points have been established.
5. System shall accommodate expansion and contraction movement due to surface temperature differential of 180 degrees F.
6. Seismic testing shall conform to AAMA recommended static test method for evaluating performance of curtain walls and storefront wall systems due to horizontal displacements associated with seismic movements and building sway.
7. Thermal Performance – When tested in accordance with AAMA 1503.1 the following results should be attained: U-Maximum .63/CRF – minimum of 59.
8. National Fenestration Rating Council (NFRC) specific application evaluation.

1.1 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
- C. Delegated-Design Submittal (to provide, if required by Architect): For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 1. Detail fabrication and assembly of aluminum-framed systems.
 2. Include design calculations.
- D. Qualification Data: For qualified Installer.
- E. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

F. Welding certificates.

G. Source quality-control reports.

H. Field quality-control reports.

I. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

J. Warranties: Sample of special warranties

1.4 QUALITY ASSURANCE

A. Single Source Responsibility:

1. Obtain entrances, storefronts, window systems, and finish through one source from a single manufacturer.

B. Provide test reports from AAMA accredited laboratories certifying the performances as specified in 1.03.

C. Field measure all related openings prior to ordering aluminum framed system.

1.5 WARRANTY

A. System shall be warranted against failure and/or deterioration of metals due to manufacturing process for a period of two (2) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Arcadia, Inc., 2301 E Vernon, Vernon, CA.; Telephone 323/269-7300, Fax 323/269-7390, or approved equal.

B. Acceptable Products:

1. Arcadia, Inc., AG451T Series, or approved equal.

2.2 FRAMING MATERIALS AND ACCESSORIES

A. Framing members, transition members, mullions, adaptors, and mounting: Extruded 6063-T6 aluminum alloy (ASTM B221 – Alloy G.S. 10a T6).

- B. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc-plated steel in accordance with ASTM.A-164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from aluminum.

- C. GLAZING GASKET

- 1. Compression-type design, replaceable, molded or extruded, or ethylene propylene diene monomer (EPDM).
 - 2. Shall be of type that locks securely into the glazing reglet to prevent glazing gaskets from disengaging.

2.3 FINISH

- A. Finish all exposed areas of aluminum and components as indicated.

- 1. An Architectural Class II or I color anodic coating conforming with AA-M12C22A34/AA-M12C22A44.

- a. Anodized finish color shall be Colornodic AB6 Dark Bronze.

2.4 SYSTEM FABRICATION

- A. Continuous sub-sill shall be provided under sill members to collect water infiltration and divert from the interior of the system.
- B. Framing members shall be internally reinforced and secured at head and sill as necessary for structural performance requirements, for hardware attachment, and as indicated.
- C. Fasteners shall be so located as to ensure concealment from view in the final assembly.

PART 3 - EXECUTION

3.1 EXAMINATIONS

- A. Examine conditions and verify substrate conditions are acceptable for product installation.

3.2 INSTALLATION

- A. Install in accordance with approved shop drawings and manufacturers installation instructions.

3.3 FIELD QUALITY CONTROL

- A. Test the storefront for water leaks in accordance with AAMA 501.2. Conduct test in the presence of the Architect. Correct deficiencies observed as a result of this test.

END OF SECTION

SECTION 08520
ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Aluminum Windows
- B. Related Sections:
 - 1. Section 04810 "Unit Masonry Assemblies."
 - 2. Section 07620 "Sheet Metal Flashing And Trim."
 - 3. Section 07920 "Joint Sealants."
 - 4. Section 08800 "Glazing."

1.2 REFERENCES

- A. American Architectural Manufacturers Association (AAMA)
- B. American Society for Testing and Materials (ASTM)
- C. Aluminum Association (AA)
- D. National Wood Window & Door Association (NWWDA)

1.3 SYSTEM DESCRIPTION

- A. General: In addition to requirements shown or specified, comply with:
 - 1. Applicable provisions of AAMA Windows and Sliding Glass Doors Manual for design, materials, fabrication and installation of component parts.
- B. Design Requirements: Arcadia ULT-500 Series HS-HC70/AW50 (thermal/nonthermal) Heavy Commercial Sliding Windows 4 inch depth.
- C. Performance Requirements: Each assembly shall be tested by a recognized testing laboratory or agency in accordance with specified test methods.
 - 1. Conformance to HS-HC70/AW50 specifications in AAMA/NWWDA 101/I.S. 2-97.
 - a. Air Infiltration: Accordance with ASTM E 283.

- b. Water Resistance: Accordance with ASTM E 331.

1.4 SUBMITTALS

- A. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-frame systems.
- C. Delegated-Design Submittal (to provide, if required by Architect): For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of aluminum-framed systems.
 - 2. Include design calculations.
- D. Qualification Data: For qualified Installer.
- E. Welding certificates.
- F. Source quality-control reports.
- G. Field quality-control reports.
- H. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- I. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Single Source Responsibility:
 - 1. Obtain entrances, storefronts, ribbon walls, window walls, curtain walls, window systems, and finish through one source from a single manufacturer.
- B. Provide test reports from AAMA accredited laboratories certifying the performances as specified in 1.03.
- C. Field measure all related openings prior to ordering aluminum framed system.

1.6 WARRANTY

- A. Warranted against failure and/or deterioration of metals due to manufacturing process for a period of two (2) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Arcadia Architectural Products, Inc., 60 Bonner Street, Stamford, CT. 203-316-8000, fax 203-316-8200.
2. Or approved equal.

B. Acceptable Products:

1. Arcadia, ULT-500 Series (thermal/nonthermal) Heavy Commercial Sliding Windows, 4" depth.
2. Or approved equal.

2.2 MATERIALS

- A. All windows shall be fabricated from aluminum extrusions of 6063-T6 alloy and temper with a minimum wall thickness of 0.100" for the sill member and a minimum of 0.072" for all other members, including frame, sash and optional sash dividers. The aluminum shall be free of defects which impair strength and appearance.
- B. Component parts and accessories shall be of aluminum alloy, stainless steel or non-metallic materials which will neither deteriorate nor promote corrosion.
- C. Thermal break barrier shall provide a continuous uninterrupted thermal separation around the entire perimeter of the frame and sash and shall not be bridged by any metal conductor at any point. Thermal barrier shall consist of a two-part, chemically curing, high-strength urethane.
- D. Sill shall have a full-length nylon track cap.
- E. Sash members shall have a minimum of 3/4" glass penetration into the aluminum to provide extra protection against "blow out" during high wind conditions.
- F. Operable sash shall be equipped with two steel tandem ball bearing (all stainless steel tandem rollers and housings optional).
- G. Locking device Adams-Rite MS+1847 stainless steel mortise lock operated by a custom flush pull handle set available in either black or metallic gray powder coat.
- H. Horizontal member shall have two contact points incorporating silicone treated woven pile with mylar center fins. Vertical members shall have four contact points of silicone treated woven pile with mylar center fins. All shall be held in integral extruded slots and secured to prevent movement or loss while operating sash.

- I. Fixed and/or sliding sash members shall be constructed to allow for either factory or field glazing. Sash glazing shall be accomplished using a “marine” style reusable, wraparound black flexible polyvinyl chloride material per commercial standard CS230-60 without the need for separate glazing beads or putty style bedding compounds. The glazing channel shall be provided with the unit for either 1” insulating glass or 1/4” single glass.
- J. All assembly and installation screws shall be 18-8 or 410 stainless steel.
- K. Screens made of extruded aluminum frame and screened with 18 x 16 fiber mesh.
- L. Provide manufacturer’s Sub Sill and End Dam.
- M. All windows shall be mounted on top of Cast-Crete Wind Resistant Flush Precast Sill or approved equal.
 - 1. Rebar: ASTM A615 Grade 60
 - 2. Concrete Strength: $f_c = 3000$ psi
 - 3. Finish: Grey Block
 - 4. Average Self Weight: 16 plf

2.3 FINISH

- A. Finish all exposed areas of aluminum and components as indicated.
 - 1. AB-6 Dark Bronze Anodized, Class 1 (0.7 mils thick) meeting AAMA 608.1.

2.4 FABRICATION

- A. Primary frame must be a minimum of 4” deep.
- B. Frame corner joint shall be secured with two stainless steel screws and must be back caulked under the frame jambs to insure a weather-resistant seal.
- C. Profile of the fixed jamb and the latching jamb shall include two weather-stripped pockets to receive the fixed and latching stiles.
- D. Fixed and sliding panels shall have a nominal 1-1/2” depth and shall have overlapped joints as well as the mortise type to provide strong interlocking, mechanically fastened hairline joints.
- E. Interlockers and latching stiles shall be heavy gauge tubular sections assuring precise alignment and to resist twisting under load conditions.

PART 3 - EXECUTION

3.1 EXAMINATIONS

- A. Examine conditions and verify substrate conditions are acceptable for product installation.

3.2 INSTALLATION

- A. Install in accordance with approved shop drawings and manufacturers installation instructions.
- B. Do not use dissimilar metals for installation. Flashing required to be at least 060 Brake metal and in aluminum.
- C. Paint all metal surfaces exposed to CMU with asphaltic coating.

3.3 FIELD QUALITY CONTROL

- A. Contractor's responsibility to make all necessary final adjustments to attain normal operation of each window and its mechanical hardware.

END OF SECTION

SECTION 08620

TUBULAR DAYLIGHTING DEVICE

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Tubular daylighting device, consisting of roof dome, reflective tube, and diffuser assembly; configuration as indicated on the drawings.
- B. Accessories.

1.2 RELATED SECTIONS

- A. Section 07540 “Thermoplastic Membrane Roofing.”
- B. Section 07620 “Sheet Metal Flashing and Trim.”

1.3 REFERENCES

- A. ASTM B 209- Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials; 2008a.
- C. ASTM A 463/A 463M - Standard Specification for Steel Sheet, Aluminum Coated, by the Hot Dip Process; 2006.
- D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized), by the Hot Dip Process; 2007.
- E. ASTM A792/A 792M – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- F. ASTM E 283 - Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004.
- G. ASTM E 308 - Standard Practice for Computing the Colors of Objects by Using the CIE System; 2006.
- H. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls and Doors; 2002.
- I. ASTM E 547 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain walls by Cyclic Air Pressure Difference; 2000.

- J. ASTM E 1886 – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
- K. ASTM E 1996 – Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricane.
- L. ASTM D 635 - Test Method for Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position; 2006.
- M. ASTM D-1929 - Test Method for Ignition Properties of Plastics; 1996 (2001).
- N. UL 181 - Factory Made Air Ducts and Air Connectors.
- O. ICC AC-16 – Acceptance Criteria for Plastic Skylights; 2008.

1.4 PERFORMANCE REQUIREMENTS

- A. Completed tubular daylighting device assemblies shall be capable of meeting the following performance requirements:
 - 1. Air Infiltration Test: Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.
 - 2. Water Resistance Test: No uncontrolled water leakage at 10.5 psf pressure differential with water rate of 5 gallons/hour/sf when tested in accordance with ASTM E 547.
 - 3. Uniform Load Test:
 - a. No breakage, permanent damage to fasteners, hardware parts, or damage to make daylighting system inoperable or cause excessive permanent deflection of any section when tested at a Positive Load of 150 psf (7.18 kPa) or Negative Load of 70 psf (3.35 kPa).
 - b. All units shall be tested with a safety factor of (3) for positive pressure and (2) for negative pressure, acting normal to plane of roof in accordance with ASTM E 330.
 - 4. Fire Testing:
 - a. When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the 2006 International Building Code.
 - b. Self-Ignition Temperature - Greater than 650 degrees F Per: U.B.C. Standard 26-6. See ASTM D-1929.
 - c. Smoke Density - Rating no greater than 450 Per U.B.C. 8-1 (See ASTM Standard E 84) in way intended for use. Classification C.

- d. Rate of Burn and/or Extent - Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2: U.B.C. Standard 26-7. See ASTM D 635.

- 1. Rate of Burn and/or Extent - Maximum Burn Extent: 1 inch (25 mm) Classification CC-1: U.B.C. Standard 26-7. See ASTM D 635.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300 "Submittals".
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings. Submit shop drawings showing layout, profiles and product components, including anchorage, flashings and accessories.
- D. Test Reports: Independent testing agency or evaluation service reports verifying compliance with specified performance requirements.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engaged in manufacture of tubular daylighting devices for minimum 20 years.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

- A. Daylighting Device: Manufacturer's standard warranty for 10 years.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Solatube International, Inc., distributed in Hawaii by Division X, Inc, www.divisionxinc.com, Ph: 528-2448.
- B. Or approved equal.

2.2 TUBULAR DAYLIGHTING DEVICES

- A. Tubular Daylighting Devices General : Transparent roof-mounted skylight dome and self-flashing curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces; complying with ICC AC-16.
- B. SolaMaster Series: Solatube Model 330 DS-C Penetrating Ceiling, 21 inch (530 mm) Daylighting System:
 - 1. Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
 - a. Glazing: Type DA, 0.143 inch (3.7 mm) minimum thickness injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV B abd 98.5 percent UV A), impact modified acrylic blend.
 - 2. LightTracker Reflector, made of aluminum sheet, thickness 0.015 inch (0.4 mm) with Spectralight Infinity. Positioned in the dome to capture low angle sunlight.
 - 3. Roof Flashing Base: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A 653/A 653M or ASTM 463/A 463M or ASTM A 792/A792 m, 0.028 inch (0.7 mm) plus or minus 0.006 inch (0.015 mm) thick.
 - a. Base Style: Type FC, Curb cap, with inside dimensions of 27 inches by 27 inches to cover curb.
 - 4. Curb Insulator: Type CI, thermal isolation material for use under flashing Type FC.
 - 5. Tube Ring: Attached to top of base section; 0.090 inch (2.3 mm) nominal thickness injection molded high impact PVC; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.
 - 6. Thermal Insulation Panel: Two climate control discs paired with polycarbonate ring to prevent conductive and convective heat transfer.
 - 7. Dome Seal: Adhesive backed weatherstrip 0.63 inch (16 mm) tall by 0.28 inch (7 mm).
 - 8. Reflective Tubes: Aluminum sheet, thickness 0.018 inch (0.5 mm).

- a. General:
 - 1. Interior Finish: Spectralight Infinity with Cool Tube Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance. Patented spectrally-selective optical surface yields specular reflectance greater than 99 percent for the Visible Light spectrum (400 nm to 760 nm) and less than 20% reflectance for Infrared (IR) wavelengths longer than 980nm, resulting in spectrally-selective Total Solar Spectrum (400 nm to 2500 nm) less than 80.2 percent.
 - 2. Color: a* and b* (defined by CIE L*a*b* color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308.
- b. Top Tube Angle Adapter and Bottom Top Tube Angle Adapter Kit, Type AK:
 - 1. Reflective 45 degree adjustable top and bottom angle adapters (one each), 16 inches (406 mm) long.
- 9. Diffuser Assemblies for Tubes Penetrating Ceilings: Solatube Model 330 DS-C. Ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube; 23.8 inches by 23.8 inches (605 mm by 605 mm) square frame to fit standard suspended ceiling grids or hard ceilings.
 - a. Round to square transition box made of opaque polymeric material, classified as CC2, Class C, 0.110 inch (2.8 mm) thick.
 - b. Lens: Type L1 OptiView Fresnel lens design to maximize light output and diffusion with extruded aluminum frame and EPDM foam seal to minimize condensation and bug, dirt, and air infiltration per ASTM E 283. Visible Light Transmission shall be greater than 90 percent at 0.022 inch (0.6 mm) thick. Classified as CC2.
- 10. Accessories:
 - a. Local Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use. Provided with dimmer switch and cable.
 - 1. Daylight Dimmer: Type D Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02: circuited, 4 conductor, size 22 cable; providing daylight output between 2 and 100 percent. Provided with dimmer switch and cable.
 - 2. Switch: Type SW, Manufacturer-specific low voltage DC DP/DT switch (white) required to operate Daylight Dimmer. Note: A maximum of 10 units can be connected to one switch.
 - 3. Cable: Type CA, Two conductor, 22 gauge, low voltage cable (500 ft) for multiple unit DC connection.

11. Catalog Number: S330 DS-C-DA-FC-AK-L1-D-SW-CA-CI.

2.3 ACCESSORIES

- A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.
- B. Suspension Wire: Steel, annealed, galvanized finish, size and type for application and ceiling system requirement.
- C. Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Coordinate requirements for power supply, conduit, and wiring.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions.
- B. After installation of first unit, field test to determine adequacy of installation. Conduct water test in presence of Owner, Architect, or Contractor, or their designated representative. Correct if needed before proceeding with installation of subsequent units.
- C. Inspect installation to verify secure and proper mounting. Test each fixture to verify operation, control functions, and performance. Correct deficiencies.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08710
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Section 08110 "Hollow Metal Doors and Frames".
 - 2. Section 08200 "Flush Wood Doors".
 - 3. Section 08411 "Aluminum-Framed Storefront".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.

7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of

other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:
 - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

- E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
 - F. Pre-Submittal Conference: Conduct coordination conference with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
 - G. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
 - B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
 - C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".
- 1.6 COORDINATION
- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
 - B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required

connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
 - C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.
- 2.2 HANGING DEVICES
- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
 5. Manufacturers:

- a. Hager Companies (HA) - CB Series.
- b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - TA Series.
- c. Stanley Hardware (ST) - CB Series.

2.3 DOOR OPERATING TRIM

- A. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 - 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 - 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 - 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 - 4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
 - 5. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer cylinders complying with the following:
 - 1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
 - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.

4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 5. Keyway: Match Facility Standard.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Key locks to Owner's existing system.
- E. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Two (2)
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Keys (where required): Ten (10).
- F. Construction Keying: Provide construction master keyed cylinders.
- G. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 2. Provide transcript list in writing or electronic file as directed by the Owner.
- 2.5 MECHANICAL LOCKS AND LATCHING DEVICES
- A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.
1. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
 2. Locks are to be non-handed and fully field reversible.
 3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 2 million cycles.
 4. Manufacturers:
 - a. Corbin Russwin Hardware (RU) – CL3300 Series.

- b. Sargent Manufacturing (SA) – 10 Line.

2.6 STAND ALONE ACCESS CONTROL LOCKING DEVICES

- A. Stand Alone Integrated Access Control Lockets: Internal, battery-powered, self-contained ANSI Grade 1, mortise or cylindrical lock consisting of electronically motor driven locking mechanism, integrated keypad, proximity card reader, or keypad/proximity card reader combination, and specified electronic programming accessories. Locks to accept standard, interchangeable (removable) core, security and high security override cylinders. Provide keypad/proximity and proximity only products with a minimum of 2,000 user codes, key override, low-battery detection and warning, LED status indicators, and ability to program at the lock for the functions indicated.
 - 1. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
 - 2. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - Access 800 AC2 Series.
 - b. Sargent Manufacturing (SA) - Profile v.G1 Series.
- B. Narrow Stile Stand Alone Keypad Trim: Battery powered access control trim for narrow stile door applications. Internal clutch protected locking/unlocking control of the exterior lever handle trim. Field selectable handing with keyed cylinder override access capability.
 - 1. Card reader trim retrofits to Adams Rite MS Series Deadbolts, 4000 Series Deadlatches, and 8000 Series Exit Devices in 31/32" backsets and greater.
 - 2. Keypad trim can accommodate up to 150 users, (including master, supervisor and emergency users) plus two one-time codes and three operational modes (standard, passage, and lockout). Powered by (4) standard "AA" batteries.
 - 3. Manufacturers:
 - a. Adams Rite Manufacturing (AD) - eForce 3090 Series.

2.7 AUXILIARY LOCKS

- A. Mortise Deadlocks, Large Case: ANSI/BHMA A156.13, Series 1000, Grade 1, certified large case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. One piece stainless steel bolts with a 1" throw. Deadlocks to be products of the same source manufacturer and keyway as other locksets.
 - 1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ML2000 Series.

- b. Sargent Manufacturing (SA) - 8200 Series.
- c. Yale Locks and Hardware (YA) - 8800 Series.

2.8 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.9 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
 - 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
 - 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 - 3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
 - 4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use.

Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 certified surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC6000 Series.
 - b. Norton Door Controls (NO) - 8500 Series.
 - c. Sargent Manufacturing (SA) - 1431 Series.
 - d. Yale Locks and Hardware (YA) - 3500 Series.

2.10 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
 - B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
1. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.11 THRESHOLDS

A. Saddle Thresholds: Type and base metal as follows:

1. Type: Smooth top and Fluted top.
2. Maximum ½" high.

B. Base Metal: Aluminum.

2.12 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
3. Reese Enterprises, Inc. (RE).

2.13 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.14 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.

- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

Hardware Sets

Set: 1.0 – By Door Manufacturer

Set: 2.0 – By Door Manufacturer

Set: 3.0

Doors: 2

3 Hinge (heavy weight)	T4A3386 NRP	US10BE	MK
1 Keypad Lock	G1-8278 LUL	US10BE	SA
1 Cylinder	26-091 B520-296	613	SC
1 Surface Closer	PR8501	613E	NO
1 Door Stop	471 EXP	US10BE	RO
1 Threshold	Per Detail x FHSL14	Al	PE
1 Rain Guard	346C x Full Frame Width	Al	PE
1 Gasket	S44D Head & Jambs		PE
1 Sweep	57AV		PE

Set: 4.0

Doors: 4

3 Hinge	TA2314	US32D	MK
1 Keypad Lock	SF G1-10G77 LUL	US26D	SA ↗
1 Cylinder	23-030	626	SC
1 Surface Closer	8501	689	NO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 5.0

Doors: 5

3 Hinge	TA2314	US32D	MK
1 Passage Latch	10U15 LL	US26D	SA
1 Wall Stop	409	US32D	RO
1 Gasket	S44D Head & Jambs		PE

Set: 6.0

Doors: 8

3 Hinge	TA2314	US32D	MK
1 Passage Latch	10U15 LL	US26D	SA
1 Surface Closer	8501	689	NO
1 Wall Stop	409	US32D	RO
1 Gasket	S44D Head & Jambs		PE

Set: 7.0

Doors: 7

3 Hinge	TA2314	US32D	MK
1 Storeroom Lock	SF 10G04 LL	US26D	SA
1 Cylinder	23-030	626	SC
1 Surface Closer	8501	689	NO
1 Kick Plate	K1050 10" x 2LDW BEV CSK	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO
1 Threshold	151A FHSL14 (verify conditions)		PE

Set: 8.0

Doors: 10, 11, 13, 14

3 Hinge	TA2314	US32D	MK
1 Office Lock	SF 10G05 LL	US26D	SA
1 Cylinder	23-030	626	SC
1 Wall Stop	409	US32D	RO
1 Gasket	S44D Head & Jambs		PE

Set: 9.0

Doors: 12

3 Hinge	TA2314	US32D	MK
1 Office Lock	SF 10G05 LL	US26D	SA
1 Cylinder	23-030	626	SC
1 Surface Closer	8501	689	NO
1 Wall Stop	409	US32D	RO
1 Gasket	S44D Head & Jambs		PE
1 Threshold	272A FHSL14 (verify conditions)		PE D

Set: 10.0

Doors: 6

3 Hinge	TA2314	US32D	MK
1 Privacy Lock	10U65 LL	US26D	SA
1 Surface Closer	8501	689	NO
1 Kick Plate	K1050 10" x 2LDW BEV CSK	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasket	S44D Head & Jambs		PE

Set: 11.0

Doors: 9

1 Existing Hardware	To Remain		OT
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END OF SECTION

SECTION 08800

GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.
 - 3. Interior borrowed lites.
 - 4. Storefront framing.
- B. Related Sections include the following:
 - 1. Section 08411 "Aluminum Framed Storefront."
 - 2. Section 08520 "Aluminum Windows".
 - 3. Section 08120 "Aluminum Doors & Frames".

1.3 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

- E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
- F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
 - b. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.
 - 1. For monolithic-glass lites heat treated to resist wind loads.
 - 2. For insulating glass.
 - 3. For laminated-glass lites.
 - c. Minimum Glass Thickness for Interior and Exterior Lites: Not less than 6.0 mm.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass

framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
 1. For monolithic-glass lites, properties are based on units with lites [6.0 mm thick] [of thickness indicated].
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- D. Qualification Data: For installers.
- E. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- F. Product Test Reports: For each of the following types of glazing products:
 1. Insulating glass.
 2. Glazing sealants.
 3. Glazing gaskets.

- G. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: laminated glass and insulating glass.
- C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.
- D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- E. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- F. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 - 1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 - 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
 - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: [GANA Laminated Division's "Laminated Glass Design Guide" and]GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.9 WARRANTY

- A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to State and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 1. Warranty Period: Five years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to State and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Product: Subject to compliance with requirements, provide product specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
5. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 GLASS PRODUCTS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.
 1. Ultra-Clear (Low-Iron) Float Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.
- B. Tempered Patterned Glass: ASTM C 1048, Kind FT (fully tempered), Type II (patterned flat glass), Class 1 (clear), Form 3 (patterned); and of quality, finish, and pattern specified.
- C. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:
 1. Interlayer: Polyvinyl butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
 - a. For polyvinyl butyral interlayers, laminate lites in autoclave with heat plus pressure.
 2. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.
 3. Interlayer shall be compatible with all glazing sealants.
 4. Approved Products:
 - a. Saflex as manufactured by Solutia Inc.
 - b. Butacite as manufactured by E.I. Dupont de Nemours & Co., Inc.
 5. Manufacturer shall warrant that laminated glass will not develop edge separation or other defects which may obstruct vision through the glass or otherwise compromise the requirements of the glass for a period of ten (10) years.

- D. Spectrally selective coating(s) shall exhibit the visual and performance characteristics of the products specified.
1. The coating shall be as approved by the State.
 2. Visual Quality Control acceptance criteria of the spectrally selective coating shall be consistent with industry guidelines, subject to approval by the State.
 - a. At typical viewing height, between 3 ft. and 7 ft. from the finished floor level.
 1. No pinholes or scratches are acceptable in the typical viewing area between 3 ft. and 7 ft. from the finished floor level.
 - b. At other areas:
 1. Pinholes with diameters in excess of 1/32 inch are not acceptable.
 2. Clusters of pinholes are not acceptable,
 3. Scratches no longer than 3 inches in length are acceptable provided that they occur within 3 inches of an edge.
 4. Edge deletion of spectrally selective coatings shall be provided at all insulating glass and structural glazing unless manufacturer submits test data acceptable to the State indicating that edge deletion is not required.
 5. Manufacturer shall warrant that spectrally selective coatings shall not peel, crack, fade or deteriorate for a period of twenty (20) years. Manufacturer shall warrant that any glass that is not edge deleted will not develop loss of adhesion with insulating glass or structural glazing sealants for a period of twenty (20) years.
- E. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
1. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
 2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 3. Sealing System: Dual seal, with primary and secondary sealants as follows:
 - a. Manufacturer's standard sealants.
 4. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 - a. Spacer Material: Aluminum with black, color anodic finish.

- b. Desiccant: Molecular sieve or silica gel, or blend of both.
 - c. Revise subparagraph above and below if specific types of desiccant and corner construction are required.
 - d. Corner Construction: Manufacturer's standard corner construction.
- F. Glass Edges:
 - 1. Butt glass edges shall be ground and swiped.
 - 2. All other edges shall have a high quality factory cut edge.
 - 3. Exposed edges, such as at corners, shall be ground and polished.

2.3 GLAZING PRODUCTS:

- A. GL-1: Low E, 1 inch insulating uncoated unit consisting of exterior 1/4 inch clear tempered glass, 1/2 inch air space, and interior 1/4 inch clear tempered glass. Solarban 70XL2, Clear Insulating.
- B. GL-2: Low E, 1 inch insulating uncoated unit consisting of exterior 1/4 inch clear tempered glass, 1/2 inch air space, and interior 1/4 inch clear float glass. Solarban 70XL2, Clear Insulating.
- C. GL-3: 1/4" Laminated glass, clear.

2.4 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene, ASTM C 864.
 - 2. EPDM, ASTM C 864.
 - 3. Silicone, ASTM C 1115.
 - 4. Thermoplastic polyolefin rubber, ASTM C 1115.
 - 5. Any material indicated above.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene.

2. EPDM.
 3. Silicone.
 4. Thermoplastic polyolefin rubber.
 5. Any material indicated above.
- C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.5 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by State from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants:
 - a. Products:
 1. GE Silicones; SilPruf SCS2000.
 2. Pecora Corporation; 864.
 3. Pecora Corporation; 890.
 4. Polymeric Systems Inc.; PSI-641.
 5. Sonneborn, Div. of ChemRex, Inc.; Omniseal.
 6. Tremco; Spectrem 3.
 7. <Insert manufacturer's name; product name or designation.>

- b. Type and Grade: S (single component) and NS (nonsag).
- c. Class: 50.
- d. Use Related to Exposure: NT (nontraffic).
- e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
 - 1. Use O Glazing Substrates: color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and wood.
- f. Applications: For weather-sealing and structural glazing to withstand high joint movement and extreme weather exposure.

2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge

damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm) as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.8 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 08900

LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Fixed louvers.

- B. Related Sections:

- 1. Section 04810 "Unit Masonry Assemblies" for building wall vents (brick vents) into masonry.
 - 2. Section 09900 "Painting" for field painting louvers.

1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.
- C. Vertical Louver: Louver with vertical blades; i.e., the axes of the blades are vertical.
- D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- E. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 - 1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

- B. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. Design earthquake spectral response acceleration, short period (Sds) for Project is 1.0.
 - 2. Component Importance Factor is 1.0.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
 - 1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
 - 2. Show mullion profiles and locations.
- C. Delegated-Design Submittal: For louvers indicated to comply with structural[and seismic] performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Manufacturer's written warranty.
- E. Certified test reports indicating compliance with specified performance requirements.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
 - 3. AWS D1.6, "Structural Welding Code - Stainless Steel."
- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Aluminum Castings: ASTM B 26/B 26M, Alloy 319.
- D. Fasteners: Use types and sizes to suit unit installation conditions.
 - 1. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
 - 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 - 3. For color-finished louvers, use fasteners with heads that match color of louvers.
- E. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing, to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- D. Include supports, anchorages, and accessories required for complete assembly.
 - 1. Exterior Corners: Prefabricated corner units with mitered and welded blades at corners.
- E. Provide subsills made of same material as louvers for recessed louvers.

- F. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Nondrainable-Blade Louver:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Air Balance Inc.; a Mestek company.
 - b. Air Flow Company, Inc.
 - c. Airolite Company, LLC (The).
 - d. All-Lite Architectural Products.
 - e. American Warming and Ventilating, Inc.; a Mestek company.
 - f. Arrow United Industries; a division of Mestek, Inc.
 - g. Construction Specialties, Inc.
 - h. Greenheck Fan Corporation.
 - i. Industrial Louvers, Inc.
 - j. NCA Manufacturing, Inc.
 - k. Nystrom Building Products.
 - l. Reliable Products, Inc.
 - m. Ruskin Company; Tomkins PLC.
 - n. United Enertech Corp.
2. Louver Depth: 6 inches (150 mm)].
3. Frame and Blade Nominal Thickness: Not less than 0.060 inch (1.52 mm) for blades and 0.080 inch (2.03 mm) for frames.
4. Louver Performance Ratings:
 - a. Free Area: Not less than 48%-50%.
 - b. Point of Beginning Water Penetration (Based on 4' x 4' unit):
 1. Free Area: 7.68 sq. ft.

2. Free area velocity: 764 FPM
3. Intake Pressure drop: 0.11 in. H₂O.
4. Exhaust Pressure drop at 1000 FPM free area velocity: 0.16 in H₂O.
5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
 1. Screening Type: Insect screening.
- B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
 1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
 2. Finish: Same finish as louver frames to which louver screens are attached.
 3. Type: Rewirable frames with a driven spline or insert.
 4. Insect Screening: Stainless steel, 18-by-18 (1.4-by-1.4-mm) mesh, 0.009-inch (0.23-mm) wire.

2.5 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 1. Color: Dark bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.
- B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

DIVISION 09 - FINISHES

SECTION 09221

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes non-load-bearing steel framing members for the following applications:
 - 1. Interior framing systems (e.g., supports for partition walls, partial height walls, framed soffits, furring, etc.).
 - 2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).
- B. Related Sections include the following:
 - 1. Section 07210 "Building Insulation" for acoustic insulation.
 - 2. Section 07242 "Direct-Applied Finish System" for exterior finish.
 - 3. Section 09290 "Gypsum Board" for non-load-bearing metal wall framing, gypsum panels, and other components of wall and ceiling assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Manufacturer's Warranty.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm) diameter wire, or double strand of 0.0475-inch- (1.21-mm) diameter wire.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.
- C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.37 mm) and minimum 1/2-inch- (12.7-mm-) wide flanges.
 - 1. Depth: As indicated on Drawings.
- D. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges, 3/4 inch (19.1 mm) deep.
 - 2. Steel Studs: ASTM C 645.
 - a. Minimum Base-Metal Thickness: As indicated on Drawings.
 - b. Depth: As indicated on Drawings.
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.
 - a. Minimum Base Metal Thickness: As indicated on Drawings.
 - 4. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.
- E. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C 645.
 1. Minimum Base-Metal Thickness: As indicated on Drawings.
 2. Depth: As indicated on Drawings.
- B. Slip-Type Head Joints: Where indicated, provide one of the following:
 1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 1. ClarkDietrich: MaxTrack slotted deflection track.
 2. Sliptrack Systems; Slotted Deflection Track.
 3. Steeler, Inc; Slotted Deflection Track.
- C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 1. Minimum Base-Metal Thickness: As indicated on Drawings.
- D. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.
 1. Depth: As indicated on Drawings.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.
- E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 1. Minimum Base Metal Thickness: As indicated on Drawings.
 2. Depth: As indicated on Drawings.
- F. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.
 1. Configuration: Asymmetrical.

- G. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch (0.79 mm).
 - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
 - 4. Jamb Struts: Manufacturer's standard J-profile strut with long-leg length of 3 inches (76 mm), in depth matching studs, and not less than 0.0329 inch (0.84 mm) thick.
- H. Partial Wall Framing Connection: Connector designed to support out-of-plane loading of cantilevered partial wall systems that are unsupported at the top track.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Pony Wall PW36 or equal.
 - a. Minimum Base-Steel Thickness: 0.0966 inch (2.45 mm) and 35-3/4".
 - b. Location: Install at corners and wall intersections.
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Simpson Strong-Tie; Kneewall Connector RCKW3 or equal.
 - a. Location: Install at each stud between corners and intersections.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacing indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

- a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
- 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
- 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
- 5. Do not attach hangers to steel roof deck.
- 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
- 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
- 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
 - 1. Space studs as indicated on the drawings'
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- D. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION

SECTION 09290
GYPSUM BOARD

GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Interior gypsum board.
- 2. Tile backing panels.

- B. Related Sections include the following:

- 1. Section 06100 "Rough Carpentry" for wood framing and furring that supports gypsum board.
- 2. Section 07210 "Building Insulation" for acoustical wall insulation.
- 3. Section 09221 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board.
- 4. Section 09300 "Tiling" for cementitious backer units installed as substrates for ceramic tile.
- 5. Section 09900 "Painting" for primers applied to gypsum board surfaces.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Manufacturer's Warranty.

1.4 QUALITY ASSURANCE

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.p

1.5 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 – PRODUCTS

2.1 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. ASTM C 1396/C 1396M includes regular, Type X, ceiling, and exterior-soffit gypsum board, as well as other types of gypsum board panels. Both standards are listed below to avoid confusion because manufacturers may only list compliance with one standard when compliance with either is satisfactory.
- B. General: Complying with ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum Co.

- b. G-P Gypsum.
 - c. National Gypsum Company.
 - d. PABCO Gypsum.
 - e. USG Corporation.
 - C. Type X:
 - 1. Thickness: 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered.
 - D. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
 - 1. Thickness: 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered.
 - 3. Core: Type X, moisture-resistant gypsum core encased in moisture and mold-resistant paper.
 - E. Moisture- and Mold-Resistant Type: With moisture and mold-resistant core and surfaces.
 - 1. Core: 5/8 inch (15.9 mm), Type X.
 - 2. Long Edges: Tapered.
- 2.3 TILE BACKING PANELS
- A. Cementitious Backer Units: ANSI A118.9.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Wonderboard.
 - b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
 - c. National Gypsum, LLC; PermaBase Cement Board.
 - d. USG Corporation; DUROCK Cement Board.
 - 3. Thickness: 5/8".

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Batts: ASTM C 665, Type I, unfaced, except a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the procedures of ASTM E 84 fiberglass insulation batt for noise control in partitions where shown.
- E. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."
 - 1. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).PART3

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

3.03 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: As indicated on Drawings.

2. Ceiling Type: As indicated on Drawings.
3. Moisture- and Mold-Resistant Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

D. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.4 APPLYING TILE BACKING PANELS

- A. Water-Resistant Gypsum Backing Board: Install at showers, tubs, and where indicated. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. Areas Not Subject to Wetting: Install Type X gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.7 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09300

TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Ceramic tile.
 - 2. Glazed wall tile.
 - 3. Stone threshold installed as part of tile installations.
 - 4. Crack-suppression membrane for thin-set tile installations.
- B. Related Sections include the following:
 - 1. Section 07920 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 2. Section 09290 "Gypsum Board" for cementitious backer units.

1.3 DEFINITIONS

- A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).
- C. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum 0.6.

1.5 SUBMITTALS

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

B. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Full-size units of each type of trim and accessory[for each color and finish required].
3. Stone thresholds in 6-inch (150-mm) lengths.
4. Metal edge strips in 6-inch (150-mm) lengths.

C. Qualification Data: For Installer.

D. Manufacturer's Warranty.

1.6 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.

1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproofing.
3. Joint sealants.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquid latexes and emulsion adhesives in unopened containers and protected from weather.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 - 1. Basis-of-Design Product: The design for each tile type is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
 - 1. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
 - 1. As indicated by manufacturer's designations.
- D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.3 TILE PRODUCTS

A. Available Manufacturers:

1. Daltile; Div. of Dal-Tile International Inc.
2. Approved equal.

B. Glazed Ceramic Mosaic Tile: Factory-mounted flat tile as follows:

1. Composition: Impervious natural clay or porcelain.
2. Module Size: 2 inches (50.8 mm) hexagon.
3. Thickness: 1/4 inch (6.35 mm).
4. Face: Plain with cushion edges.
5. Finish: Mat, opaque glaze.
6. See drawings for material and color selection.

C. Glazed Wall Tile:

1. Module Size: See drawings for size.
2. Face: Pattern of design indicated, with manufacturer's standard edges.
3. Finish: Semi-gloss finish.
4. Mounting: Factory back-mounted.
5. Glazed Wall Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base for Thin-Set Mortar Installations: Cove base, 3 by 6 inches (152 by 152 mm).
 - b. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size 3 by 6 inches (152 by 152 mm).
 - c. External Corners for Thin-Set Mortar Installations: Surface bullnose.
 - d. Revise subparagraph below if coved internal angles are required.
 - e. Internal Corners: Field-butt square corners except with coved base and cap angle pieces designed to fit with stretcher shapes.
6. See drawings for material and color selection.

2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch (12.7 mm) or less, and finish bevel to match face of threshold.
- B. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of 12 per ASTM C 1353 or ASTM C 241 and with honed finish.
 - 1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.5 CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS

- A. General: Manufacturer's standard product that complies with ANSI A118.10.
- B. Chlorinated-Polyethylene-Sheet Product: Nonplasticized, chlorinated polyethylene faced on both sides with high-strength, nonwoven polyester fabric, for adhering to latex-portland cement mortar; 60 inches (1524 mm) wide by 0.030-inch (0.76-mm) nominal thickness.
 - 1. Product: Noble Company (The); Nobleseal TS.
- C. Latex-Portland Cement Product: Flexible mortar consisting of cement-based mix and acrylic-latex additive.
 - 1. Available Products:
 - a. Boiardi Products Corporation; Elastiment 323.
 - b. MAPEI Corporation; PRP 315.
 - c. Southern Grouts & Mortars, Inc.; Southcrete 1100.
 - d. TEC Specialty Products Inc.; TA-324, Triple Flex.

2.6 SETTING AND GROUTING MATERIALS

- A. Latex-Portland Cement Product: Flexible mortar consisting of cement-based mix and acrylic-latex additive.
 - 1. Available Products:
 - a. Boiardi Products Corporation; Elastiment 323.
 - b. MAPEI Corporation; PRP 315.
 - c. Southern Grouts & Mortars, Inc.; Southcrete 1100.

- d. TEC Specialty Products Inc.; TA-324, Triple Flex.
- 2. For wall applications, provide nonsagging mortar that complies with Paragraph C-4.6.1 in addition to the other requirements in ANSI A118.1.

2.7 SETTING AND GROUTING MATERIALS

A. Available Manufacturers:

- 1. Atlas Minerals & Chemicals, Inc.
- 2. Boiardi Products Corporation.
- 3. Bonsal, W. R., Company.
- 4. Bostik.
- 5. C-Cure.
- 6. Custom Building Products.
- 7. DAP, Inc.
- 8. Jamo Inc.
- 9. LATICRETE International Inc.
- 10. MAPEI Corporation.
- 11. Southern Grouts & Mortars, Inc.
- 12. Summitville Tiles, Inc.
- 13. TEC Specialty Products Inc.

B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:

- 1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
 - a. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.

2.8 MISCELLANEOUS MATERIALS

- ### A. Trowelable Underlayments and Patching Compounds:
- Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- C. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

1. Available Products:

- a. Bonsal, W. R., Company; Grout Sealer.
- b. Bostik; CeramaSeal Grout Sealer.
- c. C-Cure; Penetrating Sealer 978.
- d. Custom Building Products; Grout and Tile Sealer.
- e. Jamo Inc.; Penetrating Sealer.
- f. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.
- g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
- h. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
- i. TEC Specialty Products Inc.; TA-256 Penetrating Silicone Grout Sealer.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Provide concrete substrates for tile floors installed with [adhesives] [or] [thin-set mortar] that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in

items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
- F. Lay out tile wainscots to next full tile beyond dimensions indicated.
- G. Lay out floor tiles, so tiles at opposite edges are of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- H. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
- I. Grout tile to comply with requirements of the following tile installation standards:
 - 1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.

3.4 CRACK-SUPPRESSION MEMBRANE INSTALLATION

- A. Install crack-suppression membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.

3.5 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
 - 1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
 - a. Tile floors in wet areas.
 - b. Tile floors composed of rib-backed tiles.
- B. Joint Widths: Install tile on floors with the following joint widths:
 - 1. Ceramic Tile: 1/8 inch (1.6 mm).
- C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

- D. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.6 WALL TILE INSTALLATION

- A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
- B. Install metal lath and scratch coat for walls to comply with ANSI A108.1A, Section 4.1.
- C. Joint Widths: Install tile on walls with the following joint widths:
 1. Ceramic Tile: 1/8 inch (1.6 mm).

3.7 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Remove latex-portland cement grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
- B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

SECTION 09511

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes acoustical panels and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices.
- C. Related Sections include the following:
 - 1. Section 09290 "Gypsum Board" for custom ceiling perimeter trim and gypsum board ceiling.
 - 2. Section 09221 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board

1.3 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension system members.
 - 2. Method of attaching hangers to building structure.

- a. Furnish layouts for clips, and other ceiling attachment devices whose installation is specified in other Sections.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
4. Minimum Drawing Scale: 1/4 inch = 1 foot (1:48).
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 1. Acoustical Panel: Set of 6-inch- (150-mm-) square samples of each type, color, pattern, and texture.
 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- (300-mm-) long Samples of each type, finish, and color.
- D. Manufacturers' product data for sealants, including printed statement of VOC content and material safety data sheets.
- E. Qualification Data: For testing agency.
- F. Field quality-control test reports.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
- H. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.
- I. Maintenance Data: For finishes to include in maintenance manuals.
- J. Manufacturer's Warranty.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
 1. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
- B. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.

2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.8 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Acoustical Ceiling Panels: Full-size panels equal to 10 percent of quantity installed.
 2. Suspension System Components: Quantity of each exposed component equal to 10 percent of quantity installed.
 3. Hold-Down Clips: Equal to 10 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match existing appearance characteristics.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- C. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Ultima, 1944 as manufactured by Armstrong World Industries..
 - 1. See drawings for material and color.
 - 2. Composition: Mineral Fiber
 - 3. Color: White
 - 4. Size: 24in X 24in X 15/16in
 - 5. Edge Profile: Beveled Tegular for interface with compatible Armstrong grid.
 - 6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.80.
 - 7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 35
 - 8. Emissions Testing: Section 01350 Protocol, < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

9. Flame Spread: ASTM E 1264; Class A (UL)

10. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.87.

11. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.

12. Antimicrobial Protection: BioBlock Plus - Resistance against the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

E. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

- H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
 - 1. Structural Classification: ASTM C 635 HD.
 - 2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
 - 3. Acceptable Product: Prelude XL 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.
 - 4. Seismic RX suspension system.
- B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least three design load, but not less than 0.106-inch- (2.69-mm-) diameter wire.
- D. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.
 - 1. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
 - a. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
 - b. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.5 ACOUSTICAL SEALANT

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 - 2. Acoustical Sealant for Concealed Joints:
 - a. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
 - b. Pecora Corporation; BA-98.
 - c. Tremco, Inc.; Tremco Acoustical Sealant.
- B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- C. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), recommended for sealing interior concealed joints to reduce airborne sound transmission.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and Cisca's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors.
 - 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 7. Do not attach hangers to steel deck tabs.
 - 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
 - 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
- 3.4 CLEANING
- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09651

RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Vinyl composition floor tile.
 - 2. Resilient base.
 - 3. Moisture Mitigation System.

1.3 RELATED SECTIONS

- A. Section 01450 – Moisture Vapor and Alkalinity Testing.
- B. Section 03300 – Cast-In-Place Concrete

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification:
 - 1. Flooring: Full-size units of each color and pattern of floor tile required.
 - 2. For each type of base product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.
- C. Product Schedule: For floor tile and resilient base.
- D. Qualification Data: For qualified Installer.
- E. Maintenance Data: For each type of floor tile to include in maintenance manuals.
- F. Manufacturer's Warranty.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.7 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
 - 2. Resilient Base: Furnish not less than 10 linear feet (3 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION FLOOR TILE

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong World Industries, Inc.; see drawings for material and color.
 - 2. Approved equal.
- B. See drawings for material and color.

2.2 Resilient Base:

- 1. 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:
 - a. Johnsonite/Tarkett.
 - b. Approved equal.
- B. Resilient Base Standard: ASTM F 1861.
 - 1. See drawings for material and color.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Moisture Mitigation System
 - 1. Manufacturer: Armstrong Flooring Inc., 2500 Columbia Avenue, Lancaster, PA 17603, www.armstrongflooring.com/commercial, or approved equal.
 - 2. Product: S-452 Seal Strong, Solvent free two component liquid epoxy to ASTM F3010.
 - a. Permeance to ASTM E96: <0.1 perm.
 - b. VOC content: <100 g/L (A and B combined); calculated, SCAQMD 1113.
- C. Adhesives:
 - 1. Flooring: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

- a. Verify with manufacturer, compatibility of surface applied vapor reduction system with adhesive.
- b. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Vinyl Composition Floor Tile Adhesives: Not more than 50 g/L.
 - 2. Rubber Floor Tile Adhesives: Not more than 60 g/L.
- 2. Resilient Base: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - a. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
- D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- C. Substrate Moisture: Measure and confirm Substrate Moisture Content, Ambient Relative Humidity, Ambient and Surface Temperature and Dew Point comply with manufacturer's recommendations.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Moisture, Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 4. Moisture Mitigation System: Apply S-452 Seal Strong to substrate when moisture content exceeds manufacturer's recommendations for installing resilient flooring.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
 - D. Do not install floor tiles until they are same temperature as space where they are to be installed.
 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 - E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles square with room axis in pattern indicated.
- C. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- D. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- F. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply two coats.

END OF SECTION

SECTION 09673

RESINOUS FLOORING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Labor, products, equipment and services necessary for resinous flooring work in accordance with the contract drawings covering the following components:
 - 1. Primer: Sikafloor® 1610, or approved equal.
 - 2. Body Coat: Sikafloor® 330, or approved equal.
 - 3. Top Coat / Color Sealer: Sikafloor® 305W, or approved equal.

1.2 RELATED SECTIONS

- A. Section 01450 "Moisture Vapor and Alkalinity Testing."
- B. Section 03300 "Cast-In-Place Concrete."
- C. Section 06160 "Sheathing."

1.3 REFERENCES

- A. ASTM C579, standard test methods for compressive strength of chemical-resistant mortars, grouts, monolithic surfacings, and polymer concretes.
- B. ASTM D2240, standard test method for rubber property—durometer hardness.
- C. ASTM D2369, standard test method for volatile content of coatings.
- D. ASTM D4060, standard test method for abrasion resistance of organic coatings by the taber abraser.
- E. ASTM D4541, standard test method for pull-off strength of coatings using portable adhesion testers.
- F. For additional standards please refer to product data sheets

1.4 SUBMITTALS

- A. Comply with Section 01300 - Submittals.
- B. Product Data: submit manufacturer's product data, including physical properties and colors available.

- C. Manufacturer's safety data sheet for each product being used.
- D. Product Samples: Submit architectural standard samples representative of the final finish, as applied. The standard shall be approved in writing by the architect and shall be the final standard of acceptance of the finish.
- E. Maintenance Instructions: Submit manufacturer's maintenance instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Acceptable Manufacturer: Sika Corporation, 201 Polito Drive, Lyndhurst, NJ 07071
 - a. No request for substitution shall be considered that would change the generic type of system specified. Equivalent materials of other manufacturers may be substituted only on approval of the State. Requests for substitution will be considered only if submitted 10 days prior to bid date. Requests shall include the respective manufacturer's technical literature for each product giving the name, generic type, descriptive information, recommended dry film thickness (DFT), Material Safety Data Sheet (MSDS), and certified test reports showing results to equal performance criteria of products specified herein.

B. Applicator Qualifications:

1. Pre-Qualification: Each bidder for this project shall be pre-qualified and approved in writing by the material manufacturer.
2. Applicator Experience: Each bidder must have a minimum 5 years experience in the application of the type of system specified. Contractor shall submit a list of five projects of similar size, scope and complexity.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, batch or lot number, and date of manufacture.
2. Material should be delivered to job site and checked for completeness and shipping damage prior to job start.

B. Storage:

1. Store materials in accordance with manufacturer's written instructions.
2. Keep containers sealed until ready for use. Material should be stored in a dry, enclosed, protected area from the elements.

3. Do not subject material to excessive heat or freezing.
 4. Shelf life: Established based on manufacturer's written recommendation for each material being used.
- C. Handling: Protect materials during handling and application to prevent damage or contamination.
 - D. Condition materials for use accordingly to manufacturer's written instructions prior to application.
 - E. Record material lot number and quantity delivered to jobsite/storage.

1.7 SITE CONDITIONS

- A. Do not install the Work of this Section outside of the following environmental ranges with Manufacturers' written acceptance:
 1. Material Temperature: Precondition material for at least 24 hours between 65° to 75°F (18° to 24°C)
 2. Ambient Temperature: Minimum/Maximum 50°/85°F (10°/30°C)
 3. Substrate Temperature: Minimum/Maximum 50°/85°F (10°/30°C). Substrate temperature must be at least 5°F (3°C) above measured Dew Point.
 4. Mixing and Application attempted at Material, Ambient and/or Substrate Temperature conditions less than 65°F (18°C) will result in a decrease in product workability and slower cure rates.
 5. Relative Ambient Humidity: Minimum ambient humidity 30%, maximum ambient humidity 75% (during application and curing)
 6. Measure and confirm Substrate Moisture Content, Ambient Relative Humidity, Ambient and Surface Temperature and Dew Point.
- B. Substrate moisture:
 1. Moisture content of concrete substrate must be $\leq 4\%$ by mass as measured with a Tramex[®] CME/CMExpert type concrete moisture meter.
 2. Additionally, relative humidity tests may be conducted per ASTM F2170 and values must be $\leq 85\%$.
 3. If moisture content of concrete substrate is $> 4\%$ by mass as measured with Tramex[®] CME/CMExpert type and/or if relative humidity tests per ASTM F2170 exceed values $> 85\%$, consider moisture mitigation systems or moisture tolerant primer.

- C. Utilities, including electric, water, HVAC and permanent lighting to be supplied by General Contractor.
- D. Maintain constant ambient room temperature of plus or minus 15°F (plus or minus 7°C) with a minimum temperature of 50°F (10°C) and maximum temperature of 85°F (30°C). Maintain constant ambient room temperature for 48 hours before, during and after installation, or until cured. Do not apply while ambient and temperatures are rising.
- E. Erect suitable barriers and post legible signs at points of entry to prevent traffic and trades from entering the work area during application and cure period of the floor.
- F. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.
- G. Insure adequate ventilation and air flow.

1.8 WARRANTY

- A. Manufacturer's warranty covering the resinous flooring against defects in materials for one year from date of substantial completion.

PART 2 - Products

2.1 MANUFACTURER

- A. Manufacturer shall be certified under ISO 9001: 2008 All liquid materials, including primers, resins, curing agents, finish coats, and sealants are manufactured and tested under an ISO 9001:2008 registered quality system.
- B. Approved Manufacturer shall be Sika Corporation, Industrial Flooring, 201 Polito Avenue, Lyndhurst, NJ 07071, Phone 201.933.8800, Fax 201.933.6225, www.sikafloorusa.com

2.2 SYSTEM

- A. Resinous flooring system: Sika ComfortFloor is an ergonomic, sound dampening, low emission floor which is UV stable, aesthetically pleasing, easy to care for and to maintain while contributing to project LEED certification. Typically applied between 80 to 120 mils thick. System to consist of the following components:
 1. Primer: Sikafloor 1610 applied between 8 – 10 mils.
 2. Body coat: Sikafloor 330 applied at 80 mils.d
 3. Top Coat / Color sealer: Sikafloor 305W applied at 8 mils.

2.3 MATERIALS

- A. Sikafloor 1610 is a two part, epoxy resin for priming and moisture barrier with the following properties:
1. Pull-off Strength (ASTM D4541): > 400 psi (2.7 MPa) with 100% concrete failure.
 2. Shore D Hardness (ASTM D2240): 78 - 82 at 7 days.
 3. VOC Content (ASTM D2369): ≤ 50 g/L.
 4. Permeability (ASTM E96): 0.1 perms at 16 mils d.f.t.
 5. Water Absorption (ASTM D570): 0.14 g/h - m².
 6. Viscosity (approximately) of Components A + B: 900 cps.
- B. Body Coat: Sikafloor 330 is an elastic, two part, solvent free, self leveling polyurethane resin system in [*Refer to Sika ComforFloor color chart*] color with the following properties:
1. Density: Mixed Resin: 11.9 lbs./gal. All Density values at 73.4°F (23°C).
 2. VOC Content (ASTM D2369): 10 g/L
 3. Tensile Strength (ASTM D2370): Resin: 1,142 psi., 14 days / 73.4°F (~ 8.0 N/mm²)
 4. Pull-off Strength (ASTM D4541): > 400 psi (concrete failure)
 5. Shore A Hardness (Resin): ~ 80 (14 days / +23°C) (DIN 53505)
 6. Elongation at Break (Resin): ~ 180% (14 days / +23°C) (DIN 53504)
 7. Tear Growth Strength (Resin): 142.75 lbs/in (~ 25 N/mm 14 days / +23°C)
 8. (ISO 34-1)
 9. Approval / Standards: Fire classification acc. to EN 13501-1, Test report 08-199, Universiteit Gent
- C. Top Coat / Color Sealer: Sikafloor 305W is a two part waterbased, low VOC, polyurethane, pigmented matte topcoat for use with flexible membrane systems with the following properties:
1. Approval / Standards Fire classification acc. to EN 13501-1, Test report 08-199, Universiteit Gent
 2. Density: Part R: 11.1 lbs./gal. (~ 1.33 kg/l)
Part H: 9.43 lbs./gal. (~ 1.13 kg/l)
Mixed Resin: 10.40 lbs./mixed gal. (~ 1.24 kg/l)
(diluted with 5% Water)
All Density values at +73 F (23°C).

3. VOC Content (ASTM D2369): 30 g/L.

D. Cove base: Epoxy mortar cove based.

PART 3 - Execution

3.1 EXAMINATION

- A. Examine surfaces to receive flooring system. Notify Architect/General Contractor/Owner/Owner's representative if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected. Do not apply to substrate treatments for moisture, repair, or leveling not of the same Manufacturer.
- B. Surface must be clean, sound and dry. Remove dust, laitance, grease, curing compounds bond inhibiting impregnations, waxes and any other contaminants. All projections, rough spots, etc. should be dressed off to achieve a level surface prior to the application.
- C. Concrete substrate to have a minimum compressive strength of 3,500 psi (24 MPa) at 28 days and a minimum of 215 psi (1.5 MPa) in tension at time of application.
- D. Substrate moisture:
 - 1. Measure and confirm Substrate Moisture Content, Ambient Relative Humidity, Ambient and Surface Temperature and Dew Point.
 - 2. Confirm and record above values at least once every 3 hours during installation, or more frequently whenever conditions change (e.g. Ambient Temperature rise/fall, Relative Humidity increase/decrease, etc.).
- E. Ensure concrete substrate conforms to the minimum requirements of the flooring manufacturer.
- F. Flooring system shall not be applied to sand-cement setting beds. Sand-cement beds shall be removed to structural concrete substrate and re-leveled/sloped as necessary to achieve grade and/or adequate drainage.
- G. Flooring system shall not be applied to asphaltic or bitumen membranes, soft wood, aluminum, copper or fiberglass reinforced polyester/vinyl ester composites.
- H. Application to glazed or vitrified brick and tile, structural wood, steel shall only be permitted with Manufacturer's written recommendation.

3.2 SURFACE PREPARATION

- A. Prepare surface to receive flooring systems in accordance with manufacturer's written instructions.
- B. Remove dirt, oil, grease, wax, laitance, curing compounds, water-soluble concrete hardeners, and other surface contaminants. Remove sealers, finishes, and paints. Remove unsound

concrete by appropriate mechanical means.

- C. Concrete: Shall be cleaned and prepared to achieve laitance-free and contaminant-free, open textured surface by shot blasting or equivalent mechanical means (CSP level as per ICRI guidelines and manufacturer's written recommendation).
- D. Chemical Surface Preparation: Chemical surface preparation (acid etching) is unacceptable and will void Manufacturer's warranty.
- E. Control joints and cracks: Provide repair and treatment of control joints and surface cracks utilizing manufacturer's standard materials and installation details.

3.3 APPLICATION

- A. Mix and apply material with strict adherence to manufacturer's written installation procedures and coverage rates.
- B. Follow Manufacturer's written recommendations on terminations and connections to walls, drains, doorways, columns and floor-to-floor transitions.
- C. Do not apply while ambient and substrate temperatures are rising.
- D. Apply resinous flooring with care to ensure that no laps, voids, or other marks or irregularities are visible, and with an appearance of uniform color, sheen and texture, all within limitations of materials and areas concerned.
- E. Match colors and textures of approved samples.
- F. Install cove base 4" high with 3/8" radius in accordance with manufacturer's written instructions.

3.4 CLEAN UP

- A. Disposal of this product, solution and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.
- B. Empty containers should be taken to an approved waste handling site for recycling or disposal.

3.5 PROTECTION

- A. Freshly applied material should be protected from dampness, condensation and water for at least 72 hrs.
- B. Beware of air flow and changes in air flow. Introduction of dust, debris, and particles, etc. may result in surface imperfections and other defects.
- C. Follow manufacturer's written recommendation with respect to cure, wait time and return to service.

END OF SECTION

SECTION 09900

PAINTING

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, The State representative will select from standard colors and finishes available.
 - 1. Interior and Exterior surfaces scheduled to be finished.
 - 2. Non Ferrous metals, plated or factory finished items specifically noted to be painted or when such items occur as accessories and appurtenance to surfaces required to be painted.
 - 3. Pipes, conduit, ducts, support apparatus and other exposed mechanical and electrical items. Exterior mechanical and electrical equipment and items on the roof or building exterior.
- C. Surfaces not to be finished, unless otherwise indicated.
 - 1. Concrete floors, paving walks stairs and textured concrete. Other concrete surfaces scheduled not to be painted.
 - 2. Exterior Stone Masonry and masonry scheduled to receive water repellant coatings only.
 - 3. Structural steel and metal elements designated to receive sprayed fireproofing unless such finishes have been UL tested with the designated assembly and are approved by the fireproofing manufacturer.
 - 4. Finish hardware, unless prime coated.
 - 5. Glass, plastic laminate, and ceramic tile.
 - 6. Acoustical ceilings, unless scheduled to be painted.

7. Integrally colored plaster or DEFS systems.
 8. Flooring and floor coverings.
 9. Plumbing and lighting fixtures, and electrical device plates.
 10. Movable furniture such as portable bookshelves, cubicles and cabinets.
- D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork.
 - b. Acoustical wall panels.
 - c. Finished mechanical and electrical equipment.
 - d. Light fixtures.
 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas.
 - b. Ceiling plenums.
 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.2 RELATED SECTIONS

- A. Section 02580 "Pavement Markings": for traffic-marking paint.
- B. Section 05402 "Interior Architectural Woodwork": for shop priming architectural woodwork.
- C. Section 07600 "Sheet Metal Flashing and Trim": for priming of sheet metal flashing and trims.
- D. Section 08110 "Hollow Metal Doors and Frames": for factory priming steel doors and frames.
- E. Divisions 15 and 16, identification marking of painting of mechanical and electrical equipment and apparatus.

1.3 REFERENCES

- A. ASTM D16 - Definition of terms relating to Paint, Varnish, Lacquer and Related Products.
- B. ASTM D2016 - Test Method for Moisture Content of Wood.
- C. MPI (Master Painter's Institute) - Approved Product List.
- D. PCDA (Painting and Decorating Contractors of America - Painting - Architectural Specification Manual.
- E. PCA (Portland Cement Association) - Painting Concrete.
- F. SSPC (Steel Structures Painting Council - Steel Structures Painting Manual)

1.4 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1.5 SUBMITTALS

- A. Product Data:
 1. Materials List: Provide an inclusive list of required patching and coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - a. For products with premixed colors, provide manufacturer's standard color chips for selection by State.

2. Manufacturer's Information: Provide data on all listed materials, including:
 - a. Thinning and mixing instructions
 - b. Application instructions and required mil film thicknesses.
 - c. Manufacturer's Material Safety Data Sheets.
- B. Certifications: Provide a letter certifying paints and coatings are free of asbestos, lead, zinc-chromate, strontium chromate, cadmium, and mercury and mercury compounds, . Provide a letter certifying the amounts of mildewcide added by both the paint manufacturer and paint supplier. Provide a letter certifying that abrasive blast media are free of crystalline silica.
- C. Schedule of Finishes: Provide finish schedule including paint spread rates required to achieve final dry film thickness indicated in the schedule.
- D. Schedule of Operations: Provide a work schedule showing sequence of operation and installation dates.
- E. Samples:
 1. Submit color and finish samples, at manufacturers normal paint chip size illustrating range of colors and textures available for each surface finishing product scheduled.
 2. After color and finish sample are returned, submit paint finish samples, 8.5" x 11" in size illustrating selected colors and textures for each selection. Divide sample in horizontal strips showing prime and overlapping second and finish coats. Show coat tinting. Prepare transparent finish samples on same material as that on which coating will be applied. Identify each sample.
- F. Manufacturer's Instructions: Indicate special surface preparation procedures, and substrate conditions requiring special attention. Refer to Section 3.01.
- G. Samples for Initial Selection: For each type of finish-coat material indicated.
 1. After color selection, Contractor will furnish color chips for surfaces to be coated.
 2. Submit 3 samples on the following substrates for State's review of color and texture only:
 - a. Painted Wood: 8-inch-square. Samples for each color and material on hardboard.
 - b. Stained or Natural Wood: 4-by-8-inch. Samples of natural or stained wood finish on representative surfaces.
 - c. Ferrous Metal: 3-inch- square samples of flat metal and 6-inch- long samples of solid metal for each color and finish.
- H. Provide a Comprehensive Spray Plan when airless spraying is proposed.

- I. Qualification Data: For Applicator.
- J. Delivery Receipts: Provide 3 copies of the delivery receipt, signed by the user's representative, attesting to delivery of extra paint as required under 1.09

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
 - 1. Exception: Alkali resistant primers if compatible with the intermediate coat paint products.
- C. Provide a Comprehensive Spray Plan when airless spraying is proposed to include:
 - 1. Documentation that the individual spray applicator(s) on the project have completed an approved "Spray Applicator Certification Program" conducted by the Painting Industry of Hawaii. The certification program shall include material and equipment selection, use and maintenance, hands-on application and safety training.
 - 2. Proposed overspray protection methods.
 - 3. Paint Manufacturer's spray application instructions and recommendations for products to be used.
 - 4. Proposed schedule to shut-down and covering existing air-conditioning and ventilation equipment and existing air intake, return and diffuser grilles.

1.07 REGULATORY REQUIREMENTS

- A. Comply with State OSHL (Occupational Safety and Health Law) and pollution control regulations of the State Department of Health and EPA.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's brand name and lot number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.

5. Thinning instructions.
6. Application instructions and coverage.
7. Color name and number.
8. VOC content.

B. Storage

1. Non-flammable Materials: Store materials not in use in tightly covered containers in a well-ventilated area. Maintain storage containers in a clean condition, free of foreign materials and residue.
2. Flammable Materials:
 - a. Store in such a manner as to prevent damage. No paint material, empty cans, paint brushes and rollers may be stored in the building(s). Store these items in separate storage facilities away from the building(s). Contractor may furnish a separate job site storage structure, if the structure complies with the requirements of the local Fire Department. Keep the storage area shall clean. Lock any storage structures when not in use or when no visual supervision is possible.
 - b. All rejected materials shall be removed from the job site immediately.

1.09 PROJECT CONDITIONS

- A. Do not apply materials when surfaces and ambient temperatures are outside the ranges required by the paint product manufacturer. Do not apply exterior coatings during rain or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- B. Protect public, pedestrians and tenants from injury. Provided, erect and maintain safety barricades around scaffolds, hoists and where constriction operations create hazardous conditions.
- C. Completed Work: Provide necessary protection for wet paint surfaces.
- D. Protective Covering and Enclosures: Provide and install clean sanitary drop cloth or plastic sheets to protect furniture, equipment, floor and other areas that are not scheduled for treatment. Remove any paint applied to surfaces not scheduled for treatment.
- E. Fire Safety: Contractor and its employees shall not smoke in the vicinity of the paint storage area. Exercise precautions against fire at all times and remove waste rags, plastic (polyester sheets), empty cans, etc. from the site at the end of each day.
- F. Where airless spraying is used, ensure that protective enclosures are erected to prevent the escape of overspray from the work area.

- G. Safeguarding Property: Safeguard the work and also the property of the State and other individuals in the vicinity of Contractor's work. Make good on any damages and for losses to work or property caused by Contractor or its employee's negligence. Where damaged property cannot be cleaned and restored to its original condition (i.e. prior to being damaged) replace it with a new product of equal quality. No prorating or use of "used" products will be permitted.
1. For painting and spray painting operation, assume that cars will not be temporarily relocated from parking areas during the painting operations.
 2. Paint overspray shall not carry more than 5 lineal feet beyond the building eave line nor within 10 lineal feet of pedestrians or property and surfaces not scheduled to be painted. Immediately cease spray painting when overspray carries beyond these specified limits. Do not continue until protective barriers are erected to properly contain the overspray and damages caused by the overspray have been corrected.
 3. The Contractor shall be assessed \$300.00 for each incidence of property or personal damage caused by overspray until such time that a satisfactory settlement has been agreed upon by the damaged party and corrective action has been completed. All corrective action shall be settled within 24 hours from the time the damage is discovered. Should the Contractor fail to take corrective action in a timely and expeditious manner, the State shall contact the Contractor's Insurance company to seek resolution on the matter.

1.10 EXTRA MATERIALS

- A. Provide extra paint in each of the different colors, types and surface textures of exterior and interior paint to the user upon completion of the project. Paint shall be in unopened one gallon containers and labeled with color, type, texture, room locations, and date in addition to manufacturer's label.
1. Provide 5 gallons of each color for paint used over large areas, such as the exterior of the building.
 2. Provide 1 gallon of each color for all other areas.

1.11 WARRANTY

- A. Provide a two year guarantee that the work performed under this section conforms to the contract requirements and is free of any defect of material or workmanship.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Mildewcide
 - 1. Except for metal primers, provide primer and finish coats with suitable chemical mildewcide to the maximum amount of mildewcide per gallon of paint permitted by the mildewcide manufacturer without adversely affecting the quality of the paint, but not less than one ounce per gallon.
- C. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names in the Paint Systems Schedule in Part 3 below to designate colors or materials, is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed products to be used.
 - 2. Equivalency: Equivalent products to the specified products are listed in the Master Painter's Institute's "Architectural Painting Specification Manual."
 - 3. Substitution: Requests for substitution of a product or product if a manufacturer is not on the "Approved Product List" will be evaluated for equivalency based on product test results per the test criteria of the Master Painter's Institute.
- D. Colors: As indicated on the drawings.
- E. Hazard Materials: Do not use paint or paint products containing asbestos, lead, mercury and mercury compounds, zinc chromates, strontium-chromate, and cadmium. Do not use abrasive blast media that contain crystalline silica.
- F. Reflectance Factor: For exterior paint, provide paint color with a reflectance factor of ≥ 0.64 .

2.02 MISCELLANEOUS MATERIALS

- A. Provide patching and repair materials. Compatible with paint finishes and substrates. Use weather resistant materials for exterior surfaces and surfaces exposed to moisture.

B. Accessories

1. General: Provide other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
2. Thinners: Thinning of paint shall be done using material recommended by the manufacturer. Mix proprietary products according to manufacturer's requirements. Do not use compound thinner, mineral oil, kerosene, refined linseed oil, or gasoline for thinning.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - a. Ensure that concrete and masonry surfaces are cured and dried to meet paint manufacturer's recommendations.
 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify State about anticipated problems when using the materials specified over substrates primed by others.

3.02 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove dust, oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.
- D. Surface Preparation Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
1. Use abrasive blast-cleaning methods if recommended by paint manufacturer. Ensure that protective enclosures as required, are erected to prevent the escape of loose paint debris from the work area.
 2. Determine alkalinity and moisture content of surfaces by performing appropriate tests. Submit test results to State.
 - a. Prior to painting, concrete and masonry surfaces shall be allowed to cure and dry in accordance with the paint manufacturer's instructions and recommendations.
 - b. Efflorescence and laitance shall be removed from the surface.
 - c. Prior to paint application, interior and exterior concrete and masonry (including grout joints) scheduled to receive paint shall be tested to determine the alkalinity level of the surface. Testing shall be performed in strict accordance with the test kit manufacturer's instructions. Submit test results to the State.
 - d. Where the alkalinity level exceeds the pH level limit of the primer take one of the following three remedies at no additional cost to the State:
 1. If new concrete or masonry, wait until alkaline level has dropped below the limit.
 2. Substitute a primer that is able to resist the measured alkalinity and that is compatible with the paint finish. Alkyd based primers and top-coats or epoxy ester primers shall not be used. Submit the substitute primer to the State for review.
 3. Neutralize the surface in accordance with the primer manufacturer's instructions to reduce the alkaline level. However, acid washing is not permitted where the surface has been finished with a cementitious coating.
 3. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

- C. Surface Preparation Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
1. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 2. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 3. If transparent finish is required, backprime with spar varnish.
 4. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 5. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
- D. Surface Preparation Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
1. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 10/NACE No. 2.
 2. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 3. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat. Spot priming specified here shall be in addition to full prime painting scheduled in Part 3 below.
- E. Surface Preparation Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- G. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

3. Use only thinners approved by paint manufacturer and only within recommended limits.

- H. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.03 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only unless otherwise noted.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel or varnish coat.
11. Ensure primers are top coated within the times required by the paint manufacturers. Top coats not applied within the recoating window may be rejected.

- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by

manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.

2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 3. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
 4. Be aware of the requirements for, and restrictions on, spray painting contained in PROJECT CONDITIONS Paragraph.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Uninsulated metal piping.
 2. Uninsulated plastic piping.
 3. Pipe hangers and supports.
 4. Tanks that do not have factory-applied final finishes.
 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.

6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
 7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
1. Switchgear.
 2. Panelboards.
 3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.
- L. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.
- 3.04 FIELD QUALITY CONTROL TESTING
- A. Inspection and Approvals: Obtain written approval upon completion of each phase of work (phases of work are: surface preparation and spot prime, prime, first finish coat, second finish coat) before proceeding into the next phase or work. For any particular area of work that deviates from the submitted work schedule, notify the State one day (24 hours minimum) in advance when completing any phase of work. Provide access to areas to be inspected.

1. Failure to obtain approval of any phase of work for a work area may result in redoing the operation at no cost to the State.
 2. Right of Rejection: Non conforming work will be rejected by the State. Remove rejected material from the job site immediately. Redo rejected work at no cost to the State.
- B. Moisture Testing: Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Plaster and Gypsum Wallboard: 12 percent.
 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 3. Interior Wood: 15 percent, measured in accordance with ASTM D2016.
 4. Exterior Wood: 15 percent, measured in accordance with ASTM D2016.
- C. Alkalinity Testing: Measure pH Level of surface to be painted. Notify State if alkalinity level is below the maximum permitted by the paint or primer manufacturer.
- 3.05 CLEANING
- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.
- 3.06 PROTECTION
- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by State.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.
- 3.07 EXTERIOR PAINT SCHEDULE (Product listed in the schedule are products of Sherwin Williams Company and used for the basis of design, or approved equal).
- A. Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry): Provide the following finish systems over exterior concrete, stucco, and brick masonry substrates:
1. Acrylic Finish: Two finish coats over a primer.

- a. Primer: Loxon[®] Block Surfacers, A24W200, alkali resistant primer: MPI #4; 8.0 mils DFT.
 - b. Finish Coats: Exterior acrylic paint. MPI #15; 1.5 mils DFT
 - c. Finish Coat Gloss Level: semi-gloss.
 - B. Concrete Unit Masonry: Provide the following finish systems over exterior concrete unit masonry:
 - 1. Acrylic Finish: Two coats of water blocking primer/finish.
 - a. Primer/Finish: Loxon[®] Water Blocking Primer/Finish, LX12W0050; 3.7 mils DFT.
 - b. Finish coat Gloss Level: flat.
 - C. Exterior Gypsum Soffit Board: Provide the following finish systems over exterior gypsum soffit board:
 - 1. Acrylic Finish: Two finish coats over a primer.
 - a. Primer: ProMar[®] 200 Zero VOC Latex Primer, B28W2600. MPI #50; 1.0 mils DFT.
 - b. Finish Coats: ProMar[®] 200 Zero VOC Latex Primer, B28W2600; 1.6 mils DFT.
 - c. Finish Coat Gloss Level: semi-gloss.
 - D. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:
 - 1. Full-Gloss Alkyd-Enamel Finish: Two finish coats over a galvanized metal primer.
 - a. Primer: Pro Industrial[™] Pro-Cryl[®] Universal Primer, B66-310 Series. MPI #107; 3.0 mils DFT.
 - b. Finish Coats: Pro Industrial[™] Acrylic Gloss, B66-600 Series. MPI #114; 3.0 mils DFT.
 - c. Finish Coat Gloss Level: full-gloss.
- 3.08 INTERIOR PAINT SCHEDULE (Product listed in the schedule are products of Sherwin Williams Company and used for the basis of design.)
- A. Concrete and Masonry (Other Than Concrete Unit Masonry): Provide the following paint systems over interior concrete and brick masonry substrates:
 - 1. Latex Finish: Two finish coats over a primer.
 - a. Primer: PrepRite[®] Block Filler, B25W25. MPI #4; 7.0 mils DFT.

- b. Finish Coats: ProMar® 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series. Mpi #43; 1.5 mils DFT.
 - c. Finish Coat Gloss Level: semi-gloss.
 - B. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:
 - 1. Water Repellent Coating: Dietrich Technologies, Inc., 333L OmegaSeal Water Repellent & Graffiti Management, apply per manufacturer's recommendation.
 - C. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
 - 1. Latex Finish: Two finish coats over a primer.
 - a. Primer: ProMar® 200 Zero VOC Latex Primer, B28W2600. MPI 50#; 1.0 mils DFT.
 - b. Finish Coats: ProMar® 200 Zero VOC Interior Latex Egg-Shell. MPI #139; mils DFT.
 - c. Finish Coat Gloss Level: egg-shell.
 - D. Wood and Hardboard: Provide the following paint finish systems over new interior wood surfaces:
 - 1. Acrylic-Enamel Finish: Two finish coats over a primer.
 - a. Primer: PrepRite® ProBlock® Latex Primer/Sealer B51 Series; MPI #6 \$ #17; 1.4 mils DFT.
 - b. Finish Coats: Pro Industrial™ Acrylic Semi-Gloss, B66-650 Series. MPI #141; 4.0 mils DFT.
 - c. Finish Coat Gloss Level: semi-gloss.
 - E. Ferrous Metal: Provide the following finish systems over ferrous metal:
 - 1. Acrylic Finish: Two finish coats over a primer.
 - a. Primer: Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series; MPI #107; 3.0 mils DFT.
 - b. Finish Coats: Pro Industrial™ Acrylic Semi-Gloss, B66-650 Series. MPI #141; 4.0 mils DFT.
 - c. Finish Coat Gloss Level: semi-gloss.
 - F. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:

1. Acrylic Finish: Two finish coats over a primer.
 - a. Primer: Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series; MPI #107; 3.0 mils DFT.
 - b. Finish Coats: Pro Industrial™ Acrylic Semi-Gloss, B66-650 Series. MPI #141; 4.0 mils DFT.
 - c. Finish Coat Gloss Level: semi-gloss.

3.09 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE

A. Waterborne Stain Satin-Varnish Finish:

1. Two finish coats of waterborne clear satin varnish over a sealer coat and waterborne interior wood stain.
 - a. Stain Coat: Wood Classics® 250 Stain, A49-800 Series. MPI #90.
 - b. Sealer Coat: Wood Classics® Fast Dry Sanding Sealer B26V43. MPI #102; 0.75 mils DFT.
 - c. Finish Coats: Wood Classics® Waterborne Polyurethane Satin or Gloss A68 Series. MPI #57; 1.0 mils DFT.
 - d. Finish Coat Gloss Level: full-gloss.

3.10 SCHEDULE — COLORS: As indicated on the drawings.

END OF SECTION

DIVISION 10 - SPECIALTIES

SECTION 10676

MOTORIZED MOBILE STORAGE SHELVING (ADDITIVE BID NO. 2)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the contract, including general and supplementary conditions and related specification sections, apply to this section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Electric, carriage mounted high-density mobile storage units, support rails, fabrication, and installation including leveling of support rails.
- B. Related Work, Not Furnished:
 - 1. Structural floor system capable of supporting live and dead loads required by prevailing building codes, including loads of storage units to be installed. Provide a maximum allowable sub floor deflection of L/480 under specified mobile storage loads.
 - 2. Finish floor covering and edging materials and installation on raised floors and ramps, or when on concrete with recessed rail installation.
 - 3. Power wiring to units from adequate power supply. Final connections to units shall be provided by installer electrician.
 - 4. Fire suppression system is by others.

1.3 REFERENCES

- A. American National Standards Institute (ANSI) Standards:
 - 1. Applicable standards for fasteners used for assembly.
- B. American Society for Testing and Materials (ASTM) Standards:
 - 1. Applicable standards for steel sheet materials used for fabrication.
- C. American Institute of Steel Construction (AISC) Standards:
 - 1. Applicable standards for steel materials used for fabrication.

D. Underwriters' Laboratories (C-UL US):

1. Listings for electrical equipment and devices described in this specification.

1.4 SYSTEM DESCRIPTION

- A. General: The system consists of manufactured storage units mounted on manufacturer's track-guided carriages to form a compact storage system. System design permits access to any single aisle by moving units until the desired aisle is opened. The carriage/rail system provides uniform carriage movement along the total length of travel, even with unbalanced loads.
- B. Carriage System Design and Features: The carriage system consists of a formed structural steel frame with hardened steel wheels riding on steel rails surface mounted to the floor. Rails shall be types selected by the manufacturer to ensure smooth operation and self-centering of mobile storage units during travel without end play or binding. Rail types, quantities and spacing shall be selected by the manufacturer to suit installation conditions and requirements. All bearings used in the drive mechanism shall be permanently shielded and lubricated.
- C. Movement Controls: Provide a carriage control panel on the accessible end of each moveable carriage, located 44 inches above the base, on the face panel. Minimum controls shall include directional control buttons, STOP/RESET push-button and a red reset light.
1. System controls shall start motors on each movable carriage "sequentially" to minimize power demands and shall provide dynamic braking to provide smooth operation. No additional hardware shall be required to change between "sequential" and "block" movement. Maximum running speed shall be limited to 3.3 inches per second.
 2. Provide solid state controls and indicator lights for a visual indication of safety system operation. Provide each aisle with a programmable distance sensor to ensure proper timing for start/stop operation.
 3. Pushing the directional control button on any moveable carriage adjacent to the desired aisle location in the direction away from the desired aisle location opens the system at the desired aisle. The selected aisle shall open automatically regardless of the position of the carriages. Manual Reset: The carriage control head will display a flashing red reset light at the newly opened aisle indicating that the aisle is locked open and requires resetting before another aisle can be opened. Provide for automatic lockout and manual reset of controls if selected aisle is not moved within a preset period of time.
 4. Controls shall feature back lit message indicating which aisle is in use.
- D. Drive System: The system shall be designed with a positive type motorized drive which minimizes end play and that carriages will stop without drifting. All system components shall be selected to ensure a smooth, even movement along the entire carriage length.
1. Each electric carriage shall be provided with a current limited fractional horsepower gear motor, connected to drive wheel assembly with a roller chain.

2. System shall include a direct drive, line shaft drive, synchro drive or chain sprocket drive system to ensure that carriages move uniformly along the total length of travel, even with unbalanced loads.
3. A tensioning device shall be provided on each chain drive (when applicable).
4. All bearings used in the drive mechanism shall be permanently shielded and lubricated.
5. System shall operate on 115 V.A.C. 50/60 hertz, 20 amp dedicated circuit provided by others, one per module.

E. Safety Features:

1. Visual indicators shall provide verification that carriages are in the locked or unlocked mode.
2. One safety sweep shall be provided in each aisle. A full-length infrared photoelectric safety sweep shall be provided to stop carriage movement if the sweep contacts an obstruction while in motion. Sweep must be equipped with OSHA approved safety demarcation tape.
3. Entire system shall be C-UL US system listed.
4. An Automatic Battery Backup shall be provided for emergency operations in case of primary power failure.

F. Finishes:

1. Fabricated Metal Components And Assemblies: Manufacturer's standard powder coat paint finish.
2. End Panels, Accessible Ends: Plastic laminate color, patterns and textures as selected by State from manufacturer's full range of offerings.

1.5 PERFORMANCE REQUIREMENTS

A. Design Requirements:

1. Limit overall height to 100 inches.
- B. Seismic Performance: Provide mobile storage units capable of withstanding the effects of earthquake movement as required by applicable building codes. Provide site specific third party structural design calculations / drawings by licensed Hawaii Structural Engineer.

1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature and installation instructions for each type of shelving, track and installation accessory required. Include data substantiating that products to be furnished comply with requirements of the contract documents.

- B. Shop Drawings: Show fabrication, assembly, and installation details including descriptions of procedures and diagrams. Show complete extent of installation layout including clearances, spacings, and relation to adjacent construction in plan, elevation, and sections. Indicate clear exit and access aisle widths; access to concealed components; assemblies, connections, attachments, reinforcement, and anchorage; and deck details, edge conditions, and extent of finish flooring within area where units are to be installed.
1. Show installation details at non-standard conditions. Furnish floor layouts, technical and installation manuals for every unit shipment with necessary dimensions for rail layout and system configuration at the project site. Include installed weight, load criteria, furnished specialties, and accessories.
 2. Provide layout, dimensions, and identification of each unit corresponding to sequence of installation and erection procedures. Specifically include the following:
 - a. Location, position and configuration of tracks on all floors.
 - b. Plan layouts of positions of carriages, including all required clearances.
 - c. Details of shelving, indicating method and configuration of installation in carriages.
 3. Provide location and details of anchorage devices to be embedded in or fastened to other construction.
 4. Provide installation schedule and complete erection procedures to ensure proper installation.
 5. Show locations of wiring and disconnects required for operating movable carriage units.
- C. Samples: Provide minimum 3 inch square example of each color and texture on actual substrate for each component to remain exposed after installation.
- D. Selection Samples: For initial selection of colors and textures, submit manufacturer's color charts consisting of actual product pieces, showing full range of colors and textures available.
- E. Warranty: Submit draft copy of proposed warranty for review.
- F. Reference List: Provide a list of recently installed mobile storage systems (5 minimum) to be visited by State, and contractor. Intent of list is to aid in verifying the suitability of manufacturer's products and comparison with materials and product specified in this section.
- G. A list shall be submitted of all specification deviations with a complete description and validation.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engage an experienced manufacturer whose internal process meet or exceed ISO 9001 requirements. Furnish manufacturer's ISO 9001 quality system

registration certificate or equivalent documentation of the process that meets or exceeds ISO 9001.

- B. Installer Qualifications: Engage an experienced installer who is a manufacturer's authorized representative for the specified products for installing carriages and anchoring shelving units to carriages.

- 1. Minimum Qualifications: 5-year experience installing systems of comparable size and complexity to specified project requirements.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Follow manufacturer's instructions and recommendations for delivery, storage and handling requirements.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions before fabrication. Indicate verified measurements on Shop Drawings. Coordinate fabrication and delivery to ensure no delay in progress of the Work.

1.10 SEQUENCING AND SCHEDULING

- A. Sequence storage shelving system installation with other work to minimize possibility of damage and soiling during remainder of construction period.
- B. Schedule installation of specified products and accessories after finishing operations, including painting have been completed.
- C. Provide components, which must be built in at a time which causes no delays general progress of the Work.
- D. Pre-installation Conference: Schedule and conduct conference on project site to review methods and procedures for installing mobile storage units.

1.11 WARRANTY

- A. Provide a written warranty, executed by Contractor, Installer, and Manufacturer, agreeing to repair or replace units which fail in materials or workmanship within the established warranty period. This warranty shall be in addition to, and not a limitation of, other rights the State may have under General Conditions provisions of the Contract Documents.
- B. Warrant the entire movable compact shelving installation against defects in materials and workmanship for a period of ten years from date of acceptance by the State.

1.12 MAINTENANCE

- A. Provide manufacturer's extended maintenance agreement for one year, commencing on the day the standard maintenance warranty ends.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Spacesaver Corporation
2. Aurora Storage Products, Inc.
3. Kordex Systems, Inc.
4. Montel

2.2 BASIC MATERIALS

- A. General: Provide materials and quality of workmanship which meet or exceed established industry standards for products specified. Use furniture grade sheet metal for component fabrication unless indicated otherwise. Material thickness/gauges are manufacturer's option unless indicated otherwise.
- B. Plastic Laminates: NEMA LD-3, GP-28, Vertical Grade.
- C. Electrical Devices and Controls: C-UL US System Listed for type of application and service.

2.3 GROUT

- A. General: Provide non-shrink, non-staining hydraulic cement compound conforming to the following requirements, based on the performance of the test specimens at room temperature and in laboratory air, as stated by the grout manufacturer.
 1. Linear Movement: No shrinkage while setting; maximum expansion limited to .002 inches per linear inch.
 2. Compressive Strength: Based on two inch cubes made following ASTM standards, tested on a Balding-Southward machine of 60,000 pounds capacity, meet or exceed the following:
 - a. Age: 1 hour ---- 4,500 psi
 - 7 days ---- 8,000 psi

2.4 MANUFACTURED COMPONENTS

A. Rails:

1. General: Provide manufacturer's proprietary design units with the following properties:
2. Material: ASTM/AISI Type 1045 steel.

3. Capacity: 1,000 pounds per lineal foot (1385kg/M) of carriage.
4. Minimum Contact Surface: 5/8 inch (16MM) wide.
5. Provide rail sections in minimum 6 foot (1.83M) lengths.
6. Rail configuration shall permit attachment to top of structural floor system with provision for leveling rails to compensate for variations in floor surface level.
7. Provide rail connections designed to provide horizontal and vertical continuity between rail sections, to gradually transfer the concentrated wheel point load to and from adjoining rail sections. Butt joints without connections are not permitted.
8. Once rails are leveled, they shall be supported the full length with the specified grout.

B. Floor / Ramp:

1. Floor/Ramp Sheathing: Minimum 3/4 inch, 7-ply underlayment grade plywood. Particleboard sheathing materials are not permitted. Provide low volatile organic compound (VOC)-emitting material for floor/ramp sheathing.
2. Provide fire retardant treated floor/ramp materials when required by code.
3. Finished flooring materials shall be provided by others.
4. Ramps at entrances to system. Full floor between all rails.

C. Carriages:

1. Provide manufacturer's design movable carriages fabricated of welded steel construction. Galvanized structural components and/or riveted carriages are unacceptable. 1,000 pound per foot minimum capacity.
2. Provide fixed carriages of same construction and height as the movable carriages, anchored to rails. Setting fixed shelving directly on floors is not permitted.
3. When required, provide bolted carriage splices designed to maintain proper unit alignment and weight load distribution.
4. Design carriages to allow the shelving uprights to recess and interlock into the carriages a minimum of 3/4 inch. Top mount carriages are unacceptable.
5. Provide each carriage with two wheels per rail.

D. Drive / Guide System:

1. Design: Provide drive system which prevents carriage whipping, binding and excessive wheel/rail wear under normal operation.
 - a. If line shafts are used, all wheels on one side of carriage shall drive.

- b. If synchronized drives are used, a minimum of one wheel assembly driving both sides of carriage at center location required. Drive shaft shall exhibit no play or looseness over the entire length of that assembly.
 - 2. Shafts: Solid steel rod or tube.
 - 3. Shaft Connections: Secured couplings.
 - 4. Bearing Surfaces: Provide rotating load bearing members with ball or roller bearings. Provide shafts with pillow block or flanged self-aligning type bearings.
 - E. Wheels:
 - 1. Materials: Type 1045 solid steel. Minimum load capacity per wheel: 3200 lbs.
 - 2. Size: Minimum 5 inches, outside diameter drive wheels.
 - 3. Guides: Determined by manufacturer; minimum 2 locations.
 - F. Motors:
 - 1. Type: 90VDC
 - G. Face Panels:
 - 1. Materials: Plastic laminate clad particleboard with plastic edging on vertical edges.
 - 2. Finishes: Selected by the State.
 - 3. End panels must cover the full height and width of shelving.
 - H. Shelving: Four Post
- 2.5 ACCESSORIES
- A. Automatic Battery Backup: Provide an integrated uninterruptible power supply for emergency operations in case of primary power failure.
- 2.6 FABRICATION
- A. General: Coordinate fabrication and delivery to ensure no delay in progress of the Work.
 - B. Wheels: Provide precision ground and balanced units with permanently shielded and lubricated bearings.
 - C. Carriages: Fabricate to ensure no more than 1/4 inch (6MM) maximum deviation from a true straight line. Splice and weld to ensure no permanent set or slippage in any spliced or welded joint when exposed to forces encountered in normal operating circumstances.

2.7 FINISHES

- A. Colors: Provide in custom colors as selected by State.
- B. Paint Finish: Provide factory applied electrostatic powder coat paint.
- C. Laminate Finish: Provide factory applied laminate panels at locations indicated on approved shop drawings.
- D. Edgings: Provide preformed edging, color-matched to unit colors selected.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine floor surfaces with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of mobile storage units.
- B. Verify that building structural system is adequate for installing mobile storage units at locations indicated on approved shop drawings.
- C. Verify that intended installation locations of mobile storage units will not interfere with, nor block established required exit paths or similar means of egress once units are installed.
- D. Verify that adequate capacity permanent power sources have been installed at locations indicated on approved shop drawings.
- E. Prepare written report, endorsed by Installer, listing conditions detrimental to proper performance of mobile storage units, once installed.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Rails:
 - 1. Lay out rails using full-length units to the maximum extent possible. Use cut lengths only at ends to attain total length required. Locate and position properly, following dimensions indicated on approved shop drawings. Verify thickness of finished floor materials to be installed (by others) and install level 1/16 inch above finished floor surfaces.
 - 2. Verify level, allowing for a minimum 1/4 inch of grout under high points. Position and support rails so that no movement occurs during grouting.
 - 3. Set rails in full grout bed, completely filling any voids entire length of all rails including rail connectors. Trim up sides flush with rails to ensure proper load transfer from rail to supporting floor. Using shims in lieu of full grouting is not permitted.
 - 4. Installation Tolerances: Do not exceed levelness of installed rails listed below:

- a. Maximum Variation From True Level Within Any Module: 3/32 inch.
 - b. Maximum Variation Between Adjacent (Parallel) Rails: 1/16 inch, perpendicular to rail direction.
 - c. Maximum Variation In Height: 1/32 inch, measured along any 10 foot rail length.
 5. Verify rail position and level; anchor to structural floor system with anchor type and spacings indicated on approved shop drawings.
- B. Floors/Ramps:
1. General: Finished elevation shall be 1/16 inch below top of rails.
 2. Place floors and ramps to the extent indicated on approved shop drawings. Extend ramps under all movable and stationary ranges. Do not extend ramps beyond the ends of carriages.
 3. Construct floors and ramps to prevent warping or deformation of floor panels in a normal operating environment. Support panels on levelers at maximum 16 inches on center.
 4. Ramp Slope: Do not exceed the following:
 - a. ADA Accessible Ramps: Maximum 1:12 slope.
 - b. Vertical Transition, Ramp edge to floor: Maximum 1/8 inch.
- C. Shelving Units Installation:
1. General: Follow layout and details shown on approved shop drawings and manufacturer's printed installation instructions. Position units level, plumb; at proper location relative to adjoining units and related work.
 2. Carriages:
 - a. Place movable carriages on rails. Ensure that all wheels track properly and centering wheels are properly seated on centering rails. Fasten multiple carriage units together to form single movable base where required.
 - b. Position fixed carriage units to align with movable units; make final leveling adjustments with leveling screws.
 3. Shelving Units:
 - a. Permanently fasten shelving units to fixed and movable carriages with vibration-proof fasteners.
 - b. Stabilize shelving units following manufacturer's written instructions. Reinforce shelving units to withstand the stress of movement where required and specified.

4. Wiring:

- a. Make final control wiring connections between modules under single control.
- b. Test wiring for continuity and proper connections with regulated field power supply before making final power connections.
- c. Make final wiring connections to permanent power source. Connection to power source by others.
- d. Test system operation by cycling all units through complete operations sequences.

3.3 FIELD QUALITY CONTROL

- A. Verify shelving unit alignment and plumb after installation. Correct if required following manufacturer's instructions.
- B. Remove components which are chipped, scratched, or otherwise damaged and which do not match adjoining work. Replace with new, undamaged, matching units.

3.4 ADJUSTING

- A. Adjust components and accessories to provide smoothly operating, visually acceptable installation.

3.5 CLEANING

- A. Immediately upon completion of mobile shelving installation, clear components and surfaces. Remove surplus materials, rubbish and debris resulting from mobile shelving installation upon completion of work and leave areas of installation in neat, clean condition.

3.6 DEMONSTRATION/TRAINING

- A. Schedule and conduct demonstration of installed equipment and features with State's personnel.
- B. Schedule and conduct maintenance training with State's maintenance personnel. Training session should include lecture and demonstration of all maintenance and repair procedures that end user personnel would normally perform.

3.7 PROTECTION

- A. Advise Contractor of additional protection needed to ensure that system will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 10711
EXTERIOR SUN CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide design and engineering of Custom Sunshades as per drawings, as specified, and as required for a complete and proper performance.
- B. Section Includes (but is not limited to): Horizontal, Vertical, Fixed, Extruded aluminum Exterior Sun Control Devices, Awnings and Canopies.
- C. Related Sections :
 - 1. Section 05120 – STRUCTURAL STEEL FRAMING, main frame knife blade attachments points, brackets any components in Steel within the curtain wall to which cantilevered units beyond the curtain wall may be affixed.
 - 2. Section 07920- JOINT SEALANTS: Joint Sealants installed in perimeter joints between frame sun control devices penetrations into fabric of building or adjoining construction

1.2 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 611, "Voluntary Specifications for Anodized Architectural Aluminum (Revised)."
 - 2. AAMA 2605, "Voluntary Specification, Performance Requirements, and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels."
- B. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE):
 - 1. ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings" (co-sponsored by IESNA).
- C. American Welding Society (AWS):
 - 1. AWS D1.2, "Structural Welding Code - Aluminum" (copyrighted by AWS, ANSI approved).

D. ASTM (ASTM):

1. ASTM B 26/B 26M, "Standard Specification for Aluminum-Alloy Sand Castings."
2. ASTM B 209/B 209M, "Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate."
3. ASTM B 221/B 221M, "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes."
4. ASTM D 1187, "Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal."

E. National Association of Architectural Metal Manufacturers (NAAMM):

1. NAAMM MFM, "Metal Finishes Manual."

1.3 SUBMITTALS

- A. Product Data: Submit specifications, and Manufacturer's data sheet for each product to be used (to include : necessary preparations, storage and handling instructions, and installation instructions, if applicable.
- B. Shop Drawings: Submit shop drawings for each product required.
1. Include plans, elevations, sections and details showing profiles, angles, and spacing of blades, frames and supports.
 2. Include sectional details showing adjacent construction, including flashing, wall finish and sealants.
 3. Indicate materials, thicknesses, types, connection details and methods, reinforcements and anchoring methods.
 4. Shop drawings shall be prepared and sealed, as well as signed by Structural Engineer, as required.
 5. On all submissions show Anchors and Inserts : List type, size, and material required for type of loading and required torque for installation as indicated.
 6. When specified in Contract, prepare and submit CAD drawings for approval following which Structural Engineered calculations showing compliance with all local codes.

C. Samples:

1. Submit samples for verification purposes. Submit 2 inch (51 mm) by 3 inch (76 mm) minimum size sample of selected color coating. Additional samples may be required to show design, fabrication techniques, and workmanship.

D. Quality Control Submittals:

1. Design Data: To comply with design loadings include structural analysis data signed and sealed by the professional engineer.

E. Manufacturer's Warranty.

1.4 SYSTEM PERFORMANCE

A. Structural Design of Sun Control Devices : General Contractor shall provide all engineering services and where necessary re-deferred approval by Authority Having Jurisdiction (AHJ) and obtain all the relevant permits and authorization.

1. Components shall have all exterior profiles and dimensions indicated on the CAD Shop Drawings.
2. Extrusion wall thicknesses, internal reinforcements, jointing and installation provisions shall all be illustrated.

B. Design and Experience : Sun Control Devices shall be designed, integrated, engineered, produced, and assembled by a single manufacturer with proven 20 yrs experience.

C. Quality Control

1. For quality and delivery control, units shall be manufactured, assembled with mechanical fasteners and finished by on manufacturer with who is also a fully licensed Duranar/Kynar approved applicator.
2. Engineer Qualifications: The engineer shall be a professional engineer legally authorized to practice in the jurisdiction where the Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of products similar to this Project in material, design, and extent, and that have a record of successful in-service performance.
3. Welding will only be acceptable when provided by certified welders or when specifically essential to the design of the product. Otherwise blades shall be removable for repair and replacement. Welder Qualifications: Qualify welding processes and welding operators in

accordance with AWS standard qualification procedures. Operators shall carry proof of qualification on their persons.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to fabrication of the work and preparation of shop drawings, to ensure proper fitting of the work. Show recorded measurements on final shop drawings. Notify the Owner and the Architect, in writing, of any dimensions found which are not within specified dimensions and tolerances in the Contract Documents, prior to proceeding with the fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.7 WARRANTY

- A. Warranty: Provide written warranty to the owner that all screen products will be free of defective materials or workmanship for a period of one year from date of installation
- B. Provide standard 20 year warranty on applicable finishes and other pertinent Warranties on Materials and labor as per published standard

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Products are manufactured by B&C Industrial Group Inc; 3080 E. Miraloma Ave., Anaheim, CA 92806; Phone: 800-962-9949; Fax: 708-388-9392; Web Site: www.bcindustrialgroup.com.

2.2 MATERIALS

- A. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer to produce required finish.

- B. Aluminum Extrusions : ASTM B221, Alloy 6063 –T5 or 6061 –T6
- C. Perforated Metal Panels should be Aluminum and not steel (due to perforation being applied after galvanizing and subject to rust)
- D. Internal and External Metal Fasteners : Stainless Steel Nuts, Bolts, Metal Screws, Rods and Clevises as applicable and as shown on drawings and as shown on drawings. Neoprene washers to be used to separate dissimilar materials. Do not use metals which are corrosive or incompatible with materials joined.
 - 1. Use types, gages, and lengths to suit unit installation conditions.
 - 2. Use flat-head machine screws for exposed fasteners, unless otherwise indicated.
- E. On all submissions show Anchors and Inserts : List type, size, and material required for type of loading and required torque for installation as indicated.
 - 1. Use nonferrous metal or hot – dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance.
 - 2. Use toothed steel or expansion bolt devices for drilled – in – place anchors and in masonry structures.
- F. Bituminous Coating. Tnemec 46-450 Heavy Tnemecol, high-build mineral – filled coal tar pitch coating, or a cold applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.3 EXTERIOR METAL CANOPIES

- A. General: Provide exterior metal canopy assemblies complying with the following:
 - 1. Cover : 16 GA Extruded Aluminum Cover
 - 2. Frame : Extruded Aluminum Tubes 6063 –T
 - 3. Supports : Overhang System

2.4 FABRICATION

- A. Assemble exterior sun control assemblies in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitation. Clearly mark units for reassembly and coordinated installation.

- B. Exterior sun control assemblies shall be assembled in accordance with manufacturer recommendations.
- C. Maintain equal blade spacing, including, but not limited to, separation between blades and frames to produce a uniform appearance. Blades shall be fixed.
- D. Make provisions to secure components in field using concealed fasteners.
- E. Include supports, anchorage, and accessories required for complete assembly.

2.5 ALUMINIM FINISH OPTION – FLUOROPOLYMER

- A. Comply with NAAMM MFM for architectural metal products for recommendations for pretreatment, application of finishes. Finish exterior sun control devices after assembly if welded.
 - 1. Aluminum Finishes: Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
- B. Specified Manufacturer: Coatings & Resins Division, PPG Industries, Inc. (Duranar, Kynar) Springdale, PA (412/274-7900 or 800/258-6398) to be applied by PPG licensed applicator.
- C. Acceptable Manufacturers :
 - 1. Akzo Nobel Coatings, Inc. (Trinar brand), Columbus, OH (614/294-3361 or 800/294-3361)
 - 2. The Valspar Corporation (Fluorpon brand), Garland, TX (972/485-7173 or 866/351-6900)
 - 3. BASF Corporation (Fluorceram brand), Southfield, MI (248/948-2442)
- D. Acceptable Resin Manufacturers : Provide coating based on PVDF resin produced by one of the following :
 - 1. Duranar
 - 2. Kynar 500, by Arkema Inc. Philadelphia, PA (800/225-7788)
 - 3. Hylar 5000, by Solvay Solexis, Inc. Thorofare, NJ (856/853-8119)
- E. PVDF Resin-Based Coating System: Thermoplastic Organic Coating System containing minimum 70 percent Kynar 500 or Hylar 5000 polyvinylidene fluoride (PVDF) resin combined with proprietary ceramic/ inorganic pigments for factory application to aluminum extrusions. Coating system shall comply with the following :

1. American Architectural Manufacturers Association (AAMA) standard AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
 2. Architectural Spray Coaters Association (ASCA) standard ASCA 96 – Voluntary Specification for Superior Performance of Organic Coatings.
- F. Touch – Up Paint: For minor field repairs to finish, air drying coating as produced and recommended by finish coating manufacturer’s specifications.
- G. Factory Application: Prepare Aluminum Extrusions and factory apply aluminum pretreatment according to finish coating manufacturer’s specifications.
1. High Performance Organic Coating:
 - a. Pretreatment : AAMA 606-98
 - b. High Temperature Alkaline Wash
 - c. Deoxidizer
 - d. Chromium Chromate Coat
 - e. Ambient Rinse and Dry Off
- H. Standard Two-Coat Fluoropolymer Finish Coating: Manufacturer's standard thermocured system, complying with AAMA 2604 standards, inhibitive primer and fluoropolymer color topcoat.
1. Pretreatment, Primers, PVDF coating and topcoats in compliance with coating manufacturer’s instructions and recommendations and in compliance with applicable provisions of referenced standards.
 2. Primer: According to coating manufacturer’s specifications as integral components of overall finish system.
 3. Finish Coat: PVDF resin based coating according to finish coating manufacturer’s specifications, thermoset after application.
 4. Coating Thicknesses :
 5. Primer : Minimum 0.3 mil (+/- 0.1 mil) dry film thickness
 6. Color coat : 1.0 mil (+/- 0.1 mil) dry film thickness

- a. Visual Performance Criteria: Coating finish shall be uniform in thickness and color, smooth and free from blemishes which might impair the serviceability or which are visible when viewed from a distance of 10 feet under normal daylight conditions at the project site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
 - 1. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the Project Site.

3.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers.
- B. Store materials in their original, undamaged packages and containers, inside a well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

3.4 INSTALLATION

- A. Install exterior sun control devices in accordance with reviewed product data, final shop drawings, and engineering calculations by qualified licensed company with over 5 years of experience.
- B. Install canopies plumb, level, and in proper alignment with adjacent Work

- C. To assist in handling and shipping assemble units with slip fit interconnections and mechanical fasteners.
- D. Isolate aluminum from steel and incompatible materials with field applied bituminous coating, insulators, vinyl or plastic gaskets.
- E. Use countersunk, concealed anchorages or intersection material and make hairline joints as inconspicuous as possible.
- F. Provide neoprene washers fitted to screws in order to protect metal surfaces and to make a point of compression a weather resistant connection.
- G. Anchor to substrate using fasteners as recommended by sunshade manufacturer, as indicated on reviewed shop drawings and in accordance with general anchoring requirements specified in Section 05090 – Anchors
- H. Form closely fitted joints with exposed connections accurately located and secured.
- I. Corrosion Protection : Protect galvanized and nonferrous metal surfaces which will be in contact with concrete, masonry, or dissimilar materials.
- J. On wall penetration, following the pilot hole drilling procedure, Installer is to apply a small quantity of sealant into hole or on thread or anchor bolt to provide water resistant bond.
- K. Following any Installation, the General Contractor, must secure the services of a professional sealing company with at least (5) years of experience. Sealants of a type related to the local climatic conditions and suitable for the purpose for which they are intended together with any preferred flashing is to be applied by a professional in such a manner to provide a water tight seal against weather penetration at all points of anchor curtain wall, substrate, backing, decking or roofing as necessary.
- L. Where possible design units with minimum welding to avoid heat applications which will change the tensile strength of the material.
- M. Build in expansion capacity to minimize distortion and oil canning of surfaces.

3.5 ADJUSTING AND PROTECTION

- A. Protection : Protect exterior sun control devices from damage during construction period including use of temporary protecting coverings where needed and approved by sun control device manufacturer. Remove Protective Covering at time of Completion Review

- B. Restoration : If necessary, restore exterior sun control devices damaged during installation and construction period, so that no evidence remains of corrective work.
 - 1. Clean and touch up minor abrasions in finishes with air dried coating that matches color and gloss of, as well as compatible with, factory applied finish coating.
 - 2. If results of restoration are unsuccessful, as determined by City's Representative remove damaged units and replace with new units.

3.6 CLEANING

- A. Progress Cleaning : Periodically clean exposed surfaces of sunshade (without the use of ladders) which are not protected by temporary covering, to remove dust and soiling during construction period ; do not let dust or soiling accumulate until final cleaning
- B. Final Cleaning : Before Completion Review, clean exposed surfaces with water and with a mild soap or detergent not harmful to finishes. Rinse thoroughly and dry surface.
- C. Units not to be walked upon or bare loads during or after installation.

END OF SECTION

SECTION 10800
WASHROOM ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Bathroom and handwash accessories.
 - 2. Under-lavatory guards.
- B. Related Sections include the following:
 - 1. Section 09221 "Non-Structural Metal Framing."
 - 2. Section 09290 "Gypsum Board" for tile substrate and wall material.
 - 3. Section 09300 "Tiling" for ceramic toilet and bath accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated on Drawings.
- C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by State.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.
- B. Brass: ASTM B 19 flat products; ASTM B 16 (ASTM B 16M), rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 1 1/4" (6.0 mm) thick.

- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 BATHROOM ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Specialties, Inc
 - 2. Bobrick Washroom Equipment, Inc.
 - 3. Bradley Corporation
 - 4. General Accessory Manufacturing Co. (GAMCO)
 - 5. Seachrome Corporation.
- D. Soap Dispenser (SD):
 - 1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.
 - 2. Model: B-2111
 - 3. Description: Designed for dispensing soap in liquid form.
 - 4. Mounting: Vertically oriented, surface mounted.
 - 5. Capacity: 40 oz.
 - 6. Materials: Stainless steel tank-type soap dispenser, filled from the top. Valve is black molded plastic push button with antibacterial-soap-resistant plastic cylinder and stainless steel spring.
 - 7. Refill Indicator: Window type.
- E. Paper Towel Dispenser at Restroom (PTD-1):
 - 1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.
 - 2. Model: B-2620

3. Description: Touch free pull towel dispenser, dispenses C-fold and multifold paper towels 3-18" to 3-13/16" (79-97mm) deep. TowelMate accessory Bobrick Part No.262-130 shall be provided. TowelMate accessory allows for paper towels to dispense one at a time without bulging, sagging, or falling through the towel tray opening. Paper towels are dispensed with pull force of less than 5 pounds (22.2 N).
 4. Mounting: Surface.
 5. Minimum Capacity: 400 C-fold or 525 multifold paper towels. Slots in sides of cabinet indicate refill time.
 6. Material and Finish: Type 304, 22 gauge stainless steel cabinet and door with all-welded construction; exposed surfaces shall have satin finish. Door shall be secured to cabinet with a full-length stainless steel piano-hinge and equipped with a knob latch. Paper towel tray shall have a hemmed opening to dispense paper towels without tearing.
 7. Lockset: Knob latch.
- F. Paper Towel Dispenser at Break Room (PTD-2):
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.
 2. Model: B-2621
 3. Description: Touch free pull towel dispenser, dispenses C-fold and multifold paper towels 3-18" to 3-13/16" (79-97mm) deep. TowelMate accessory Bobrick Part No.262-130 shall be provided. TowelMate accessory allows for paper towels to dispense one at a time without bulging, sagging, or falling through the towel tray opening. Paper towels are dispensed with pull force of less than 5 pounds (22.2 N).
 4. Mounting: Surface.
 5. Minimum Capacity: 200 C-fold or 275 multifold paper towels. Slots in sides of cabinet indicate refill time.
 6. Material and Finish: Type 304, 22 gauge stainless steel cabinet and door with all-welded construction; exposed surfaces shall have satin finish. Door shall be secured to cabinet with a full-length stainless steel piano-hinge and equipped with a knob latch. Paper towel tray shall have a hemmed opening to dispense paper towels without tearing.
 7. Lockset: Knob latch.
- G. Grab Bar (GB):
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.
 2. Model: B-6806 Series, see drawings for length.
 3. Mounting: Flanges with concealed fasteners.

4. Material: Stainless steel, 0.05 inch (1.2 mm) thick.
 - a. Finish: Smooth, No. 4, satin finish.
5. Outside Diameter: 1-1/2 inches (38 mm).
6. Configuration and Length: As indicated on Drawings.

H. Toilet Tissue Dispenser (TPD):

1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.
2. Model: B-2888
3. Description: Double-roll dispenser with door.
4. Mounting: Surface mounted.
5. Capacity: Designed for 4-1/2- or 5-inch- (114- or 127-mm-) diameter tissue rolls.
6. Material and Finish: Stainless steel, No. 4 finish (satin).

I. Mirror Unit:

1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.
2. Model: B-165 1830
3. Mirror: No. 1 quality, 1/4" (6mm) select float glass: selected for silvering, electrolytically copper-plated by the galvanic process. Back is protected by full-size, shock-absorbing, water-resistant, nonabrasive, polyethylene padding.
4. Frame: Stainless-steel channel.
 - a. Corners: Mitered and mechanically interlocked.
5. Concealed Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
6. Size: 18" x 30".

2.3 UNDERLAVATORY GUARDS

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

- B. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. Plumberex Specialty Products, Inc.
 - 2. TCI Products.
 - 3. Truebro, Inc.
- C. Underlavatory Guard:
 - 1. Basis-of-Design Product: Plumberex Specialty Products, Inc.
 - 2. Model: Handy-shield
 - 3. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.
 - 4. Material and Finish: Antimicrobial, molded-plastic, white.

2.4 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six (6) keys to State's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.

- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

DIVISION 12 – FURNISHINGS

SECTION 12492

MANUAL ROLLER SHADES

PART 1 - GENERAL

1.1 SCOPE

A. SUPPLIER:

1. Furnish and install Manual Roller Shades (Premium Quality).

B. RELATED WORK SPECIFIED ELSEWHERE:

1. Section 06100: Rough Carpentry
2. Section 08520: Aluminum Windows

1.2 REFERENCES

A. FLAME-RESISTANT MATERIALS SHALL PASS OR EXCEED ONE OR MORE OF THE FOLLOWING TESTS:

1. National Fire Protection Association (NFPA) 701 (small scale for horizontal applications)
2. Department of Transportation Motor Vehicle Safety Standard 302 Flammability of Interior Materials
3. California Administrative Code Title 19
4. Federal Standard 191 Method 5903 (used by Port Authority of New York and New Jersey for drapery, curtain, and upholstery material).
5. Boston Fire Department Teat BFT IX-1
6. New York State Uniform Fire Prevention and Building Code.

1.3 SUBMITTALS

A. Product data:

1. Manufacturer's descriptive literature shall be submitted indicating materials, finishes, construction and installation instructions and verifying that product meets requirements specified. Manufacturer's recommendations for maintenance and cleaning shall be included.

B. Sample:

1. Responsible State or agent shall supply one sample shade of each type specified in this contract for approval. Supplied units shall be furnished complete with all required components, mounting and associated hardware, instructions and warranty.

1.4 QUALITY ASSURANCE:

A. Supplier:

1. Manufacturer, subsidiary or licensed agent shall be approved to supply the products specified, and to honor any claims against product presented in accordance with warranty.

B. Installer:

1. Installer or agent shall be qualified to install specified products by prior experience, demonstrated performance and acceptance of requirements of manufacturer, subsidiary, or licensed agent. Installer shall be responsible for an acceptable installation.

C. Uniformity:

1. Provide Manual Roller Shades of only one manufacturer for entire project.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Product shall be delivered to site in manufacturer's original packaging.

B. Product shall be handled and stored to prevent damage to materials, finishes and operating mechanisms.

1.6 JOB CONDITIONS:

A. Prior to shade installation, building shall be enclosed.

B. Interior temperature shall not exceed 80%. Wet work shall be complete and dry.

1.7 WARRANTY

A. Product shall be delivered to site in manufacturer's original packaging.

B. Product shall be handled and stored to prevent damage to materials, finishes and operating mechanisms.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MAUFACTURERS:

A. Hunter Douglas Contract/ 13915 Danielson St., Ste. 100/ Poway, CA 92064/ Phone: 800-727-

8953 Fax 800-205-9819/ Website: www.hunterdouglascontract.com. Contact the following for project assistance and dealer referral at 800-964-2580:, (Western/Mountain/Upper Midwest) David Cover ext. #827313

- B. or architect approved equivalent. Product substitutions must be approved by architect minimum of 30 days prior to close of bid.

2.2 MANUAL ROLLER SHADES

A. Product:

1. Hunter Douglas “Manual Roller Shades”.
 - a. Model: RB 500 Roller Shade
 1. Heavy Duty Clutch System with Fascia

B. Materials:

1. Fabrics:
 - a. Inherently anti-static, flame retardant, fade and stain resistant, light filtering, room darkening, & blackout fabrics providing 0% -15% openness factors. Fabric weights to range between 6.00 oz/sq. yd. - 20.70 oz/sq. yd. Containing fiberglass, PVC, Polyester, acrylic, vinyl laminates, cotton, & vinyl coatings. Finish selected by architects from manufacturer's available contract colors.
2. Control System:
 - a. Adjustment-free, heavy duty, continuous qualified #10 stainless steel ball chain ((90-lb. Test)) and pulley clutch operating system allows precise control and ensures a uniform look. Clutch will develop no more than 1/2-lb drag for ease of lifting. Glass reinforced polyester thermopolymer (PBT) plastic components conform to military specification MIL M-24519 and designed for smooth, trouble-free operation.

2.3 FABRICATION

- A. Shade measurements shall be accurate to within +1/8” or as recommended in writing by manufacturer.

2.4 FABRICS

- A. Fabric selection from the following: (0% Openness) Avila Twilight, Edessa Twilight, Geneva Twilight, Flocke, Morocco, Pima, Sheerweave 7000, Sheerweave 7100, Sheerweave 7300 (1% Openness) GlacierScreen HD2001, GreenScreen Revive 1%, E Screen 7501, Vizela, Sheerweave 7350, Sheerweave 2701, Sheerweave 4800 (3% Openness) GlacierScreen HD1003, GlacierScreen HD2003, GreenScreen Eco, GreenScreen Revive 3%, T Screen, E Screen 7503, E Screen 7703 KoolBlack, M Screen 8503, T Screen, Sheerweave 2410, Sheerweave 2410 Performance +, Infinity2, Sheerweave 2703, Sheerweave 4400, Sheerweave

4600, Sheerweave 4650, (4% Openness) Star 2115 (5% Openness) GlacierScreen HD1005, E Screen 7505, E Screen 7705 KoolBlack, Cortina, Satine, M Screen 8505, M Screen Deco, SilverScreen, Sheerweave 2000, Sheerweave 2390, Sheerweave 2390 Performance +, Sheerweave 2705, Sheerweave 4000, Sheerweave 4500, Sheerweave 4550, Sheerweave 4700, Sheerweave 5000, (7% Openness) Siena (10% Openness) GlacierScreen HD1010, E Screen 7510, Vienne, New Orleans, Sheerweave 2100, Sheerweave 2360, Sheerweave 2710, Sheerweave 4100 (12% Openness) Natte (14% Openness) A Screen, Sheerweave 3000.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Subcontractor shall be responsible for inspection on site, approval of mounting surfaces, installation conditions and field measurement for this work.
- B. Other interacting trades shall receive drawings of shade systems, dimensions, assembly and installation methods from subcontractor upon request.

3.2 INSTALLATION

- A. Installation shall comply with manufacturer's specifications, standards and procedures as detailed on contract drawings.
- B. Adequate clearance shall be provided to permit unencumbered operation of shade and hardware.
- C. Clean finish installation of dirt and fingermarks. Leave work area clean and free of debris.

3.3 DEMONSTRATION

- A. Demonstrate operation method and instruct owner's personnel in the proper operation and maintenance of the blinds.

3.4 SCHEDULE:

- A. Exterior Windows: See window schedule in drawings.
- B. Interior Windows: See window schedule in drawings.

END OF SECTION

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13281

REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING MATERIALS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish all labor, materials, and equipment necessary to carry out the safe removal and disposal of all asbestos containing materials (ACM) and suspected ACM as necessary for the safe performance of the renovation project in compliance with the Specifications and all applicable Federal, State and Local laws and regulations. If there is a conflict with the requirements, the more stringent requirement shall apply. Ignorance of the above requirements and any applicable regulations resulting in additional cost to the Contractor shall not be reimbursable or billable to the Engineer. Any question regarding conflict or inconsistency between Specification and/or regulations should be directed to the Engineer's authorized representative.
- B. The asbestos abatement work shall include, but may not be limited to:
 - 1. Removal and disposal of ACM from the areas affected by the Project. ACM is identified the *Limited Hazardous Materials Survey Report, Hawaii District Land Division Headquarters in Hilo, Hilo, Hawaii, Hawaii*, dated December 28, 2018, was prepared by EnviroServices & Training Center, LLC.
 - 2. The Contractor is responsible for conducting his own site visit to verify all quantities and material locations.
 - 3. The Contractor is responsible for conducting all work without disturbing ACM to remain in place.

1.2 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only, and include but are not limited to, the following:
- B. CODE OF FEDERAL REGULATIONS (CFR)
 - 29 CFR 1926.103 Respiratory Protection
 - 29 CFR 1926.51 Sanitation
 - 29 CFR 1926.200 Accident Prevention Signs and Tags
 - 29 CFR 1926.59 Hazard Communication
 - 29 CFR 1926.1101 Asbestos, Tremolite, Anthophyllite, Actinolite
 - 40 CFR 61-SUBPART A General Provisions
 - 40 CFR 61-SUBPART M National Emission Standard for Asbestos

40 CFR 763 Asbestos Containing Material in Schools
49 CFR 172 Hazardous Materials, Tables, and Hazardous Materials Communications Regulations
49 CFR 178 Shipping Container Specification

C. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 560/5-85-024 Guidance for Controlling ACM in Buildings

D. HAWAII OCCUPATIONAL SAFETY AND HEALTH (HIOSH)

12-114.2 Personal Protective Equipment
12-121.2 Fall Protection
12-122.2 Materials Handling, Storage, Use, and Disposal
12-145.1 Asbestos
12-151 Hazardous Waste Operations and Emergency Response

E. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z9.2 (1979; R 1991) Fundamentals Governing the Design and Operation of Local Exhaust Systems
ANSI Z88.2 (1992) Respiratory Protection

F. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 1368 (1990) Visual Inspection of Asbestos Abatement Projects
ASTM E 1494 (1992) Encapsulants for Spray- or Trowel-Applied Friable Asbestos-Containing Building Materials

G. UNDERWRITERS LABORATORIES INC. (UL)

UL 586 (1990) High-Efficiency, Particulate, Air Filter Units

1.3 DEFINITIONS

A. Abatement: Procedure to control fiber release from asbestos containing material.

1. Removal: Shall adhere to all specified procedures herein and shall include the proper removal and disposal of asbestos containing material as per all applicable Federal, State and local rules, regulations, and industry standards.
2. Post-Removal Surface Encapsulation: Procedures necessary to coat surfaces from which ACM have been removed to control any residual fiber release.

B. Amended Water: Water containing a wetting agent or surfactant with a maximum surface tension of 2.9 Pa (29 dynes per square centimeter) when tested in accordance with ASTM D 1331.

- C. Asbestos: The term asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, and actinolite asbestos and any of these minerals that has been chemically treated or altered.
- D. Asbestos Containing Material (ACM): Materials that contain more than one percent asbestos as determined by Polarized Light Microscopy or Transmission Electron Microscopy.
- E. Asbestos Control Area: That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris.
- F. Asbestos Fibers: Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by NIOSH Method 7400.
- G. Asbestos Permissible Exposure Limit (PEL): 0.1 fibers per cubic centimeter of air as an 8-hour time weighted average measured in the breathing zone as defined by 29 CFR 1926.1101 or other Federal legislation having legal jurisdiction for the protection of workers health.
- H. Background: The ambient airborne asbestos concentration in an uncontaminated area as measured prior to any asbestos hazard abatement efforts. Background concentrations for other (contaminated) areas are measured in similar but asbestos free locations.
- I. Certified Clean: Certification that a work area has no visible signs of fibrous materials or other contamination, and does not have levels of airborne fibers above the defined air clearance criteria.
- J. Competent Person: As used in this section, refers to a person employed by the Contractor who is trained in the recognition and control of asbestos hazards in accordance with current federal, State, and local regulations and has the authority to take prompt corrective actions to control the asbestos hazards.
- K. Contractor: The Contractor is that individual, or entity engaged under contract to the Engineer or General Contractor to remove, encapsulate and/or dispose of ACM.
- L. Decontamination Facility (DF) or Area: A series of connected rooms or spaces including Clean, Shower, and Contaminated Equipment Areas, used for both the decontamination of all workers, equipment and their personal protective equipment upon departing an asbestos removal work area, and for access to such work areas.
- M. Engineer's Authorized Representative: The person or persons designated by the Engineer to act on his/her behalf, who performs inspection activities during abatement and renovation work and shall have the authority to initiate engineering controls.
- N. Fixed Object: A unit of equipment or furniture in the work area which cannot be removed from the work area without dismantling.
- O. Friable Asbestos Material: ACM that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

- P. High Efficiency Particulate Air (HEPA) Filter Equipment: HEPA filtered vacuum and/or exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters shall retain 99.97 percent of particles 0.3 microns or larger as indicated in UL 586.
- Q. Non-Friable ACM: ACM in which the asbestos fibers have been immobilized by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not normally release asbestos fibers during any appropriate use, handling, storage or transportation. It is understood that Non-Friable ACM may release asbestos fibers under other conditions such as demolition, removal, or mishap.
- R. Post-Removal Encapsulant: A liquid material applied to surfaces from which ACM has been removed, to control the possible release of residual fibers, either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components (penetrating encapsulant).
- S. Surfactant: A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.
- T. Wetting Agent: A chemical added to water to reduce the water's surface tension thereby increasing the water's ability to soak into the material to which it is applied.

1.4 ABBREVIATIONS

- A. ANSI: American National Standards Institute, Inc.
- B. CFR: Code of Federal Regulations
- C. HIOSH: Division of Occupational Safety and Health, Department of Labor and Industrial Relations, State of Hawaii
- D. EPA: U.S. Environmental Protection Agency
- E. NESHAP: National Emission Standards for Hazardous Air Pollutants
- F. NIOSH: National Institute for Occupational Safety and Health
- G. OSHA: Occupational Safety and Health Administration
- H. State: State of Hawaii

1.5 AUTHORITY TO STOP WORK

- A. The Engineer's authorized representative has the authority to stop the abatement work at any time they determine that conditions are not within the drawing/specification requirements and applicable regulations. The work stoppage shall continue until corrective steps have been taken and specified conditions restored to the satisfaction of the Engineer's authorized representative. Standby time required to resolve violations shall be at the Contractor's expense. Stop Work

Orders may be issued for, but shall not be limited to the following:

- B. Excessive airborne fibers inside (>0.5 f/cc) and/or outside (>0.01 f/cc) the work area.
- C. Visible emissions of dust or debris going beyond the work area boundaries.

1.6 SUBMITTALS

- A. Submit in accordance with SECTION 01300 – SUBMITTALS.
- B. Detailed Schedule: Submit the actual start date and completion dates for each phase of the asbestos removal.
- C. Notices: As regulated by each agency and before commencement of any on-site project activity send written notice of the proposed asbestos abatement work as early as possible but at least 10 working days prior to commencement of work in accordance with Hawaii Administrative Rules, Title 11, 501. Send notice with copies to the Engineer's authorized representative and to the following agencies:
 - 1. State of Hawaii, Department of Health, "Notification of Demolition and Renovation" form. Send to: Noise, Radiation and Indoor Air Quality Branch, Asbestos Abatement Office, State of Hawaii, 99-945 Halawa Valley Street, Aiea, Hawaii 96701.
- D. Permits and Licenses: Submit copies of all permits, licenses and arrangement for removal, transportation and disposal of ACM no later than 20 consecutive working days from notice of award unless otherwise instructed in writing by the Engineer's authorized representative.
- E. Landfill Approval: Submit written evidence that the landfill for disposal is approved for asbestos disposal by the EPA and Hawaii regulatory agency(s).
- F. Manufacturer's Data: Submit copies of manufacturer's specifications, installation instructions and field test materials for all equipment related to asbestos handling and abatement, including any other data that may be required to demonstrate compliance with these Specifications and proposed uses.
- G. Samples: Submit samples of the following items for approval prior to ordering materials:
 - 1. Asbestos encapsulant(s): Copies of manufacturer's literature including all laboratory data, SDS, and application instructions.
 - 2. Plastic sheeting: Three 8-1/2 by 11-inch pieces of each thickness and type with labels indicating actual mil thickness.
 - 3. Surfactant: Copies of manufacturer's literature including all laboratory data, MSDS, and mixing and application instructions.
 - 4. Tapes and adhesives: Copies of manufacturer's literature including all laboratory data.

5. Warning labels and signs.
 6. Protective clothing: Copies of manufacturer's literature on all protective clothing and one sample of each item. Samples submitted will be returned to the Contractor.
 7. Respiratory equipment: Copies of manufacturer's literature on all respiratory equipment and one sample of each item along with a description of where and how each item will be used. Samples submitted will be returned to the Contractor.
- H. Shop Drawings: Submit no later than 10 consecutive working days from award notice, copies of shop drawings for the following items as a minimum:
1. Description of any equipment to be employed not discussed in this Section.
 2. Security provisions, if any, in and around the project area.
 3. Outline of work procedures to be employed.
 4. Location and construction of all airtight barriers.
 5. Staging of the work.
 6. Entrances and exits to the work place.
 7. Location and construction of worker and equipment decontamination units.
 8. Type of respiratory protection to be used.
 9. Water filtration system for all contaminated water.
 10. Existence and location of negative air exhaust ports and containment.
- I. Asbestos Abatement Plan: Contractor shall develop, submit for approval to the Engineer's authorized representative no later than 15 consecutive days from notice of award, and implement a work procedure for abatement work describing work practices and engineering controls to be used to prevent emissions of asbestos from the work site, ensure maximum site safety and safeguard the public, workers and the environment from asbestos exposure. The Asbestos Abatement Plan will be a detailed plan of the safety precautions such as lockout-tagout, fall protection, and equipment, and work procedures to be used in the removal of ACM. The plan shall be prepared, signed, and sealed by a State of Hawaii Certified Project Designer. Such plan shall include but not be limited to the precise personal protective equipment protection, the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, and a detailed description of the method to be employed in order to control environmental pollution. This plan must be approved in writing prior to starting any asbestos work. The Contractor and the Engineer's authorized representative shall meet prior to the start of work to discuss in detail the standard

operating procedures. Once approved by the Engineer's authorized representative, the plan will be enforced as if an addition to the Specification.

- J. Documentation of Training: Submit no later than 10 consecutive working days from notice of award, documentation that each and every individual, including foreman, supervisors, other company personnel or agents, and any other individual who may be exposed to airborne asbestos fibers and who may be responsible for any aspects of abatement activities which may occur, has currently attended and passed the AHERA Abatement Worker and/or AHERA Abatement Contractor/Supervisor course, whichever is relevant to that workers responsibilities, as specified in Hawaii Administrative Rules, Title 11, 504 and 40 CFR Part 763, "Asbestos Materials in Schools". These courses shall be approved by the State of Hawaii Department of Health in the most current listing of the Federal Register. Also submit documentation that all individuals have current certification for the appropriate course from the State of Hawaii. No worker shall be allowed on site if they are found to have either an expired certification or do not comply with the requirements set forth in Hawaii Administrative Rules, Title 11, 501-504 and 40 CFR Part 763 on training. The Contractor shall be responsible for keeping the documentation up to date and submitting subsequent documentation to the Engineer's authorized representative before any additional employee or individual, not currently on the list, is allowed within the project site.
- K. Documentation of Instructions: Submit no later than 10 consecutive working days from notice of award, documentation that all personnel or agents who may be exposed to airborne asbestos fibers and who may be responsible for any aspects of abatement activities which may occur have had instructions on the nature of the activities and operations which create a risk of asbestos exposure and the necessary protective steps, on use and fitting of respirators in accordance with qualitative procedures as detailed in HIOSH 12-145.1 Appendix C, Qualitative and Quantitative Fit Testing.
- L. Documentation From Physician: Submit no later than 10 consecutive working days from notice of award, documentation from a licensed medical doctor that all employees or agents who may be required to wear a respirator have been provided with an opportunity to be medically monitored to determine whether they are physically capable of working while wearing the required respirator without suffering adverse health effects. In addition, document that all individuals permitted within the project site have received medical monitoring or had such monitoring made available to them as required in HIOSH 12-145.1. The Contractor must be aware of and provide information to the examining physician about unusual conditions in the work place environment (e.g. high temperatures, humidity, chemical contaminants) that may impact the employee's ability to perform work activities. The Contractor shall keep and make available to all affected individuals a record and the results of such examinations.
- M. Medical Surveillance Program: Submit no later than 10 consecutive days from notice of award, all medical examinations for employees to be used on this project and a copy of the Contractor's medical surveillance program prepared in accordance with all applicable Federal, State and local laws.
- N. Respiratory Protection Program: Submit no later than 10 consecutive working days from notice of award, a copy of the Contractor's Respiratory Protection Program prepared in accordance

with all applicable laws. The Contractor shall also submit fit test records on all employees to be used on this project who may be required to wear a respirator.

- O. Hazard Communication Program: Submit no later than 10 consecutive working days from notice of award, a copy of the Contractor's Hazard Communication Program prepared in accordance with all applicable laws.
- P. Safety Program: Submit no later than 10 consecutive working days from notice of award, a copy of the Contractor's Health and Safety Plan prepared in accordance with all applicable laws.
- Q. HEPA Vacuums: Submit no later than 10 consecutive working days from notice of award, manufacturer's certification that vacuums conform to ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems as applicable to this project.
- R. Rental Equipment: When rental equipment is to be used in abatement areas or to transport asbestos contaminated waste, a written notification concerning intended use of the rental equipment must be provided to the rental agency with a copy submitted to the Engineer's authorized representative.
- S. Testing Laboratory: Submit no later than 10 consecutive working days from notice of award name, address and telephone number of testing laboratory responsible for analysis and report of airborne fiber concentration for compliance with HIOSH 12-145.1 and this specification, along with evidence that the air monitoring testing laboratory is a successful participant in the American Industrial Hygiene Association's (AIHA) Proficiency Analytical Testing (PAT) program for phase contrast microscopy (PCM).
- T. Emergency Planning and Procedures: The Contractor shall submit an emergency plan prior to abatement initiation for review and acceptance by the Engineer's authorized representative.
 - 1. Emergency procedures shall be in written form and prominently posted adjacent to the Health and Safety Plan. Prior to entering the work area, everyone must read and sign these procedures to acknowledge receipt of emergency exits and emergency procedures.
 - 2. Emergency planning shall include notification of police, fire, and emergency medical personnel of the work schedule of the planned abatement activities, and of the layout of the work area, particularly any barriers that may affect response capabilities.
 - 3. Emergency planning shall include considerations of fire, explosion, toxic atmosphere, electrical hazards, slips, trips and falls, confined spaces, and heat related injury. Written procedures shall be developed and employee training procedures shall be provided in the Contractor's plan.
- U. Visitor/Worker Entry Log: Maintain a log of all personnel including the Contractor's employees and agents who enter the work area while asbestos abatement operations are in progress, until final clearance is passed. The log shall contain the following information as a minimum and certified copies shall be submitted to the Engineer's authorized representative weekly:

1. Date of visit.
2. Visitor's name, employer, business address, and telephone number.
3. Time of entry and exit from work area.
4. Purpose of visit.
5. Type of protective clothing and respirator worn.
6. Certificate of release signed and filed with the Contractor.

V. Field Test Reports

1. Employee Exposure Sampling Results: Submit test results to the Engineer's authorized representative and the affected Contractor's employees within three (3) working days, signed by the testing laboratory employee performing the analysis.
2. Asbestos Disposal Quantity Report.

- W. Waste Disposal Manifest Forms: Submit copies of all transport manifests, trip tickets and disposal receipts for all asbestos containing waste materials no later than 10 consecutive working days from the date the waste is removed from the work area during the abatement process.

X. PRODUCT HANDLING

Deliver materials to the site in original packaging, containers or bags fully identified with manufacturer's name, brand and lot number. Store materials in a dry, well-ventilated space under cover, off the ground and away from surfaces subject to dampness or condensation as approved by the Engineer's authorized representative. Material that becomes contaminated with asbestos shall be disposed of in accordance with applicable regulations. Replacement materials shall be stored outside the contaminated work area until abatement is completed.

1.7 PROTECTION

A. Site Security:

1. The work area is to be restricted only to authorized, trained, and protected personnel. These may include the Contractor's employees, the Engineer's authorized representative, State and local inspectors and any other designated individuals. A list of authorized personnel shall be established prior to job start.
2. Entry to the work area by unauthorized individuals shall not be permitted without the express approval of the Engineer's authorized representative and any such entry shall be reported immediately to the Engineer's authorized representative by the Contractor.
3. A Visitor/Worker Entry Log shall be maintained.

4. The Contractor shall have control, subject to approval of the Engineer's authorized representative, of security in the work area and in proximity of Contractor's equipment and materials.
- B. Site Protection and Safety: As a minimum, follow the requirements of all applicable Federal, State and local regulations. Take all necessary precaution to ensure there is no asbestos contamination to those areas not included in the work schedule.
- C. Protective Covering: The Contractor shall provide and install protective covering as required or upon request by the Engineer's authorized representative. Protective covering shall be unused plastic sheets.
- D. Safeguarding of Property: The Contractor shall take whatever steps necessary to safeguard his work area, any property of the Engineer, and all other individuals in the vicinity of his work area during the execution of this Contract. The Contractor shall be responsible for and shall compensate to the injured party's satisfaction any and all damages resulting from their employee's negligence.

1.8 ADDITIONAL REQUIREMENTS

- A. The Contractor shall examine and have at all times in his possession at his office (one copy) and in view at each job site office (one copy) the following materials:
 1. Hawaii Administrative Rules, Title 11, Chapters 501, 502, 503 and 504;
 2. Title 29 Code of Federal Regulations Part 1926.62; Safety and Health Standards;
 3. Title 29 Code of Federal Regulations Part 1926.1101; Asbestos;
 4. Title 29 Code of Federal Regulations Part 1910.134; Respiratory Protection;
 5. Title 40 Code of Federal Regulations Part 261; Identification and Listing of Hazardous Waste;
 6. Title 40 Code of Federal Regulations Part 262; Standards Applicable to Generators of Hazardous Waste;
 7. Title 40 Code of Federal Regulations Part 263; Hazardous Waste Transporters;
 8. Copies of any other applicable Federal, State and local regulations, standards, documents and codes;
 9. Documentation of the adequacy of compressed air systems and respiratory protection system including a list of compatible components and specifications of the types and maximum number of respirators that may be used with the system;
 10. Copies of the procedures for the use of the decontamination enclosure system or any other procedures which have been established to prevent contamination or areas outside the work

area;

11. Copies of procedures to be followed during medical emergencies, including phone numbers of the nearest hospital or other emergency facility, which shall be posted by the nearest telephone;
 12. Copies of the Contractor's Respiratory Protection Program, Hazardous Communication Program, Safety Program and Asbestos Abatement Plan;
 13. Copies of Material Safety Data Sheets for all chemicals used;
 14. Copies of all relevant certificates held by abatement workers and abatement contractors/supervisors actively engaged in the abatement project;
 15. Certification of the Project Designer who wrote procedures for the job;
 16. Copies of bulk sampling results, including inspector and laboratory names, of all suspect material to be disturbed that is not assumed to be asbestos-containing; and
 17. Records of all air sampling as required in HIOSH section 12-145.1-5.
- B. Whenever approval of the Engineer's authorized representative is required prior to proceeding with other work, the Contractor shall comply with the following:
1. The Contractor shall give, at a minimum, five (5) days notification to the Engineer's authorized representative prior to the start of any asbestos work.
 2. The Contractor shall not begin any work without the Engineer's authorized representative present onsite.
 3. The Contractor shall allow the Engineer's authorized representative 24 hours from notification to respond to the request for site inspection(s).
 4. The Contractor shall designate one person (either a foreman or superintendent) who will be authorized to request inspections. The name of the designated person shall be submitted in writing to the Engineer's authorized representative prior to commencing work. Requests from any other person will not be considered official requests.
 5. The designated person requesting an inspection shall provide the following information:
 - a. Name of caller.
 - b. Building and rooms to be inspected.
 - c. Work phase of inspection, as specified.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Plastic Sheetting: 6-millimeter-minimum-thickness polyethylene film.
- B. 6-mil Plastic Bags: Transparent, 6-millimeter minimum thickness, seamless bottomed polyethylene bags. All bags used to transport ACM must carry the DOT class 9 label, a space for generator information and the following warning:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

- C. Tape: Tape shall be capable of sealing joints of adjacent sheets of polyethylene, attaching polyethylene sheeting to finished or unfinished surfaces of dissimilar materials and adhering under both dry and wet conditions such as when amended water is used.
- D. Adhesives: Adhesive shall be capable of sealing joints of adjacent sheets of polyethylene, attaching polyethylene sheeting to finished or unfinished surfaces of dissimilar materials and adhering under both dry and wet conditions such as when amended water is used.
- E. Encapsulant: The encapsulant shall be capable of being applied to surfaces of ACM and surfaces from which ACM has been removed to control the possible release of asbestos fibers. The encapsulant shall be capable of either creating a membrane over the surface (i.e. a bridging encapsulant) or penetrating into the material and binding its components (i.e. a penetrating encapsulant) and shall be compatible with the existing finishes.
- F. Post-Removal Encapsulation: The encapsulant shall be capable of being applied to surfaces from which asbestos-containing material has been removed to control the possible release of residual fibers. The encapsulant shall be capable of either creating a membrane over the surface (i.e. a bridging encapsulant) or by penetrating into the material and binding its components (i.e. a penetrating encapsulant) and shall be compatible with the existing finishes.
- G. Surfactant (Wetting Agent): 50 percent polyoxyethylene ester and 50 percent polyoxyethylene ether, or pre-approved equal, and shall be mixed with water to provide a minimum concentration of one ounce of surfactant to five (5) gallons of water.
- H. Warning Labels, Tape and Signs: As required by OSHA 29 CFR 1926.1101 and HIOSH regulation 12-145.1.
- I. Protective Clothing: The Contractor shall have all the coveralls required for this project on site prior to the start of work.
- J. Other Products: Provide all other materials including but not limited to, lumber, plywood, nails,

fasteners, metal studs, hardware, sealants, and caulking which may be required to properly prepare and complete this project.

2.2 TOOLS AND EQUIPMENT

- A. Provide sufficient and suitable tools for the asbestos abatement procedures, including but not limited to:
 - 1. Water Sprayer: Airless or pressure sprayer for amended water application as applicable.
 - 2. Paint/Encapsulant Sprayer: Airless type only.
 - 3. HEPA vacuum.
 - 4. Negative Air Pressure Units: Portable “exhaust units with air purification equipment in accordance with “Guidance for Controlling Asbestos Containing Materials in Buildings” (the Purple Book) EPA 560/5-85-024 June 1985, Appendix J – Recommended Specifications and Operating Systems Procedures for the Use of Negative Air Pressure Systems for Asbestos Abatement. Ensure that at least one functional back-up negative air pressure unit is on-site.
 - 5. Ladders or Scaffolds: All ladders and scaffolds shall be OSHA approved, and shall be of sufficient dimensions and quantities so that all work surfaces can be easily and safely accessed by the workers, the Engineer’s authorized representative and other inspectors. Scaffold joints and ends shall be sealed with tape to prevent migration of asbestos fibers.
 - 6. Electrical Equipment: All electrical equipment shall be Underwriter’s Laboratory listed and approved, and shall have ground fault circuit interrupter protection, installed by a licensed electrician.
 - 7. Hand Power Tools: All hand power tools shall be equipped with HEPA–filtered local exhaust ventilation if used to drill, cut or otherwise disturb ACM.
 - 8. Other tools and equipment as necessary.

2.3 ELECTRICAL EQUIPMENT PROTECTION

- A. Non-current carrying metal parts of the Contractor’s fixed, portable and plug-connected equipment shall be grounded. Portable tools and appliances protected by a UL approved system of double insulation need not be grounded. All light and power circuits in the asbestos removal area shall be protected by ground fault circuit interrupters.
- B. Extension cords shall be the 3-wire type, protected from damage, and shall not be fastened with staples, hung from nails, or suspended with wires. Splices shall have soldered wire connections with insulation equal to the cable. Worn or frayed cords shall not be used.
- C. As necessary, safe lighting equipment for each work area shall be provided by the use of wire guard protected floodlights. Temporary wiring shall be properly insulated and substantially

supported. Circuits shall be properly designed and fused. All temporary lighting inside the asbestos removal area shall be weather-proofed.

2.4 PERSONAL PROTECTION REQUIREMENTS

- A. The contractor acknowledges that he alone is responsible for instruction and for enforcement of personal protection requirements and that these specifications provide only a minimum acceptable standard.
- B. Personal Protective Equipment (PPE)
 - 1. Respirators: Provide personnel engaged in pre-cleaning, cleanup, handling, removal and demolition of asbestos materials with respiratory protection as indicated in 29 CFR 1926.1101, - 29 CFR 1926.103 and 29 CFR 1910.134. Respirators shall be worn at all times within the work area and any other areas where workers may be exposed to asbestos.
 - 2. Outer protective clothing: Provide personnel exposed to asbestos with disposal “non-breathable,” whole body outer protective clothing, head coverings, gloves, and foot coverings. Provide disposal plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber gloves for comfort, but shall not be used alone. Make sleeves secure at the wrists, make foot coverings secure at the ankles, and make clothing secure at the neck by the use of tape. Reusable whole body outer protective clothing shall not be used.
 - 3. Additional safety equipment (e.g. hardhats meeting the requirements of ANSI Z89.1-1981, eye protection meeting the requirements of ANSI Z41.1-1967, disposable PVC gloves), as necessary, shall be provided to all workers.

PART 3 - EXECUTION

3.1 DECONTAMINATION AREA

- A. The decontamination area as outlined below shall be employed during removal work involving only exterior materials that do not extend to the interior, where all work is performed from the exterior and the work area is fully sealed off from the interior.
- B. General: The Contractor shall construct the decontamination area, acceptable to the Engineer’s authorized representative, adjacent to the work area. The decontamination area shall consist of an area covered by an impermeable drop cloth on the floor or horizontal working surface. The area must be of sufficient size as to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area.
- C. Access: In all cases, access between contaminated rooms or areas and clean rooms or areas shall be through the decontamination system.
- D. Cleaning: Work clothing and personal protective equipment must be cleaned in the decontamination area with a HEPA vacuum prior to removal. All equipment and surfaces or

containers filled with ACM must be cleaned in the decontamination area prior to removal.

- E. Clean Area: The Contractor shall establish a clean area adjacent to the decontamination area with sufficient space for storage of any worker's and agent's street clothes, personal effects and other non-contaminated items.

3.2 DECONTAMINATION ENCLOSURE SYSTEM

- A. The decontamination enclosure system as outlined below shall be employed during any abatement work involving indoor materials, including materials extending from the exterior to the interior such as window or vent sealant, except where openings to the interior are fully sealed and all work is performed from the exterior of the building.
- B. General: The Contractor shall construct the decontamination enclosure system or use portable units acceptable to the Engineer's authorized representative that are connected to the work area with framed-in or accordion tunnels. The Contractor shall line all tunnels with 6-mil plastic and shall seal this lining with tape at all joints. All vertical surfaces subject to observation from the exterior, non-contaminated areas shall be constructed of opaque materials.
- C. Access: In all cases, access between contaminated rooms or areas and the decontamination enclosure unit shall be through an airlock. In all cases, access between any two rooms/areas within the decontamination enclosure unit shall be through a curtained doorway.
- D. Decontamination Unit: Provide personnel decontamination unit within the asbestos control area in an area approved by the Engineer's authorized representative. The Unit shall contain the following:
 - 1. An Equipment Area with two doorways, one leading to the Work Area and another leading to the Shower Area.
 - 2. A Shower Area with two doorways, one leading to the Equipment Area and another leading to the Clean Area. An adequate supply of soap shall be maintained within this Shower Area. The Contractor must ensure that no leakage from the shower area occurs and that all wastewater shall be disposed of as contaminated or filtered through the wastewater filtering system.
 - 3. A Clean Area with two doorways, one leading to the Shower Area and another leading to a non-contaminated area outside the asbestos work area. The Clean Area shall have sufficient space for storage of any worker's and agent's street clothes, personal effects and other non-contaminated items.

3.3 NEGATIVE PRESSURE SYSTEM

- A. The negative pressure system outlined below shall be employed for all interior asbestos abatement work, including materials extending from the exterior to the interior such as window or vent sealant, except where openings to the interior are fully sealed and all work is performed from the exterior of the building.

- B. Local Exhaust System: Provide a local exhaust system in the asbestos control area in accordance with ANSI Z9.2 and 29 CFR 1926.1101 that will provide at least six air changes per hour within the negative enclosure. Local exhaust equipment shall be operated continuously until the asbestos control area is removed and shall be leak proof. To lengthen the life of the HEPA filter, the local exhaust system shall be equipped with a 10 micron particle arrestance pre-filter, a 5 micron particle arrestance secondary filter placed ahead of the HEPA filter. Maintain a minimum pressure differential in the work area of (-)0.08 inches of water gauge relative to the air pressure outside the work area. HEPA filters shall conform to ANSI Z9.2 and UL 586.
- C. Location of Exhaust Units: Locate units to ensure that the flow of air moves from the decontamination unit and passes through as much of the work area as is possible. The local exhaust system shall not terminate in an occupied space or near a ventilation intake.
- D. Filter Replacement: Change filters in the local exhaust units in accordance with the manufacturer's recommendations or when there is a loss of negative pressure. With the unit in operation change the prefilter and check for pressure drop. If the pressure drop remains, with the unit in operation change the secondary filter. If the pressure drop still remains, stop work, shut off the unit and replace the HEPA filter as per the manufacturer's recommendations. All used filters are to be disposed of as asbestos waste.

3.4 WASTEWATER FILTERING SYSTEM

- A. All wastewater shall be treated as contaminated with asbestos and shall be filtered using two in-line filter cartridges with 2" inlets and outlets and be removed from the site by the Contractor. The outlet of the first cartridge shall connect to the inlet of the second cartridge. The first cartridge shall contain six 100-micron prefilters and the second cartridge shall contain six 0.5-micron filters or equivalent staging according to type of filtering unit.
- B. One spare set of 100-micron prefilters shall be maintained at the site at all times to replace prefilters during cleaning. Maintain at least one set of 0.5-micron or equivalent filters at the site at all times for replacements as necessary.
- C. When prefilters become clogged, replace with spares, and wash out the prefilters in the Wash Area allowing drainage from the cleaning operation to go through the filtering system.
- D. When the final filters become clogged, remove the filters, replace with new, and dispose of the clogged filters as contaminated waste.
- E. Provide a holding tank for contaminated wastewater as required to prevent backup of water into the shower when the amount of water generated exceeds the flow rate of the filters.

3.5 WORK AREA PREPARATION

- A. Posting of Danger Signs: Post danger signs in and around the work area to comply with 29 CFR 1926.1101, HIOSH 12-145.1 and all other Federal, State and local requirements. Signs shall be posted at a distance sufficiently far enough away from the work area to permit a person to read the sign and take the necessary protective measure to avoid exposure.

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA

- B. Inspection of Building Openings: At the beginning of each work day, the Contractor shall inspect and ensure that all doors, windows and other openings of affected buildings are closed and locked.
- C. Critical Barrier Enclosures: Cover all openings including, but not limited to, glazed openings, doors, corridors, ducts, grilles, floor drains or plates, diffusers, vents, windows, electrical outlets, and any other penetrations to the work areas with two layers of 6-mil plastic and seal with tape.
- D. Decontamination System: Provide a decontamination area as described in section 3.1 for exterior work and decontamination enclosure system as described in section 3.2 for interior work.
- E. Pre-Cleaning/Wet-Wiping:
 - 1. Pre-clean fixed objects within the work area by using HEPA vacuum equipment and then wet-wiping as appropriate. All such fixed object will then be covered in 6-mil plastic sheeting and sealed with tape.
 - 2. Clean the work area using HEPA vacuum equipment and the wet-wiping as appropriate. Do not use dust generating methods such as dry sweeping or non-HEPA vacuuming.
- F. Plastic: Objects which may be contaminated during abatement or will be difficult to clean after abatement shall be taped and sealed in 6-mil plastic.
- G. Temporary Electricity: Existing Electrical service to the facility may be used for temporary electrical power during abatement and replacement work. However, the electrical power within the work area must be shut off. The contractor shall verify the locations of available electrical service or use generators as needed.
- H. Temporary Light: Provide a minimum of 35 foot-candles of illumination on surfaces for finishing operations and 100 foot-candles of illumination for removal operations. Provide 24-volt safety lighting.
- I. Temporary Water: Existing water services to the facility may be used as a temporary water source during construction. Locations of line tie-ins must be approved by the Engineer's authorized representative.
- J. Temporary Sanitation Facilities: The Contractor shall provide toilet facilities for the use of

Contractor personnel and agents during abatement work. Maintain toilet facilities in a clean and sanitary condition in compliance with all applicable Federal, State and local regulations.

- K. Temporary Fire Protection: The Contractor shall provide and maintain temporary fire protection equipment during the asbestos abatement operations. Equipment shall be of the appropriate type to fight fires associated with the materials to be found within the work area.
- L. Work Area Isolation and Protection: The Contractor shall isolate the work area for the duration of the project. The work area shall be protected subject to the approval of the Engineer's authorized representative.
- M. Warning Signs: The Contractor shall post warning signs that meet the requirements of OSHA 29 CFR 1926.1101 (k)(1) and (k)(2)(ii) at the outside door to the Decontamination System. The Engineer's authorized representative may also require that the Contractor post additional warning signs around the work area or at other potential exposure points.
- N. AFTER THE POSTING, SEALING AND TEMPORARY FACILITY WORK HAS BEEN COMPLETED, NOTIFY THE ENGINEER'S AUTHORIZED REPRESENTATIVE FOR APPROVAL BEFORE PROCEEDING WITH THE ABATEMENT.

3.6 REMOVAL OF ASBESTOS CONTAINING MATERIALS

- A. Surfaces to remain in areas where asbestos containing materials will be removed shall be covered with one layer of 6-mil plastic sheeting. Ventilation intake air sources shall be isolated or the system shall be shut down.
- B. Wet the asbestos containing materials with a wetting agent (amended water) using a fine mist sprayer prior to the start of abatement. Wetting agent shall continuously be applied to control the release of asbestos fibers from the ACM prior to and during removal.
- C. Carefully remove asbestos containing materials by lifting them in whole and unbroken pieces to the greatest extent possible. Continue to apply the wetting agent during removal to control dust. Avoid breaking and pulverizing the material.
- D. The Contractor is prohibited from using methods or removal that create excessive amounts of dust and debris.
- E. Waste debris shall be double bagged and sealed leak-tight in properly labeled 6-mil plastic bags immediately after removal. The Contractor shall not allow removed ACM to accumulate in work area. All gross debris created by the removal process shall be bagged and sealed before the main break and again at the end of each workday.
- F. Asbestos containing roof material that has been removed from the roof shall not be dropped or thrown to the ground. Material shall be carried or passed to the ground by hand or lowered to the ground via covered, dust-tight chute, crane or hoist.
- G. Intact asbestos containing roof materials and any debris that is not intact shall be lowered to the ground as soon as is practicable, but in no event later than the end of the work shift. While

the material is on the roof it shall either be kept wet, placed in an impermeable waste bag, or wrapped in plastic sheeting. Once lowered, unwrapped material shall be transferred to a closed receptacle.

- H. The Contractor shall minimize contamination of the work floor, the exterior of disposal containers, and all other surfaces within the work area.

3.7 CLEANUP

- A. All contaminated equipment and tools used for removal work shall be washed and cleaned in the work area prior to removing them from the work area. No washing of contaminated equipment and tools will be allowed outside the work area.

3.8 CLEARANCE

- A. Remove all visible accumulation of ACM and debris by HEPA vacuums, sponging, and wet-wiping.
- B. The Engineer's authorized representative will visually inspect the affected areas for residual asbestos debris and waste. The Contractor shall re-clean areas showing asbestos debris and waste. If re-cleaning is required, the Engineer's authorized representative will visually inspect for asbestos debris and waste after re-cleaning. This process will be repeated until the Engineer's authorized representative deems the area free of visible asbestos debris and waste.
- C. The work area shall be totally visibly clean before the remaining material is encapsulated. After the visual inspection has been passed, encapsulate all remaining materials.
- D. Interior Removal Work Area:
 - 1. Upon the approval of the Engineer's authorized representative, the work area shall be completely vacated for at least a 24 hour period after material encapsulation and enclosure to permit the Engineer's authorized representative to collect air clearance samples according to SECTION 13288 – TESTING/AIR MONITORING.
 - 2. If the air clearance sample results fail the clearance criteria, the Contractor shall be required to perform additional cleaning and decontamination. Once this has been completed, additional visual inspection and air clearance sampling shall be performed by the Engineer's authorized representative. If additional clearance testing is required due to a failed initial clearance test, the costs of such testing shall be the responsibility of the Contractor.
- E. If the work area passes the clearance criteria, the Contractor shall remove all signs, temporary barriers and materials when their use is no longer required.

3.9 DISPOSAL OF ASBESTOS CONTAINING MATERIAL

- A. Collect asbestos waste, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of

asbestos fibers and place them in properly labeled transparent 6-mil plastic seamless bottomed bags. Wastes within the bags must be adequately wet in accordance with 40 CFR 61-SUBPART M.

- B. Affix a warning and Department of Transportation (DOT) label to each bag or use bags preprinted with the approved warnings and DOT labeling. The name of the waste generator and the location at which the waste was generated shall be clearly indicated on the outside of each container.
- C. Vehicles used for transporting waste to the disposal sites shall have a completely enclosed, lockable storage compartment. Storage compartments shall be covered and sealed with a minimum of one layer of 6-mil plastic sheeting on the sides and top and two layers of 6-mil plastic sheeting on the floor. The compartments shall be thoroughly wet-cleaned and HEPA vacuumed following the disposal of each load at the approved disposal sites.
- D. Workers unloading bags at the disposal sites shall wear full body protective clothing and dual HEPA cartridge full-face air purifying respirators.
- E. Waste disposal manifest forms shall be properly completed to verify custody and ensure disposal of all ACM and asbestos contaminated waste at approved disposal sites. Forms shall be kept on file as directed by the Engineer's authorized representative. Copies shall be submitted to the Engineer's authorized representative no later than the next working day after each trip. It is the Contractor's responsibility to assure that any landfill used for disposal of asbestos containing or asbestos contaminated waste is approved for that purpose.

3.10 PAYMENT

- A. Payment for removal, hauling and disposal of ACM shall be made at the lump sum price bid as scheduled in the Proposal. The final payment will not be made until proper documentation of the disposal of ACM and related waste are submitted to the Engineer.

END OF SECTION

SECTION 13282

LEAD-CONTAINING PAINT CONTROL MEASURES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish all labor, materials and equipment necessary to complete the safe removal, transportation and disposal of lead-containing paint, including lead-based paint, in areas that may be affected by the renovation activities in compliance with the Specifications and all applicable Federal, State and Local laws and regulations. If there is a conflict with the requirements, the more stringent requirement shall apply. Ignorance of the above requirements and any applicable regulations resulting in additional cost to the Contractor shall not be reimbursable or billable to the State. Any question regarding conflict or inconsistency between Specification and/or regulations should be directed to the Engineer's authorized representative.
- B. The lead work shall include, but may not be limited to:
 - 1. Areas including any lead-containing paint (LCP), including lead-based paint (LBP), that is loose and flaking or areas where LCP/LBP has the potential to become airborne or otherwise create dust (i.e. from sanding, drilling, friction, etc.) during the renovation activities. Lead was detected on painted surfaces of structures at the site as specified in the *Limited Hazardous Materials Survey Report, Hawaii District Land Division Headquarters in Hilo, Hilo, Hawaii, Hawaii*, dated December 28, 2018, prepared by EnviroServices & Training Center, LLC. The Contractor shall be responsible for conducting a site visit to verify all quantities and material locations.
 - 2. Preparation of work areas and removal, transportation and disposal procedures. All work shall be performed as required of lead-containing and lead-contaminated materials by persons trained, knowledgeable and qualified in the techniques of handling and disposing of lead-containing and lead-contaminated materials and in the subsequent cleaning of lead-contaminated areas. Workers shall be EPA-certified lead workers and capable and willing to perform the work of this contract.
 - 3. Separation and recycling as scrap metal of renovation debris, steel components and miscellaneous metal elements. Debris and waste resulting from renovation work, except as otherwise specified, shall become the property of the Contractor.

1.2 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only, and include but are not limited to, the following.

B. CODE OF FEDERAL REGULATIONS (CFR)

- 29 CFR 1926.33 Access to Employee Exposure and Medical Record
- 29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists
- 29 CFR 1926.59 Hazard Communication
- 29 CFR 1926.62 Lead Exposure in Construction
- 29 CFR 1926.65 Hazard Waste Operations and Emergency Response
- 29 CFR 1926.103 Respiratory Protection
- 40 CFR 260 Hazardous Waste Management Systems: General
- 40 CFR 261 Identification and Listing of Hazardous Waste
- 40 CFR 262 Generators of Hazardous Waste
- 40 CFR 263 Transporters of Hazardous Waste
- 40 CFR 265 Interim Status Standard for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- 40 CFR 268 Land Disposal Restriction
- 40 CFR 745 Lead; Requirement for Lead-Based Paint Activities
- 49 CFR 172 Hazardous Materials, Tables, and Hazardous Materials Communications Regulations
- 49 CFR 178 Shipping Container Specification

C. HAWAII OCCUPATIONAL SAFETY AND HEALTH DIVISION (HIOSH)

- 12-114.2 Personal Protective Equipment
- 12-121.2 Fall Protection
- 12-122.2 Materials Handling, Storage, Use, and Disposal
- 12-148.1 Lead
- 12-151 Hazardous Waste Operations and Emergency Response

D. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI Z88.2 (1992) Respiratory Protection

E. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

HUD Guidelines for the Evaluation and Control of Lead Based Paint Hazards in Housing

F. UNDERWRITERS LABORATORIES INC. (UL)

- UL 586 (1990) High-Efficiency, Particulate, Air Filter Units

1.3 DEFINITIONS

- A. Action Level: Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period.
- B. Authorized Visitor: The Engineer's authorized representative, Inspector, air monitoring personnel, or a representative of any regulatory or other agency having jurisdiction over the

project.

- C. Competent Person: As used in this section, refers to a person employed by the Contractor who is trained in the recognition and control of lead hazards in accordance with current federal, State, and local regulations, has the authority to take prompt corrective actions to control the lead hazards and is an EPA-certified lead inspector or risk assessor.
- D. Contaminated Area: An area where unwanted toxic or harmful substance exists.
- E. Contractor: For this project, the Contractor is that individual, or entity under contract to the General Contractor to perform the herein listed work.
- F. Engineer's Authorized Representative: Authorized Engineer representative who is a Qualified Environmental Consultant (QEC), hired by the Engineer, who performs inspection activities during abatement and renovation work and shall have the authority to initiate engineering controls.
- G. EPA: United States Environmental Protection Agency
- H. High Efficiency Particulate Air (HEPA) Filter: HEPA filtered vacuuming equipment with a filter system capable of collecting and retaining lead-contaminated particulate. A high efficiency particulate filter demonstrates at least 99.97 percent efficiency against 0.3 micron or larger size particles.
- I. Lead: Metallic lead, inorganic lead compounds, and organic lead soaps. Excludes other forms of organic lead compounds.
- J. Lead-Based Paint (LBP): Protective or decorative coating which contains at least 1.0 mg per square centimeter of lead by area or at least 0.5 percent (5,000 milligrams per kilogram) of lead by weight.
- K. Lead Containing Paint (LCP): Protective or decorative coating which contains any detectable quantity of lead; includes Lead-Based Paint.
- L. Lead Control Area: A temporary area or structure or containment, sometimes equipped with HEPA filtered local exhaust, that prevents the spread of lead dust or debris. Usually critical barriers and physical boundaries are employed to isolate the lead control area and to prevent migration of lead contamination and unauthorized entry of personnel.
- M. OSHA: United States Department of Labor, Occupational Safety and Health Administration.
- N. Permissible Exposure Limit (PEL): 50 micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more or less than 8 hours in a work day, the PEL shall be determined by the following formula:
- O. $PEL \text{ (micrograms per cubic meter of air)} = 400/\text{number of hours worked per day}.$

- P. Physical Boundary: Area physically roped or partitioned off around lead control area to limit unauthorized entry of personnel.
- Q. Qualified Environmental Consultant (QEC): An EPA-certified Lead Inspector/Assessor and who is an Industrial Hygienist or similar safety professional with experience in enforcing lead safety regulations and performing airborne lead sampling.
- R. State: State of Hawaii

1.4 QUALITY ASSURANCE

- A. Engineer's authorized representative's responsibilities:
 - 1. Review and approve Contractor personnel training.
 - 2. Review and approve Contractor's Work Procedure Plan for conformance to the applicable reference standards.
 - 3. Inspect work for conformance to the Contractor's approved Work Procedure Plan.
 - 4. Schedule and conduct required air monitoring, inspection and reporting.
 - 5. Monitor work to verify that work is performed at all times in accordance with the requirements of this Specification.
 - 6. Monitor work to verify that adequate control is being maintained at all times of hazardous exposure to employees and to the environment.
 - 7. Be onsite during all worksite preparation and cleaning, be available by telephone, pager or answering service at all other times during the work and able to be present at the work site in no more than 2 hours.
 - 8. After final cleanup, verify that the lead control area is free of any visible lead paint chip debris, waste or dust and that final area air samples have lead concentrations at or below the background level.
- B. Safety and Health Compliance
 - 1. In addition to the detailed requirements of this Specification, the Contractor shall comply with laws, ordinances, rules, and regulations of Federal, State, and local authorities regarding removing, handling, storing, transporting, and disposing of lead waste materials.
 - 2. Comply with the applicable requirements of the current issue of 29 CFR 1926.62, HIOSH 12-148.1, and HIOSH 12-202-33.
 - 3. Where requirements of this Specification and the referenced documents vary, the most stringent requirement shall apply.

C. Pre-Construction Conference

1. The Engineer's authorized representative shall meet with the Contractor and Engineer to discuss in detail the work procedures, precautions and area and personal air monitoring to be employed.
2. If rental equipment is to be used during lead-containing material handling and disposal, notify the rental agency in writing concerning the intended use of the equipment. Submit a copy of the written notification to the Engineer's authorized representative.

1.5 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor acknowledges that he alone is responsible for the instruction of personnel in and enforcement of personal protection requirements. The Contractor shall comply with all requirements of 29 CFR 1926.62 and HIOSH 12-148.1. The Contractor shall also be responsible for complying with all applicable EPA regulations in regards to lead-containing materials.
- B. The Contractor shall examine and have at all times at his office (one copy) and in view at each job site (one copy) the following materials:
 1. State of Hawaii Department of Labor and Industrial Relations; Occupational Safety and Health Standards; Part 8, Section 12-148.1;
 2. Department of Housing and Urban Development; Office of Public and Indian Housing; Lead Paint Guidelines;
 3. Title 29 Code of Federal Regulations Part 1926.62; Safety and Health Standards;
 4. Title 29 Code of Federal Regulations Part 1910.134; Respiratory Protection;
 5. Title 40 Code of Federal Regulations Part 261; Identification and Listing of Hazardous Waste;
 6. Title 40 Code of Federal Regulations Part 262; Standards Applicable to Generators of Hazardous Waste;
 7. Title 40 Code of Federal Regulations Part 263; Hazardous Waste Transporters;
 8. Title 40 Code of Federal Regulations Part 745; Lead; Requirement for Lead-Based Paint Activities;
 9. Copies of any other applicable Federal, State and local regulations, standards, documents and codes;
 10. Copies of the procedures to be followed during medical emergencies, including phone

numbers of the nearest hospital or other emergency medical facility, which shall be posted by the nearest telephone;

11. Copies of the Contractor's Respiratory Protection Program, Hazardous Communication Program, Safety Program, and Work Procedure Plan;
 12. Copies of Safety Data Sheets for all chemicals used;
 13. Copies of the Contractor's Competent Person's qualifications and employee training Certificates; and
 14. Copies of Personal Air Monitoring results.
- C. Whenever approval of the Engineer's authorized representative is required prior to proceeding with other work, the Contractor shall comply with the following:
1. The Contractor shall give, at a minimum, five (5) days notification to the Engineer's authorized representative prior to the start of any lead work.
 2. The Contractor shall not begin any work without the Engineer's authorized representative present onsite.
 3. The Contractor shall allow the Engineer's authorized representative 24 hours from notification to respond to the request for site inspection(s).
 4. The Contractor shall designate one person (either a foreman or superintendent) who will be authorized to request inspections. The name of the designated person shall be submitted in writing to the Engineer's authorized representative prior to commencing work. Requests from any other person will not be considered official requests.
 5. The designated person requesting an inspection shall provide the following information:
 - a. Name of caller.
 - b. Building and rooms to be inspected.
 - c. Work phase of inspection, as specified.
- D. Pollution Control: The Contractor shall not contaminate the air, water, soil or other items with hazardous materials such as cleaning solutions, lead-containing paint or lead-contaminated debris and wastes, etc. The Contractor shall immediately clean the contaminated area and dispose of the waste in compliance with all Federal, State and local laws, ordinances, rules and regulations at his or her own expense.
- E. Use of Site:
1. Confine operation at the site to the areas permitted under the contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and

regulations affecting work while at the project site.

2. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage to the areas authorized by the Engineer's authorized representative.

1.6 COMMENCEMENT OF WORK

- A. Each time work that calls for the disturbance of lead-containing paint is to begin in a new work area the Contractor shall not commence work unless the following requirements have been met.
- B. Submittals: All submittals, notifications, posting and permits must be provided and be satisfactory to the Engineer's authorized representative.
- C. Equipment: All equipment required for the work such as removal, clean-up and disposal must be on hand.

1.7 SUBMITTALS

- A. Submit in accordance with SECTION 01300 – SUBMITTALS.
- B. Manufacturer's Catalog Data: Submit copies of manufacturer's specifications, installation instructions and field test materials for all chemicals and equipment related to lead-containing and lead-contaminated materials, including any other data that may be required to demonstrate compliance with these Specifications and proposed uses. This includes, but is not limited to, data for vacuum filters and respirators.
- C. Safety Data Sheets: Submit copies of the Safety Data Sheets for all chemicals used.
- D. Notifications: Submit written notification to the Engineer's authorized representative 15 days prior to the start of any renovation or demolition work involving lead-containing materials.
- E. Respiratory Protection Program: Submit no later than 10 consecutive working days from notice of award, a copy of the Contractor's Respiratory Protection Program prepared in accordance with all applicable laws. The Contractor shall also submit fit test records on all employees to be used on this project who may be required to wear a respirator.
- F. Hazard Communication Program: Submit no later than 10 consecutive working days from notice of award, a copy of the Contractor's Hazard Communication Program prepared in accordance with all applicable laws.
- G. Safety Program: Submit no later than 10 consecutive working days from notice of award, a copy of the Contractor's Health and Safety Plan prepared in accordance with all applicable laws.
- H. Work Procedure Plan: Submit no later than 10 consecutive working days from notice of award, a copy of the Contractor's Work Procedure Plan. The following are required components of a

Work Procedure Plan:

1. A sketch showing the location, size, and details of lead control areas, signage, security, decontamination and support areas including eating, drinking, smoking, and restroom areas;
 2. Procedures, interface of trades, sequencing of lead-related work, respirators, protective equipment;
 3. A detailed description of the methods of control of the work to ensure that airborne lead concentrations of 30 micrograms per cubic meter of air are not exceeded;
 4. Work plan and schedule for waste containment and disposal including daily cleanup and disposal of stray paint chips and paint dust;
 5. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment;
 6. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes;
 7. Estimated quantities of wastes to be generated and disposed of as well as a description of the methods used to identify hazardous wastes encountered with the work;
 8. Spill prevention, containment, and cleanup contingency measures to be implemented;
 9. Description of procedures to stop work in the event that area monitoring and laboratory analysis indicate air concentrations of lead in excess of the action level; and
 10. Methods to eliminate runoff of the water used to minimize dust created by renovation work, and collection and disposal plan for wastewater and paint debris.
- I. Rental Equipment: When rental equipment is to be used during lead-containing material handling and disposal, a written notification concerning intended use of the rental equipment must be provided to the rental agency with a copy submitted to the Engineer's authorized representative.
- J. HEPA Vacuums: Submit no later than 10 consecutive working days from notice of award, manufacturer's certification that vacuums conform to ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems as applicable to this project.
- K. Contractor's Competent Person's Qualifications: The Contractor shall submit no later than 10 consecutive working days from notice of award the Contractor's Competent Person's name, contact information, valid qualifications, and current certification of completion of the EPA Lead Inspector/Assessor course.
- L. Certification of medical examinations: The Contractor shall submit documentation from a physician that all employees or agents who may be exposed to airborne lead-containing dust

or fumes have been medically monitored to determine whether they are physically capable of working while wearing the respirator required without suffering adverse health effects. In addition, the Contractor shall document that his personnel have received medical monitoring as required in the HIOSH lead standard (12-148.1).

- M. Employee EPA Lead Worker/Supervisor Certifications: Submit no later than 10 consecutive working days from notice of award, documentation that each and every individual, including foreman, supervisors, other company personnel or agents, and any other individual who may be exposed to airborne lead dust and who may be responsible for any aspects of lead-containing paint removal activities which may occur, has currently attended and passed the EPA Lead Worker and/or EPA Lead Supervisor course, whichever is relevant to that worker's responsibilities. These courses shall be EPA-approved or approved by a State Accreditation Program in the most current listing of the Federal Register. No worker shall be allowed in the lead control area if they are found to have an expired accreditation certificate. The Contractor shall be responsible for keeping the documentation up to date and submitting subsequent documentation to the Engineer's authorized representative before any additional employee or individual, not currently on the list, is allowed within the lead control area.
- N. Employee training certifications: Submit documentation within 10 consecutive calendar days of award, satisfactory to the Engineer's authorized representative, that the Contractor's employees, including foreman, supervisors and any other company personnel or agents who may be exposed to airborne lead dust or who may be responsible for any aspects of lead work activities, have received training in accordance with OSHA 29 CFR 1926.62 and the HIOSH lead standard (12-148.1). Training shall include, but not be limited to, the dangers of lead exposure, respirator use and decontamination procedures.
- O. Laboratory Qualifications
 - 1. Personal Air Monitoring Laboratory Qualifications - Submit name, address and telephone number of testing laboratory responsible for analysis of personal air monitoring samples and reporting concentrations of airborne lead.
 - 2. TCLP Testing Laboratory - Submit name, address and telephone number of testing laboratory responsible for TCLP analysis.
- P. Personal Air Monitoring Results: Submit test results to the Engineer's authorized representative and the affected Contractor's employees within three (3) working days of collection, signed by the testing laboratory employee performing the analysis and the Contractor's Competent Person. Test results for the first two full days of initial personal air monitoring shall be submitted to the Engineer's authorized representative within 48 hours after completion of sampling.
- Q. TCLP Results: Submit test results to the Engineer's authorized representative within three (3) working days of collection, signed by the testing laboratory employee performing the analysis and the Contractor's Competent Person.
- R. Log of Lead Disturbance Work: Complete and submit a daily log of all lead disturbance work

performed.

- S. Certification of work performance: Certification in writing that the regions both inside and outside of the lead control area have airborne lead concentrations below the background level, that the respiratory protection for the employees was adequate, and that the work procedures were performed in accordance with 29 CFR 1926.62 and this Specification.
- T. Waste Disposal Manifest Forms: Submit copies of all transport manifests, trip tickets and disposal receipts for all hazardous waste removed from the work area and disposed of at a disposal facility during the work process.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- A. Respirators: Select respirators approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services. Respirators shall comply with the requirements of 29 CFR 1926.62 and HIOSH 12-148.1. For this project, respirators shall be worn at all times throughout the renovation or as deemed necessary by the Contractor's Competent Person.
- B. Protective Clothing: Furnish personnel exposed to lead dust with appropriate personal protective equipment as required by 29 CFR 1926.62 and HIOSH 12-148.1. For this project, respirators shall be worn at all times throughout the renovation or as deemed necessary by the Contractor's Competent Person.
- C. Chemicals: Submit applicable Material Safety Data Sheet for all chemicals used on this project. Use the least toxic product approved by the Engineer's authorized representative.

PART 3 - EXECUTION

3.1 LEAD CONTROL AREA REQUIREMENTS

- A. Boundary Requirements:
 - 1. Establish a lead control area to contain renovation operations by demarcating a boundary around the structure to be demolished or renovated in accordance with the Contractor's approved Work Procedure Plan. The lead control area shall be isolated by physical boundaries, such as temporary fencing, boundary tape and rope, to prevent unauthorized entry of personnel.
 - 2. Post Warning and Danger signs in accordance with 29 CFR 1926.62 and HIOSH 12-148.1. Signs shall be placed at all approaches to lead control area and at the boundary of the lead control area. Signs shall be posted at all locations where airborne lead concentrations may exceed ambient background levels. Locate signs at such a distance that personnel may read the sign and take necessary protective measures to avoid exposure. In addition, post signs

with “Authorized Entry Only, Lead Control Area” and “PPE Required” at every entry point.

B. Personal Protection Requirements:

1. No one will be permitted in the lead control area unless they have been given appropriate training, Personal Protective Equipment (PPE) and medical examinations. PPE is required for all employees and persons within the lead control area.
2. Eating, drinking, smoking and application of cosmetics shall be permitted only in areas designated by the Contractor, approved by the Engineer’s authorized representative, and which are free of dust generated by the renovation. Eating, drinking, smoking and application of cosmetics are not permitted in the lead control area.
3. Where eyes may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes shall be provided within the work area.

C. Environmental Protection Requirements:

1. Ensure airborne lead levels outside the lead control area are below the Action Level.
2. Perform work without damage to or contamination of the areas adjacent to locations where lead-containing or lead-contaminated material will be disturbed as a result of renovation activities. If any part of the work area is damaged or contaminated during the disturbance of lead-containing materials, restore the damaged or contaminated area to its original condition or better, as determined by the Engineer’s authorized representative.
3. Drainage inlets, downspouts, and all entrances to underground utilities which lie within, or provide drainage for, a lead control area shall be sealed until that lead control area has been cleaned, visually inspected and cleared.
4. Within a lead control area, any windows, doors or vents shall be sealed and air-conditioning units with intake or exhaust in a lead control area shall be shut down and sealed until that lead control area has been cleared with a level of airborne lead below the background level.

D. Exit Procedures: Whenever personnel exit the lead control area, they shall perform the following procedures and shall not leave the work place wearing any clothing or other equipment worn in the lead control area.

1. Vacuum themselves off with HEPA-filtered vacuum equipment, using UL-586 labeled HEPA filters;
2. Remove protective clothing in the designated changing area within the lead control area and place them in an approved impermeable disposal bag;
3. Wash their hands and faces in the designated changing area before exiting to the designated

clean area outside of lead control area; and

4. Prevent migration of mud, dust and/or debris carried on work boots, clothing or equipment from the renovation site into areas beyond the lead control area.

3.2 RENOVATION INVOLVING LEAD-CONTAINING PAINT

- A. Perform lead work as specified herein. Use procedures and equipment required to limit occupational exposure and environmental contamination with lead when renovation is performed in accordance with 29 CFR 1926.62 and as specified herein.
- B. Disturbance of lead-containing paint as a result of renovation activities shall be kept to a minimum. Spot remove lead-containing paint only as necessary for the safe renovation of LCP painted structures. Water spray, vacuuming and other engineering controls shall be used to minimize airborne lead dust. Care shall be taken to avoid pulverizing, scraping, or crumbling lead debris.
- C. Dispose of all lead-containing paint and associated waste in compliance with all Federal, State and local requirements.
- D. Clean, as needed, all floor surfaces adjacent to the lead control area using a HEPA filtered vacuum.
- E. Use 6-mil polyethylene sheeting to cover ground underneath the work area.
- F. Use 6-mil polyethylene sheeting to cover any surfaces and equipment that will not be painted, disturbed or utilized during disturbance of lead-containing paint. After completion of work, the Contractor shall repair all damage from fastening and sealing and remove all adhesive residue from surfaces at no additional cost to the State.
- G. Manual or power sanding, grinding, abrasive or sand blasting of interior and exterior painted surfaces is not permitted. Select removal processes (describe in the Work Procedure Plan) to minimize contamination of work areas with lead-contaminated dust or other lead-contaminated debris/waste.
- H. Open flame burning or torching of lead-containing paint is prohibited.
- I. The use of heat guns or hot knives which reach temperatures above 650 degrees Fahrenheit, on surfaces containing lead-containing paint, is prohibited.
- J. Use of vacuum equipment without HEPA filters in areas containing lead-containing paint is prohibited.
- K. The use of chemical paint strippers containing methylene chloride is prohibited.
- L. Control of Airborne Lead Level – The Contractor shall control the lead level outside of the work boundary to less than the action level at all times.

- M. Control of Visible Emissions – The Contractor shall control lead dust emissions from the project site so that no visible lead dust emissions leave the project work areas during renovation work. Wet methods or other engineering controls shall be used to control the emission of dust and/or debris from the renovation site in accordance with all applicable Federal, State, and local regulations. Emissions in excess of the above shall be cause for immediate shut down of the project until corrective measures are implemented.
- N. Control of Water Runoff – Water used to control emissions of dust from the renovation activities shall not be allowed to flow uncontrolled from a lead control area, to any adjacent area or to enter the sanitary or storm water sewer system. All water runoff from lead control areas shall pass through a filter berm to remove particulate matter prior to discharge to water sewer system. The Contractor shall use only sufficient water to adequately control dust. Under no conditions shall wastewater be disposed of in storm drains or dumped on the ground.
- O. Perform renovation involving lead-containing paint as indicated in Federal, State, and local regulations. The worksite preparation (barriers or containments) shall be job dependent.

3.3 CLEANUP

- A. Clean surfaces and surrounding ground within the lead control area daily. Do not allow paint chips, dust and debris to accumulate.
- B. Restrict and minimize the spread of dust and debris. Keep waste from being distributed over the general area. Do not dry sweep or use compressed air to clean the area.
- C. When the operation has been completed, the area will be cleaned of all visible lead contamination. The Engineer's authorized representative will visually inspect the affected areas for residual lead paint chips and debris, and the Contractor shall re-clean areas showing residual paint chips and debris.
- D. If re-cleaning is required, the Engineer's authorized representative will visually inspect for lead debris after the re-cleaning. This process will be repeated until the Engineer's authorized representative deems the area free of visible paint chips and debris.
- E. Do not remove the lead control area barriers or roped-off perimeter and warning signs prior to the Engineer's receipt of the Engineer's authorized representative's lead clearance certification.

3.4 DISPOSAL

- A. Disposal of Non-Hazardous Lead Construction Debris (TCLP for Lead Not Exceeding EPA Limit of 5.0 Milligrams per Liter):
 - 1. Remove non-hazardous lead waste including debris, scraps, waste materials, rubbish, and trash from the site and dispose of such waste at a landfill approved for such purposes.
 - 2. The Contractor shall submit to the Engineer's authorized representative documentation that the lead-containing waste material removed from the work area has been accepted by the

landfill owner.

- B. Disposal of Hazardous Lead Construction Debris (TCLP for Lead Exceeding EPA Limit of 5.0 Milligrams per Liter):
1. Collect lead-contaminated wastes, scraps, debris and any other lead-contaminated materials and place into U.S. Department of Transportation approved and appropriately labeled containers.
 2. Store lead wastes and debris in U.S. Department of Transportation approved containers in an interim storage area assigned by the Engineer's authorized representative at the site. Any and all hazardous wastes shall be removed from the site to an EPA approved disposal facility within 90 days of the removal work (as applicable).
 3. Handle, store, transport, and dispose of lead or lead-contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.
 4. The Contractor shall submit to the Engineer's authorized representative documentation that the lead-containing waste material removed from the work area has been accepted by the landfill owner.

3.5 CERTIFICATION

- A. The Contractor or his authorized representative shall certify in writing that the regions both inside and outside of the lead control area have airborne lead concentrations below the background level, that the respiratory protection for the employees was adequate, and that the work procedures were performed in accordance with 29 CFR 1926.62 and this Specification.
- B. Upon inspection and approval of the area by the Engineer's authorized representative, the Contractor shall certify that there were no visible accumulations of lead-contaminated paint, dust and debris remaining on the work-site.
- C. The Contractor shall not remove the lead control area boundary and warning signs prior to the submittal and approval by the Engineer's authorized representative of the Contractor's certification that there were no visible accumulations of lead contaminated paint, dust and debris remaining on the work-site.
- D. The Contractor shall re-clean areas showing residual paint chips, debris or wastes. Chips, debris and wastes shall be disposed of properly, in accordance with this Specification and all applicable Federal, State and local regulations.

3.6 MEASUREMENT AND PAYMENT

- A. Payment for removal, hauling and disposal of all lead-related wastes shall be made at the lump sum price bid as scheduled in the Proposal. The final payment will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-contaminated material delivered is submitted to the Engineer.

END OF SECTION

SECTION 13284

REMOVAL AND DISPOSAL OF MERCURY CONTAINING LAMPS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish all labor, materials and equipment necessary to carry out the safe removal and disposal of mercury-containing lamps throughout the buildings to be demolished in compliance with the Specifications and all applicable Federal, State and Local laws and regulations including all incidental and pertinent operations. If there is a conflict with the requirements, the more stringent requirement shall apply. Ignorance of the above requirements and any applicable regulations resulting in additional cost to the Contractor shall not be reimbursable or billable to the State. Any question regarding conflict or inconsistency between Specification and/or regulations should be directed to the Engineer.
- B. Mercury-containing lamps are identified in the *Limited Hazardous Materials Survey Report, Hawaii District Land Division Headquarters in Hilo, Hilo, Hawaii, Hawaii*, dated December 28, 2018, prepared by EnviroServices & Training Center, LLC. The Contractor shall be responsible for conducting a site visit to verify all quantities and material locations.

1.2 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only, and include but are not limited to, the following.
- B. CODE OF FEDERAL REGULATIONS (CFR)
 - 29 CFR 1910.1000 Air Contaminants
 - 49 CFR 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communication, Emergency Response Information, and Training Requirements.
 - 49 CFR 178 Shipping Container Specification
- C. HAWAII OCCUPATIONAL SAFETY AND HEALTH (HIOSH)
 - 12-114.2 Personal Protective Equipment
 - 12-121.2 Fall Protection
 - 12-122.2 Materials Handling, Storage, Use, and Disposal
 - 12-151 Hazardous Waste Operations and Emergency Response

1.3 DEFINITIONS

- A. Mercury-Containing Lamps: As used in this Specification shall mean all fluorescent and high-intensity discharge (HID) lamps, including exit signs, without labeling stating "No Mercury".

1.4 TRAINING REQUIREMENTS

- A. Within one (1) year prior to assignment to mercury work, each employee shall be instructed by an Industrial Hygienist or equivalent safety specialist concerning the hazards of mercury, necessary safety and health precautions, the use of and requirements for protective clothing, equipment and respirators. Training shall include engineering and other hazard control techniques and procedures.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01300 – SUBMITTALS.
- B. Documentation of Instruction: Each worker and supervisor shall submit current training certificates required for removing mercury-containing fluorescent lamps, as described in Section 1.4 of this specification. Certificates shall be signed and dated by the Industrial Hygienist or equivalent safety specialist providing the training.
- C. Mercury-Containing Lamp Removal Plan: The Contractor shall submit to the Engineer a detailed job-specific plan of the work procedures to be used in the removal of mercury-containing lamps. The plan shall be approved prior to the start of any mercury-containing lamp removal work.
- D. Mercury-Containing Lamp Disposal Plan: The plan shall comply with all applicable requirements of Federal, State, and local regulations. The plan shall also include:
 - 1. Identification of mercury waste associated with the work.
 - 2. Estimated quantities of waste to be generated and disposed of.
 - 3. Names and qualifications of personnel who shall be working on-site with mercury wastes.
 - 4. Names, qualifications, facility locations and 24-hour point of contact information for each contractor that shall be transporting, storing, treating, disposing of waste.
 - 5. List of waste handling equipment to be used in performing the work, including cleaning, volume reduction, and transport equipment.
 - 6. Spill prevention, containment, and cleanup contingency measures to be implemented.
- E. Emergency Planning Procedures: Emergency planning shall be developed prior to initiation of work and approved by the Contractor and the Engineer. It shall include, but not be limited to, considerations of fire, explosion, electrical hazards, slips, trips and falls and heat related injuries. The Contractor shall develop written emergency procedures and provide employee emergency training.
- F. Notification: Notify the Engineer 10 working days prior to the start of any removal work.
- G. Permits/Arrangements: Submit copies of all permits and arrangements for transportation and

disposal of mercury waste.

- H. Waste Disposal Manifest Forms: Submit copies of all transport manifests, trip tickets and disposal receipts for all mercury waste removed from the work area during the abatement process.
- I. Other Documents: Submit copies of all documents, laboratory data and field notes necessary for the preparation of the final report.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Protective Clothing: Furnish personnel exposed to mercury material with appropriate protective clothing, including safety glasses and rubber gloves.
- B. Mercury Spill Kit: Assemble a spill kit to include several pairs of the following items:
 - 1. Disposable coveralls and polyethylene gloves and foot covers;
 - 2. Chemical safety glasses or face shields;
 - 3. Mercury caution signs displaying "Mercury Spill -- Authorized Personnel Only";
 - 4. 100 foot caution tape;
 - 5. Absorbent material;
 - 6. Aspirator bulbs;
 - 7. Disposable plastic dustpan;
 - 8. Polyethylene waste bags;
 - 9. Cloth backed tape;
 - 10. Mercury resistant sponges;
 - 11. Paper and writing equipment; and
 - 12. Non-breakable, wide-mouth waste containers with airtight-seal lids.

PART 3 - EXECUTION

3.1 WORK PROCEDURES

- A. The Contractor shall not be allowed to perform any on-site work unless the Engineer or the

Engineer's authorized representative is present.

- B. Personnel shall wear and use protective clothing and equipment as outlined in Section 2.1.
- C. No one shall be permitted in the mercury work areas unless the person is provided with appropriate training and protective equipment.
- D. Personnel shall package and mark mercury materials as required by EPA, and DOT regulations and dispose of in accordance with all Federal, State, and local regulations.
- E. The Engineer or the Engineer's authorized representative shall perform an inspection following the mercury removal operation. If any area is contaminated, the contaminated area shall be cleaned, and visually inspected.
- F. All light fixtures shall be de-energized by a licensed electrician prior to the light fixture removal.
- G. Remove light fixtures whole and intact. Handle mercury such that neither skin contact nor inhalation occurs.
- H. Remove, package and dispose of/recycle mercury containing lamps as specified in this section. Lamps labeled "No Mercury" shall be segregated from the hazardous waste stream and disposed of as normal demolition debris. Lamps without the "No Mercury" label shall be assumed to contain mercury.

3.2 MERCURY LAMP DEBRIS CLEANUP REQUIREMENTS

- A. Mercury Lamp Breakage: Immediately report to the Engineer any mercury lamp breakage.
- B. Mercury Lamp Debris Control Area: Rope off an area around the edges of any mercury lamp debris and post a "Mercury Spill -- Authorized Personnel Only" caution sign.

Mercury Lamp Debris Cleanup: The mercury lamp debris cleanup shall be in accordance with all applicable Federal, State and local regulations. Initiate cleanup of spills as soon as possible, but no later than 24 hours after discovery. Cleanup personnel shall wear gloves that prevent both mercury exposure and physical injury due to broken glass. All debris shall be placed in a non-breakable container with an airtight-seal lid. Any items that came in contact with the mercury lamp debris shall be cleaned, labeled and disposed of as mercury contaminated waste.

3.3 STORAGE FOR DISPOSAL

- A. Storage Containers for Mercury Lamps: The Contractor shall store mercury lamps in appropriate transport containers. The boxes shall be stored and labeled for transport in accordance with 40 CFR 262 and 40 CFR 263.
- B. Labeling of Waste Containers: Label all containers with the date the item was placed in storage. Label mercury-containing lamp waste containers in accordance with 49 CFR 172.

3.4 CLEANUP

- A. Clean surfaces within mercury control areas daily. Do not allow mercury material, debris and dust to accumulate.
- B. Restrict the spread of dust, debris, vapors and fumes; keep waste from being distributed over the general area.
- C. The Engineer shall visually inspect the affected areas for any residual mercury material and accumulated dust.
- D. The Contractor shall re-clean areas showing dust or residual mercury material at no additional cost to the State.

3.5 DISPOSAL

- A. Mercury disposal shall comply with requirements and procedures outlined in 40 CFR 263.
- B. Transporter Certification: Comply with disposal requirements and procedures outlined in 40 CFR 263. Before transporting the mercury lamp waste, sign and date the manifest acknowledging acceptance of the mercury-containing waste. Hazardous waste will not be removed from site without proper manifest documentation and verification of waste destination. The Contractor shall submit transporter certification of notification sent to EPA of lamp waste activities.
- C. Certificate of Disposal and/or Recycling: Certificates for the disposal of mercury lamps, shall be submitted to the Engineer within 30 days of the date of completion of disposal identified in the manifest was completed. Certificates of Disposal shall include:
 - 1. The identity of the disposal and/or recycling facility, by name, address, and EPA identification number.
 - 2. Identification of mercury waste affected by the Certificate of Disposal including reference to the shipment manifest number.
 - 3. A statement certifying disposal and/or recycling of the identified mercury lamp waste that includes the date(s) of disposal, and the disposal process used.

3.6 MEASUREMENT AND PAYMENT

- A. Payment for removal, hauling and disposal of ACM shall be made at the lump sum price bid as scheduled in the Proposal. Final payment will not be made until a signed copy of the Certificate of Disposal is furnished to the Engineer.

END OF SECTION

SECTION 13286

REMOVAL AND DISPOSAL OF ARSENIC-CONTAINING MATERIALS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. The work specified herein shall include the disturbance of arsenic-containing components, transportation and disposal procedures as required of arsenic-containing materials. This work must be performed in compliance with all applicable Federal, State, and local regulations and be performed by workers who are capable of and willing to perform the work of this contract.
- B. The Contractor shall identify and properly remove, and dispose of arsenic-containing materials referenced in the *Limited Hazardous Materials Survey Report, Hawaii District Land Division Headquarters in Hilo, Hilo, Hawaii, Hawaii*, dated December 28, 2018, prepared by EnviroServices & Training Center, LLC including storage containers and their contents.
- C. The Contractor shall be responsible for conducting a site visit to verify all quantities and material locations. **There will be no change orders issued for the abatement of additional hazardous materials discovered in the course of the abatement activities.**
- D. Applicable Standards and Guidelines: All work under this contract, and any other trade work conducted with the project, shall be done in strict accordance with all applicable Federal, State and local regulations, standards and codes governing arsenic-containing material disturbance, transportation and disposal of generated waste. The most recent edition of any relevant regulation, standard, document or code shall be in effect.

1.2 DESCRIPTION

- A. In performing this project, all possible safeguards, precautions and protective measures should be utilized to prevent exposure of any individual to hazardous materials.

1.3 REFERENCES

- A. Compliance with the specific statutory and regulatory requirements shall include but not limited to:
 - 1. Title 29 CFR of Federal Regulations Part 1910 General Industry Standard
 - 2. Title 29 Code of Federal Regulations Part 1910.1018, Inorganic Arsenic
 - 3. Title 29 Code of Federal Regulations Part 1910.134, Respiratory Protection.
 - 4. Title 29 Code of Federal Regulations Part 1926, Construction Standards

5. Title 40 Code of Federal Regulations Part 268, Land Disposal Restrictions
6. Title 49 Code of Federal Regulations Part 178, Shipping Container Specification

1.4 DEFINITIONS

- A. Definitions as outlined in 29 CFR 1910.120
- B. Action Level (AL): Employee exposure averaged over an 8-hour period, without regard to the use of respirators, to a particular airborne concentration. OSHA requirements become effective at this level. AL for Arsenic: 5 micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$)
- C. Air Monitoring: The process of measuring the content of a specific, known, volume of air in a stated period of time.
- D. Arsenic, Inorganic: Copper aceto-arsenite and inorganic compounds containing arsenic except arsine, measured as arsenic (As).
- E. Authorized Visitor: The DLNR, their representatives, Engineer, Engineer's authorized representatives, Industrial Hygienist, or a representative of any regulatory or other agency having jurisdiction over the project.
- F. Contaminated Area: An area where unwanted toxic or harmful substances exists.
- G. HEPA Filter: A High Efficiency Particulate Air filter capable of trapping and retaining 99.97% of particulates greater than 0.3 micron in length.
- H. Industrial Hygienist: Qualified industrial hygienist (IH) to perform project monitoring, work review, inspections, and other actions as designated in this Section.
- I. Permissible Exposure Limit (PEL): The employer shall ensure that no employee is exposed to concentrations greater than the PEL as determined from an 8-hour time weighted average. PEL for Arsenic: 10 micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$)
- J. Personal Monitoring: Contractor's daily sampling of arsenic in air concentrations within the breathing zone of an employee to determine the 8-hour time weighted average. The samples shall be representative of the employee's work tasks. The breathing zone shall be considered an area within 12-inches of the nose or mouth of an employee.
- K. Qualified Testing Laboratory: Laboratory certified by the American Industrial Hygiene Association (AIHA), able to provide analysis and reporting of airborne concentrations of arsenic. The laboratory judged proficient by current inclusion and successful participation in the Proficiency Analytical Testing (PAT) Program for arsenic.

1.5 REQUIREMENTS

- A. Worker Training: Within one year prior to assignment to arsenic work, each employee shall be instructed by a qualified training provider, or equivalent safety specialist with regard to the

hazards of arsenic, safety and health precautions, the use and requirements for protective clothing, equipment, and respirators, and the additional requirements of 29 CFR 1910.1018, HAZWOPER or equivalent. Submit training certificates signed and dated by the training provider, or equivalent safety specialist.

- B. Supervisor Training: Field managers and supervisors who are directly responsible for, or who supervise employees engaged in arsenic work, must have successfully completed either the 40 hour basic HAZWOPER and additional 8-hour supervisor training or equivalent, or the refresher courses, as required by 29 CFR 1910.120, within the last year.
- C. Field Experience: Each employee assigned to work at the site must also have a minimum of three days of field experience under the direct supervision of trained, experienced personnel. The field experience, at a minimum, must have included hands-on training in the proper use and calibration of field instruments, waste cleanup, spill control and containment, and general site safety.
- D. First-Aid and CPR Training: A minimum of two Contractor personnel with current Basic First Aid and CPR training must be on site at all times. Valid documentation in the form of a Red Cross or American Heart Association card must be submitted to the Engineer prior to performing any work.
- E. Medical Surveillance: Employees and subcontractors who are assigned to work at the site are required to have medical clearance satisfying 29 CFR 1910.120 and 1910.134. A physician must have examined the employee or subcontractor within the past twelve months and must certify that the employee or subcontractor is physically fit to wear a respirator and perform work at hazardous waste sites. Individuals, whose medical clearance is not current will not be allowed to work at the site.

1.6 SUBMITTALS

- A. Submit in accordance with SECTION 01300 - SUBMITTAL PROCEDURES.
- B. Pre-work Submittals: The following must be submitted a minimum of 10 working days prior to start of work; and accepted by the Engineer, prior to the start of work:
 - 1. Arsenic Disturbance Work Plan including but not limited to the following: work area preparation, post cleaning activities, and waste disposal.
 - 2. List of employees who will be working at the job site and documentation of proper training.
- C. Post-work Submittals: The following must be submitted a maximum of 30 working days after completion of the work:
 - 1. All personnel air monitoring field data, laboratory reports and results shall be submitted weekly during the project and completely at the completion of the project.
 - 2. All completed and signed waste disposal documents.

3. List of any change of personnel for project and include additional required training certificates (must be approved by IH prior to new personnel being allowed on site).
 4. Weekly job progress report and completion report.
- D. Training: Submit training certificates signed and dated by the training provider, or equivalent safety specialist.
 - E. Arsenic Disturbance Work Plan: The Contractor shall submit for review for acceptance to the Engineer, an Industrial Hygienist reviewed and approved, detailed job-specific work plan of the work procedures to be used in the disturbance and disposal of arsenic-containing material prior to the start of work. The work plan shall also include interface with trades, sequencing of arsenic-related work; disposal; liquid and solid waste storage plan, containerization plan; daily personnel air sampling plan; respirators; protective equipment; worker training certification; emergency plan; a detailed description of the method to be employed in order to control pollution and security provisions. The personal air sampling portion of the plan shall include sampling, training, and strategy; estimated number of air samples per day, and sampling methodology.
 - F. Contractor Required Testing: The Contractor shall provide and pay for all required OSHA testing and air monitoring during arsenic-containing material activities. The Contractor shall use a Laboratory certified by the American Industrial Hygiene Association (AIHA), and judged proficient by current inclusion and successful participation in the Proficiency Analytical Testing (PAT) Program for arsenic.
 - G. Manufacturer's Catalog Data: Submit copies of manufacturer's specifications, installation instructions and field test materials for all chemicals and equipment related to miscellaneous hazardous materials, including any other data that may be required to demonstrate compliance with these Specifications and proposed uses. This includes, but is not limited to, data for respirators.
 - H. Safety Data Sheets: Submit copies of the Safety Data Sheets for all chemicals used.
 - I. Respiratory Protection Program: Submit no later than 10 consecutive working days from notice of award, a copy of the Contractor's Respiratory Protection Program prepared in accordance with all applicable laws. The Contractor shall also submit fit test records on all employees to be used on this project who may be required to wear a respirator.
 - J. Hazard Communication Program: Submit no later than 10 consecutive working days from notice of award, a copy of the Contractor's Hazard Communication Program prepared in accordance with all applicable laws.
 - K. Safety Program: Submit no later than 10 consecutive working days from notice of award, a copy of the Contractor's Health and Safety Plan prepared in accordance with all applicable laws.
 - L. Certification of medical examinations: The Contractor shall submit documentation from a physician that all employees or agents who may be required to wear a respirator have been

medically monitored to determine whether they are physically capable of working while wearing the respirator required without suffering adverse health effects.

- M. Emergency Planning Procedures: Emergency planning shall be developed prior to initiation of work and approved by the Contractor and the Engineer. It shall include, but not be limited to, considerations of fire, explosion, electrical hazards, slips, trips and falls and heat related injuries. The Contractor shall develop written emergency procedures and provide employee emergency training.
- N. Notification: Notify the authorized representative of the Engineer 10 working days prior to the start of any removal work.
- O. Waste Disposal Manifest Forms: Submit copies of all transport manifests, trip tickets and disposal receipts for all hazardous waste removed from the work area and disposed of at a disposal facility during the work process.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Plastic Sheeting: Minimum thickness of 6-mil polyethylene film.
- B. Plastic Bags: Minimum thickness 6-mil polyethylene film labeled as specified hereinafter.
- C. Tapes: Tape shall be capable of sealing joints of adjacent sheets of polyethylene and for attaching polyethylene sheets to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including the use of amended water. Silver cloth duct tape, minimum two (2)-inch wide, and double-faced foam tapes, by Nashua, 3-M, Arno, or approved equal shall be used on polyethylene sheeting, red or NATO orange tape, minimum 2-inches wide for exit arrows.
- D. Adhesives: Adhesives shall be capable of sealing joints of adjacent sheets of polyethylene and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water. 3-M #76, #77, or approved equal.
- E. Warning Signs and Labels: Provide warning signs at approaches to the arsenic control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Provide and affix labels to impermeable bags, arsenic waste drums, and other containers containing arsenic materials, scrap, waste, or debris. Signs and labels shall comply with the requirements of 29 CFR 1910.1018. Warning signs and labels shall be provided throughout the entire project and as deemed necessary by the Engineer. Signage shall be approved by the Engineer.
- F. Protective Clothing: Furnish personnel exposed to arsenic dust with disposable protective whole-body clothing, eye-protection, head covering, gloves, and foot coverings. Furnish disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after

approval from the Contractor's competent person or industrial hygienist. For this project, respirators shall be worn at all times throughout the disturbance process.

- G. Respirators: Use appropriate respirators and filters which meet all requirements of OSHA 29 CFR 1910.134.
- H. Other Materials: Provide all other materials, which may be required to properly prepare and complete this project.

PART 3 - EXECUTION

3.1 WORK AREA PREPARATION

- A. Area Requirements: Establish an arsenic control area with warning signs and appropriate barriers. Only authorized personnel shall be allowed within the control area.
- B. Barriers
 - 1. Standard barriers such as construction warning tape, fencing, etc. shall be used to prevent the general public access on to the work site.
 - 2. Warning signs shall be posted at all sides of the work area.
 - 3. Cover doorways beneath the work area with construction barrier tape.
- C. Floor Covering: Cover the floor beneath their work area with 6-mil polyethylene sheeting.

3.2 WORK PROCEDURE

- A. Perform arsenic-related work as specified herein.
 - 1. Personnel shall wear and use protective clothing and equipment as specified herein.
 - 2. Eating, smoking, or drinking shall not be permitted in the arsenic control area.
 - 3. No one will be permitted in the arsenic control area unless the person is provided with appropriate training and protective equipment. The Contractor shall be responsible for providing their personnel with the appropriate training and the necessary protective equipment while they are performing arsenic-related work.
 - 4. Avoid creating dust at all times. Absolutely no dust creating method shall be utilized during disturbance of arsenic-containing material.
 - 5. The disturbance area shall be clean of all visible arsenic-containing debris prior to final visual inspection by the Contractor and Engineer.
 - 6. The Contractor is solely responsible for complying with any and all regulations concerning employee safety and health and the requirements specified herein.

- B. Arsenic Control Area Requirements: Establish an arsenic control area by covering doorways and entrances beneath the work area. No one will be permitted in the arsenic control area unless the person is provided with appropriate training and protective equipment. During the arsenic-containing material disturbance operation, when the employees need to exit the controlled area, they will be required to remove all visible dust from themselves using a HEPA vacuum and wet wiping; remove their disposable coveralls; place them in an approved impermeable container; as a minimum wash face and hands with soap and water; and then exit the area.
- C. Ensure that all personnel working on site during the demolition work is properly trained and protected as required by law.
- D. At the completion of the disturbance work, ensure that all arsenic-containing debris is removed from the site. Waste must be disposed of at an approved waste disposal site within 90 days of the disturbance work. The Contractor shall comply with all applicable transport and disposal regulations including 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 268, 49 CFR 172 and 49 CFR 178.

3.3 CONFORMANCE

- A. All work shall be executed in accordance with the following:
 - 1. Occupational Safety and Health Administration (OSHA); Hawaii Occupational Safety and Health (HIOSH) standards and rules.
 - a. All cost associated with the execution of work in accordance with these OSHA and HIOSH standards and rules shall be the Contractor's responsibility.
 - b. The Contractor shall implement good housekeeping methods to confine the spread of airborne dust when performing work that pulverizes existing arsenic-containing material in all rooms and spaces in this project.
 - c. Identify the arsenic-containing material that will be impacted by the work. All arsenic-containing material that will be removed from the buildings will be collected, properly packaged, and disposed at an approved waste disposal site.

3.4 TRANSPORTATION AND DISPOSAL

- A. Disposal of Generated Waste: Remove arsenic waste including, debris, scraps, waste materials, rubbish, and trash from the site and dispose of at a landfill approved for such purposes. The Contractor shall submit to the Engineer, documentation that the arsenic-containing waste material removed from the work area has been accepted.
 - 1. The Contractor shall submit disposal documents showing acceptance of all waste material by the approved waste disposal site to the Engineer. The shipping papers shall include names and addresses of the Facility Owner, the Contractor, and the Landfill Operator and information on the type and number of waste containers.

3.5 MEASUREMENT AND PAYMENT

- A. Payment for disposal of hazardous wastes will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of hazardous materials delivered is returned and a copy is furnished to the Engineer.

END OF SECTION

SECTION 13288

TESTING/AIR MONITORING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish all labor, materials, and equipment necessary to carry out the personnel monitoring, record keeping, air monitoring and inspectional services in compliance with the Specifications and all applicable Federal, State and Local laws and regulations during the performance of the Project. If there is a conflict with the requirements, the more stringent requirement shall apply. Ignorance of the above requirements and any applicable regulations resulting in additional cost to the Contractor shall not be reimbursable or billable to the State. Any question regarding conflict or inconsistency between Specification and/or regulations should be directed to the Engineer.

1.2 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only, and include but are not limited to, the following:

- B. CODE OF FEDERAL REGULATIONS (CFR)

- 29 CFR 1926.33 Access to Employee Exposure and Medical Record
- 29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists
- 29 CFR 1926.59 Hazard Communication
- 29 CFR 1926.62 Lead Exposure in Construction
- 29 CFR 1926.103 Respiratory Protection
- 29 CFR 1926.1101 Asbestos, Tremolite, Anthophyllite, Actinolite
- 29 CFR 1910.134 Respiratory Protection
- 40 CFR 61-SUBPART A General Provisions
- 40 CFR 61-SUBPART M National Emission Standard for Asbestos
- 40 CFR 763 Asbestos Containing Material in Schools
- 40 CFR 745 Lead; Requirement for Lead-Based Paint Activities
- 49 CFR 172 Hazardous Materials, Tables, and Hazardous Materials Communications Regulations

- C. ENVIRONMENTAL PROTECTION AGENCY (EPA)

- EPA 560/5-85-024 Guidance for Controlling ACM in Buildings

- D. HAWAII OCCUPATIONAL SAFETY AND HEALTH (HIOSH)

- 12-114.2 Personal Protective Equipment
- 12-145.1 Asbestos

12-148.1 Lead

12-151 Hazardous Waste Operations and Emergency Response

E. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

HUD Guidelines for the Evaluation and Control of
Lead Based Paint Hazards in Housing

F. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z88.2 (1992) Respiratory Protection

1.3 DEFINITIONS

- A. Action Level - Lead: Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period.
- B. Area Sampling: Sampling of concentrations which is representative of the airborne concentrations but is not collected in the breathing zone of personnel (approximately 1.5 to 1.8 meters above the floor).
- C. Background: The ambient airborne asbestos concentration in an uncontaminated area as measured prior to any asbestos hazard abatement efforts. Background concentrations for other (contaminated) areas are measured in similar locations.
- D. Competent Person - Asbestos: As used in relation to asbestos, refers to a person employed by the Contractor who is trained in the recognition and control of asbestos hazards in accordance with current Federal, State, and local regulations and has the authority to take prompt corrective actions to control the asbestos hazards.
- E. Competent Person - Lead: As used in relation to lead, refers to a person employed by the Contractor who is trained in the recognition and control of lead hazards in accordance with current Federal, State, and local regulations, has the authority to take prompt corrective actions to control the lead hazards and is an EPA certified lead inspector or risk assessor.
- F. Permissible Exposure Limit (PEL) - Asbestos: 0.1 fibers per cubic centimeter of air as an 8-hour time weighted average measured in the breathing zone as defined by 29 CFR 1926.1101 or other Federal legislation having legal jurisdiction for the protection of workers health.
- G. Permissible Exposure Limit (PEL) - Lead: 50 micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more or less than 8 hours in a work day, the PEL shall be determined by the following formula: $PEL (\text{micrograms per cubic meter of air}) = 400 / \text{number of hours worked per day}$
- H. Personal Sampling: Air sampling which is performed to determine concentrations within the breathing zone of a specific employee. Samples shall be representative of the employee's work tasks. The breathing zone shall be considered an area within 12 inches of the nose or mouth of an employee.

- I. Project Monitor: A person hired by the Engineer who shall certify and document the necessary removal and clean-up of all asbestos- and lead-containing materials and associated waste from the project site and perform visual clearances, clearance sampling, and during removal air monitoring.
- J. Qualified Testing Laboratory – Asbestos: Laboratories shall be accredited by the American Industrial Hygiene Association (AIHA) for each type of asbestos analysis performed by the laboratory.
 - 1. Environmental and Work Area Monitoring Laboratory – The testing laboratory employed by the Engineer to perform analysis of environmental and work area air monitoring samples and report concentrations of airborne lead.
 - 2. Personal Air Monitoring Laboratory – The testing laboratory utilized by the air monitoring firm retained by the Contractor to perform analysis of personal air monitoring samples and report airborne concentrations of asbestos. Collection of the Contractor’s OSHA personal air samples will be performed by a firm independent of the Contractor, at the Contractor’s expense.
- K. Qualified Testing Laboratory – Lead: Laboratories shall be accredited under the EPA’s National Lead Laboratory Accreditation Program (NLLAP) by the American Industrial Hygiene Association’s (AIHA’s) Environmental Lead Laboratory Accreditation Program (ELLAP) and successfully participating in the Environmental Lead Proficiency Analytical Testing (ELPAT) program for each lead matrix analyzed by the laboratory. The laboratory shall fulfill all requirements of accreditation for analyzing lead in air. Laboratory personnel performing the work shall have been judged proficient in the analysis of lead in the applicable parameter by successful participation within the last year in AIHA’s ELPAT.
 - 1. Environmental and Work Area Monitoring Laboratory – The testing laboratory employed by the Engineer to perform analysis of environmental and work area air monitoring samples and report concentrations of airborne lead.
 - 2. Personal Air Monitoring Laboratory – The testing laboratory utilized by the air monitoring firm retained by the Contractor to perform analysis of personal air monitoring samples and report airborne concentrations of lead. Collection of the Contractor’s OSHA personal air samples will be performed by a firm independent of the Contractor, at the Contractor’s expense.
 - 3. Toxicity Characteristic Leaching Procedure (TCLP) Testing Laboratory - The testing laboratory employed by the Contractor to perform TCLP tests of a representative sample of the debris waste stream of each structure and of any lead-contaminated chips or debris generated through abatement to determine whether or not the waste is hazardous or non-hazardous. The laboratory shall be experienced in and analyze TCLP samples using the EPA Method 1311/6010.
- L. In addition, Definitions as outlined in Section 13281 – REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS and Section 13282 – LEAD-CONTAINING PAINT CONTROL MEASURES.

1.4 ABBREVIATIONS

- A. ANSI: American National Standards Institute, Inc.
- B. CFR: Code of Federal Regulations
- C. HIOSH: Division of Occupational Safety and Health, Department of Labor and Industrial Relations, State of Hawaii
- D. EPA: U.S. Environmental Protection Agency
- E. NESHAP: National Emission Standards for Hazardous Air Pollutants
- F. NIOSH: National Institute for Occupational Safety and Health
- G. OSHA: Occupational Safety and Health Administration
- H. State: State of Hawaii

1.5 AUTHORITY TO STOP WORK

- A. The Engineer has the authority to stop the abatement work at any time they determine that conditions are not within the drawing/specification requirements and applicable regulations. The work stoppage shall continue until corrective steps have been taken and specified conditions restored to the satisfaction of the Engineer. Standby time required to resolve violations shall be at the Contractor's expense. Stop Work Orders may be issued for, but shall not be limited to the following:
 - 1. Excessive airborne fibers inside (>0.5 f/cc) and/or outside (>0.01 f/cc) the work area.
 - 2. Excessive dust outside (>30 micrograms per cubic meter of air) the work area.
 - 3. Visible emissions of dust or debris going beyond the work area boundaries.

1.6 COORDINATION

- A. The Contractor shall coordinate with the Engineer for the testing/air monitoring requirements included in these specifications for testing/air monitoring consultants or inspectors and all applicable Federal, State and local regulations.
- B. Whenever approval of the Engineer is required prior to proceeding with other work, the Contractor shall comply with the following:
 - 1. The Contractor shall give, at a minimum, ten (10) days notification to the Engineer prior to the start of any work.
 - 2. The Contractor shall not begin any work without the Engineer present to observe.
 - 3. The Contractor shall allow the Engineer 24 hours from notification to respond to the

request for site inspection(s).

4. The Contractor shall designate one person (either a foreman or superintendent) who will be authorized to request inspections. The name of the designated person shall be submitted in writing to the Engineer prior to commencing work. Requests from any other person will not be considered official requests.
5. The designated person requesting an inspection shall provide the following information:
 - a. Name of caller.
 - b. Building and rooms to be inspected.
 - c. Work phase of inspection, as specified.

1.7 PRE-CONSTRUCTION CONFERENCE

- A. A conference shall be held prior to construction and shall be conducted by the State Project Manager assisted by the Engineer.
- B. Attendance: The Contractor, Project Designer, industrial hygienist/air monitoring personnel shall also attend.
- C. Agenda:
 1. Review final schedule for project.
 2. Verify legal requirements and special conditions
 3. Verify compliance with pre-construction requirement
 4. Obtain copies of all mandatory notifications.
 5. Inspect sample respiratory equipment and other abatement equipment.
 6. Review procedures and responsibilities.
 7. Clarify the scope of work and its best impact on the users of the building.

1.8 SUBMITTALS

- A. As specified in Section 13281 – REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS and Section 13282 – LEAD-CONTAINING PAINT CONTROL MEASURES.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 AIR SAMPLING - ASBESTOS

- A. Sampling for airborne concentrations of asbestos fibers shall be performed by the Certified Asbestos Project Monitor. Sampling of airborne concentrations of asbestos fibers shall be performed in accordance with 29 CFR 1926.1101 and as specified herein. Unless otherwise specified, NIOSH Method 7400 will be followed for all sampling and analysis.
 - 1. Sampling Prior to Asbestos Work: Baseline air sampling may be conducted by the Certified Asbestos Project Monitor one-day prior to the masking and sealing operations for each removal site.
 - 2. Sampling During Asbestos Work: The performance and execution of the Contractor's work shall be closely and continuously monitored by the Certified Asbestos Project Monitor. Air monitoring and inspection by the Certified Asbestos Project Monitor shall be performed inside the work area, in the work area surroundings and in any occupied adjacent buildings to ensure full compliance with the Specification and all applicable regulations. The Contractor shall provide full cooperation and support to the Certified Asbestos Project Monitor and to their technicians throughout the work.
- B. Air Monitoring with Respect to Contractor's Employees
 - 1. The Contractor shall be responsible for all personal air monitoring as required by OSHA regulations. All personal air monitoring will be conducted by an agent of the Contractor who is currently certified by the Hawaii Department of Health to conduct personal air sampling.
 - 2. The Contractor shall provide own personal sampling of 25 percent of his workers or minimum of two workers, whichever is greater as indicated in 29 CFR 1926.1101 and governing environmental regulations.
 - 3. Laboratory performing analysis shall be an independent party, not financially or managerially connected with the Contractor. Laboratory shall also be approved by the Engineer and AIHA accredited in the type of analysis being performed.
 - 4. At the conclusion of each day's sampling, copies of all air monitoring records shall be provided to the Engineer.
 - 5. Results of sample analysis shall be provided to the Engineer within forty-eight (48) hours of collection.
- C. All other air sampling for compliance with the Specification shall be performed by the Certified Asbestos Project Monitor.

3.2 AIR SAMPLING – LEAD

- A. Environmental and work area air monitoring of airborne lead concentrations shall be performed by the Project Monitor in accordance with 29 CFR 1926.62 and as specified herein.
1. Sampling Prior to Lead Work: The Project Monitor shall collect area air samples outside the work area prior to the start of work in order to establish the background level of lead in the air. The samples shall be analyzed by the Environmental and Work Area Monitoring Laboratory for the airborne concentration of lead. This concentration shall be the background level.
 2. Sampling During Lead Work: The Project Monitor shall perform area air monitoring during the entire abatement operation. The Contractor shall allow access to the work area and assist the Project Monitor as needed.
 - a. Sufficient area air monitoring shall be conducted at the border of the lead control area to ensure unprotected personnel are not exposed to lead concentrations above 30 micrograms per cubic meter of air at all times. As a minimum, conduct area monitoring in areas immediately adjacent to the lead control area daily during each shift in which abatement operations are performed. At least one sample on each shift shall be taken on the downwind side of the lead control area.
 - b. If the outside boundary of the lead control area is determined to have air lead levels above the background levels the Contractor shall be required to adequately correct the conditions causing the increased lead levels. Any work necessary to correct the condition will be completed by the Contractor at no additional cost to the State.
 - c. If the outside boundary of the lead control area is determined to have air lead levels at or above 30 micrograms per cubic meter of air, the Contractor shall immediately stop work and correct the conditions causing the increased level.
 - d. Work shall resume only when approval is given by the Engineer or the Engineer's authorized representative.
 - e. Air Monitoring with Respect to Contractor's Employees
 3. The Contractor's Competent Person shall perform initial personal air monitoring to determine employee exposure during abatement work. During initial personal monitoring, the first two full days of work (two 8-hour work shifts), all workers shall be provided with a minimum of air-purifying half-mask respirators and disposable protective clothing.
 4. Personal monitoring samples shall be taken on at least 25 percent of the employees or a minimum of 2 employees, whichever is greater, or a representative sample of employees with the greatest potential for exposure as determined by the Contractor's competent person during each work shift.
 5. At the end of the period of initial determination all results shall be submitted to a laboratory for analysis by NIOSH Method 7082.

6. Results from the first two full days (two 8-hour work shifts) of initial air monitoring, signed by the testing lab employee performing the analysis and the Competent Person, shall be provided to the Engineer within 48 hours after completion of sampling. Results of initial air monitoring shall be used by the Contractor's Competent Person to determine appropriate worker protection requirements for similar work activities. Determination shall be submitted to Engineer within 48 hours.
7. Regardless of initial air monitoring results, continue personal air monitoring during the entire abatement operations.
8. If the personal air monitoring tests covering a period of two full work days (two 8-hour work shifts) show airborne lead concentrations below the action level, the Contractor's Competent Person may determine that the use of HEPA-filtered air purifying respirators is not required. Other elements of protective clothing shall continue to be worn throughout the abatement operation.
9. If exposure to lead at or in excess of 30 micrograms per cubic meter of air as an 8-hour time weighted average is indicated, the Contractor's Competent Person will immediately notify the Contractor and Engineer. The Contractor will provide and require all persons exposed to this concentration of airborne lead dust to wear, at a minimum, half mask air purifying respirators with HEPA filters. In addition, the Contractor's work procedures will be immediately reviewed by the Engineer and the Contractor and modifications in the Contractor's work performance shall be implemented to lower the concentration of airborne lead.
10. Results of air monitoring shall be submitted to the Engineer within three (3) working days of collection, signed by the testing lab employee who performed the analysis and the Competent Person.

3.3 LEAD WASTE CHARACTERIZATION

- A. TCLP testing of the gross solid lead abatement debris shall be performed by the Contractor to characterize the debris as either non-hazardous or hazardous waste. Metal items to be demolished and removed shall be recycled.
- B. The Contractor shall not concentrate, treat, or intermix wastes from outside this project with the debris and wastes generated by this project.
- C. For lead wastes generated by abatement operations, including used disposal PPE, lead paint chips and waste from paint stripping operations, TCLP testing of the waste shall be provided and paid for by the Contractor as specified herein.
- D. All TCLP test samples shall be collected by the Contractor in accordance with SW 846, "Test Methods for Evaluating Solid Waste – Physical/Chemical Methods."
- E. All TCLP test samples shall be analyzed for lead concentration using EPA Method 1311/6010 by the TCLP Testing Laboratory.

- F. Submit results of TCLP tests to the Engineer within 3 working days of collection, signed by the testing lab employee performing the analysis and the Contractor's Competent Person.

3.4 PAYMENT

- G. Payment for abatement monitoring shall be included at the lump sum price bid under Hazardous Material Testing and Monitoring as scheduled in the Proposal. The final payment will not be made until proper documentation of the disposal of hazardous waste is submitted to the Engineer.

END OF SECTION

DIVISION 15 – MECHANICAL

SECTION 15000

GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section shall apply to all phases of work indicated in contract drawings, or required to provide for a complete installation of mechanical systems included in this project.

1.2 GENERAL REQUIREMENTS

- A. These general mechanical requirements apply to all sections of DIVISION 15 – MECHANICAL of this project specifications, unless specified otherwise in the individual sections.
- B. “Provide” shall mean “furnish and install” when used herein. Connect building systems to exterior utility systems at five (5) feet beyond the building line and/or as shown on the drawings.

1.3 QUALITY ASSURANCE

- A. The Contractor shall furnish all labor, materials, tools, and equipment and perform all work and services necessary for complete and properly operated mechanical system, as shown on the drawings and as specified, in accordance with provisions of the Contract Documents and completely coordinate his work with that of all other trades.
- B. The Contractor shall completely examine the Contract Documents and shall report to the Engineer any error, inconsistency or omission he discovers. Bidders are cautioned to review the Technical Specifications carefully and thoroughly. The submittal of a bid shall be considered as acceptance of the specifications as published. Protests concerning the Technical Specifications lodged after bid opening shall not be considered.
- C. The Contractor shall visit the site and examine the conditions affecting his work before submitting his proposal. The submission of the proposal shall be considered evidence that the Contractor has visited the site. Extra payments will not be allowed to the Contractor on account of extra work made necessary by his failure to visit the site.
- D. Provide all supplementary or miscellaneous items, hangers, support structure, details, appurtenances and devices incidental to or necessary for a sound, secure and complete mechanical system where work required is not specifically indicated.
- E. Drawings and specifications shall be taken together. Provide work specified or stated in one or the other document as though mentioned in both.

- F. Substitution of another manufacturer's product for materials or equipment specified and for items with "approved equal" after the brand name requires approval by engineer in lieu of those specified hereinafter by specific manufacturer and model number.
- G. The Contractor shall warrant that all materials and equipment, furnished under this Contract, will be new and that all work will be of good quality, free from faults and defects, in conformance with the Contract Documents for a guarantee period of one (1) year, commencing after thirty (30) consecutive days of trouble-free operation after date of acceptance of the work as a whole by the Engineer, against all defects in material and workmanship.
- H. The Contractor shall maintain at the site, a minimum of one (1) copy of all drawings, specifications, addenda, approved shop drawings, change orders and other modifications, in good order and marked to record all changes made during construction. These shall be made available to the Engineer.
- I. The Contractor, at all times, shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. Upon completion of the work, the Contractor shall remove all his waste materials and rubbish from and about the project, as well as all his tools, construction equipment, machinery and surplus materials and shall clean all new equipment and accessories.
- J. The Contractor shall give the Engineer timely notice of its readiness for testing any work, including the date arranged so the Engineer may observe such testing. The Contractor shall bear all cost of such tests.
- K. Workmanship and Materials
 - 1. Workmanship shall be of the best quality and none, but competent mechanical workers, skilled in their trades and thoroughly familiar with the work involved, shall be employed. The Contractor shall furnish the services of an experienced superintendent, who will be constantly in charge of the work, until completed and accepted.
 - 2. References to standards are intended to be the latest revision of the standard specified.
 - 3. Unless otherwise specified later in this section, each article of its kind shall be the standard product of a single manufacturer.
 - 4. Whenever the words "or approved equal" or other words of similar intent or meaning are used, implying that judgment is to be exercised, it is understood that it is the judgment of the Engineer that is referred to.
 - 5. All manufactured materials shall be delivered and stored in their original containers. Equipment shall be clearly marked or stamped with the manufacturer's name and rating. Equipment and materials shall be carefully handled, properly stored and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Engineer. Damaged or defective items, in the opinion of the Engineer, shall be replaced at no cost to the State.

- L. The Engineer shall have the right to accept or reject materials, equipment and/or workmanship and determine when the Contractor has complied with the contract documents.

1.4 CONTRACT DRAWINGS

- A. Contract drawings are essentially diagrammatic, indicating general layout and approximate locations toward establishing the scope for uniform estimating basis for all bidders. They are not intended to be detailed construction working drawings. Equipment, fixtures, ductwork and piping arrangements shall fit into space allotted and shall allow adequate clearances for servicing and maintenance. Reasonable modifications to indicated locations and arrangement to suit job conditions shall not constitute basis for requesting additional funds from the State.
- B. Because of the small scale of drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Contractor shall carefully investigate structural and finish conditions affecting his work and arrange such work accordingly, furnishing such fittings, traps, valves, ductwork, piping, supports, and accessories as may be required to meet such conditions.
- C. Verification of Dimensions: The Contractor shall be responsible for the coordination and proper relation of this work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Engineer of any discrepancy before performing any work.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01300 – SUBMITTALS. Submittal requirements are specified in each mechanical section, as well as in this section.
- B. Within thirty (30) calendar days after award of contract and before installation of any materials or equipment is begun, Contractor shall submit to the Engineer for approval a complete list of materials and equipment together with names and addresses of manufacturers, catalog numbers, and trade names; and annotated descriptive data showing the specific model, type, and size of each item the Contractor proposes to furnish. Prepare working drawings on sheets not smaller than 24 inches by 36 inches, and include data essential to the proper installation of the system. Do not commence work until the design of the system and the various components have been approved.
- C. Approval of materials will be based on manufacturer's published rating. Any materials and equipment which are not in accordance with these specifications may be rejected.
- D. Prior to start of any field work, required copies of to-scale shop drawings of equipment, fixtures, ductwork, piping and controls shall be submitted for review. No work shall be started without approval from the Engineer. Where apparatus and equipment have been indicated on the contract drawings, dimensions have been taken from typical equipment of the class indicated. The shop drawings shall show the details of construction and installation of the particular equipment or fixture furnished. The shop drawings shall be fully dimensioned to show that the equipment and connections fit the space provided.

1. Contractor shall check the submittals and shop drawings and certify that they are correct and in compliance with the contract drawings and specifications.
 2. Review of shop drawings is confined to arrangement of equipment and fixtures only and does not relieve the Contractor from responsibility for proper fit, performance and construction. Any deviation from the Contract drawings and specifications shall be clearly noted on the shop drawings. Since manufacturing methods vary, reasonable variations from the Contract Documents are acceptable; however, performance and material requirements are minimum and the State retains the right to judge the quality of any variation.
- E. Submit eight (8) copies of each submittal required for approval.
- F. Substitution Requests: Substituted material or equipment may be used if qualified by written permission from the Engineer.
- G. Shop Drawings: Submit prints of dimensioned shop drawings, indicating equipment layout, piping, hangers, equipment bases, support details, wiring diagrams for control and interlock, and locations and sizes of pipe sleeves and duct openings. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices and components. Coordinate drawings with other trades to avoid interference. Drawings shall be minimum 24 inches by 36 inches in size, except as specified elsewhere. Approval of shop drawings does not relieve the Contractor from responsibility of a complete installation or proper performance. Work shall not commence until shop drawings are approved by the Engineer.
1. The Contractor shall review, stamp with his approval, and submit all shop drawings required by the Contract documents or subsequently by the State.
 2. At the time of submission, the Contractor shall inform the State in writing of any deviation in the shop drawings from the requirements of the Contract Documents.
 3. By approving and submitting shop drawings, the Contractor certifies that he has determined and verified all field measurements and obstructions, field construction criteria, materials, catalog numbers and similar data, that he has checked and coordinated each shop drawing with the requirements of the work and of the contract documents and that all equipment fits within designated spaces.
 4. Drawings shall verify and indicate piping locations and inverts. Backflow preventer, valves, and valve boxes shall be properly integrated with the existing piping.
- H. Product Data:
1. Product data of equipment, fixtures and trim showing manufacturer's name, trade name, catalog model or number, project specification and paragraph reference, material specifications, performance data, certified dimensions, motor sizes and if applicable, sound power levels by octave bands.

2. Contractor shall clearly indicate (highlight, arrow, etc.) on product data submittals the project related information and delete (X or cross out) the non-applicable information.
- I. Schedule: Submit schedules of mechanical equipment which include a complete list of materials and equipment together with names and addresses of manufacturers, catalog numbers, and trade names.
 - J. Certified Test Reports: Before delivery of materials and equipment, certified copies of all test reports, specified in the individual sections shall be submitted for approval.
 - K. Certificates of Conformances or Compliance:
 1. Manufacturer's Certification: Submit certification from the manufacturer attesting that materials and equipment, to be furnished for this project comply with the requirements of this specification and of the reference publications. Preprinted certifications will not be acceptable; certifications shall be in the original, and dated and signed by an authorized officer of the manufacturer. The certification shall not contain statements that could be interpreted to imply that the product does not meet all requirements specified, such as "as good as"; "achieve the same end use and result as materials formulated in accordance with the referenced publication", "equal or exceed the service and performance of the specified material." The certification shall simply state that the product conforms to the requirements specified.
 2. Contractor's Guarantee: Submit certificate of guarantee as detailed in "Guarantee and Certificate" paragraph in this Section.
 3. Standards of Compliance: When materials or equipment must conform to the standards of organizations such as the International Association of Plumbing and Mechanical Officials (IAPMO), proof of such conformance shall be submitted to the Engineer for approval.
 - L. Operating and Maintenance Instructions: Prior to final inspection, submit bound copies of the Operating and Maintenance Instructions on all equipment and the system as a whole and as required by the individual technical sections.
 - M. Field Posted As-Built Drawings: Record changes from the contract drawings of all concealed piping. Show exact locations and sizes, as actually installed, of mechanical equipment, fixtures, piping, isolating valves and items requiring maintenance or inspection. Dimension underground piping from a visible point on structure. Keep at the job site a complete, accurate record of all approved deviations from the contract drawings, shop drawings and specifications. Keep these changes in reproducible prints of the drawings affected and submit to the Engineer at the completion of the project.
 - N. Guarantee: Submit guarantee as noted under item entitled "GUARANTEE AND CERTIFICATE" hereinbelow.

1.6 LAWS, REGULATIONS AND CODES

The following shall govern where applicable: the Uniform Plumbing Code – as adopted by the County of Maui, the International Building Code of the County of Maui, the Division of Wastewater Management, State of Hawaii Department of Health Regulations, OSHA, Rules and Regulations and all other codes and standards referenced in these specifications. Where requirements differ in these codes and standards, the more stringent shall apply.

1.7 PERMITS AND INSPECTIONS

- A. Obtain and pay for all fees, permits licenses, assessments, connection charges and inspections required for this project.
- B. The Contractor shall apply and pay for all necessary inspections required by any public authority having jurisdiction.

1.8 MANUFACTURER'S RECOMMENDATIONS

- A. Equipment installed under this division of the specifications shall be installed according to manufacturer's recommendations, unless otherwise shown on the drawings or herein specified. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the equipment being installed, printed copies of these recommendations shall be furnished to the Engineer, prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the equipment.
- B. Certain specified construction and details may not be regularly included in the manufacturer's catalogued product. The Contractor shall provide the material or equipment complete as specified.

1.9 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Bound Instructions: Unless otherwise indicated, submit eight (8) copies of an operation, maintenance, and troubleshooting manual for each item of equipment and the system as a whole. Furnish the manual, bound in hardback binders or an approved equivalent. Furnish one (1) complete manual prior to the time that equipment tests are performed and furnish the remaining manuals before the contract is completed. Inscribe the following identification on the cover; the words OPERATION AND MAINTENANCE MANUAL, the name and location of the building, the name of the Contractor, the name of the Consultant, date, and the contract number. The manual shall include the names, addresses and telephone numbers of each subcontractor installing equipment and of the local representatives for each item of equipment. Also, include a list of equipment by manufacturer, with the model number and serial number, tag number, quantity of each unit, location of unit and area served. When standard manufacturers brochures are used, adequately indicate (highlight, arrow, etc.) the project related information and delete (X or cross out) the non-applicable information. Flysheet shall be placed before instructions covering each subject. The instruction sheets shall be

approximately 8-1/2 x 11 inches, with large sheets of drawings folded in. The manual shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include:

1. System layout showing piping, backflow preventer and all equipment layout;
2. Description of the function of each principle item of equipment;
3. Shutdown instructions;
4. Maintenance instructions;
5. Safety precautions, test procedures; performance data; and

- B. The manual shall be complete in all respects for equipment, fixtures, controls, accessories, and associated appurtenances provided.

1.10 SUBSTITUTION OF EQUIPMENT OR MATERIAL

- A. Design is based on equipment, fixtures and material as described in the drawings. The space available for some equipment installation is limited. Any changes in equipment, fixtures, bases, piping, connections, or equipment specified and required by approved substitutions shall be made by Contractor at no additional cost to the State. Contractor shall ensure proper fit, clearances, operation and maintainability for any equipment or material that is substituted for that indicated.

1.11 DISCREPANCIES

- A. The drawings and specifications are intended to be cooperative. Any materials, fixtures, equipment or system related to this division and exhibited on the drawings, but not mentioned in the specifications are to be executed to the intent and meaning thereof, as if it were both mentioned in the specifications and set forth on the drawings.
- B. In case of differences between the drawings and specifications, the specifications shall govern first, and then the drawings. Large-scale details shall take precedence over small-scale drawings, as to the shape and details of construction. Specifications shall govern as to materials.
- C. Should any discrepancy or apparent difference occur between drawings and specifications or should an error occur in the work of others affecting the work, the Contractor shall notify the Engineer at once. If the Contractor proceeds with the work affected without instructions from the Engineer, he shall make good any resultant damage, re-work, extra work or defect at no additional cost to the State. All interpretations of drawings and specifications shall be clarified by the Engineer.

1.12 OMISSIONS

- A. It is the intent of the Project to provide a complete installation. Should there be omissions, the Contractor shall call the attention of the Engineer to such omissions so that the necessary corrections can be made.

1.13 GUARANTEE AND CERTIFICATE

- A. The Contractor shall guarantee and certify in writing the following items:
 - 1. All equipment and material furnished for a period of one (1) year commencing after date of acceptance of the work as a whole by the Engineer, against all defects in material and workmanship. If any equipment, piping or material fails, does not operate satisfactorily or shows undue wear, the Contractor will be notified, and shall be required to correct the defect and damage to other work caused by such defect, immediately and at no additional cost to the State.
 - 2. All equipment, piping and materials to provide the results specified or shown.
 - 3. All equipment and fixtures to be properly installed in strict accordance with manufacturer's recommendations.
 - 4. All piping to be drip free and properly installed.
- B. The above guarantee shall not be interpreted as voiding, limiting or reducing any equipment manufacturer's warranty of any guarantee permitted by law.
- C. The State shall have the right to require a written certificate, dated and signed by a responsible employee of the Contractor, evidencing the performance of any portion of the work, or any testing; as a condition precedent to the acceptance of any work or the result of any test. Whenever a regulatory agency performs inspections or tests of any portion of the work, a certificate shall be furnished by the Contractor that the inspection or test was satisfactorily passed.
- D. The Contractor shall be held responsible for all damages to any part of the premises, building or contents caused by leaks or other defects in pipe, fixtures, equipment or materials provided under this specification for a period of one (1) year after date of acceptance of the work as a whole by the Engineer.
- E. Terms of this guarantee are in addition to other guarantee provisions of the specifications, and do not substitute for other more stringent terms, if any.

1.14 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Furnish new equipment, materials, piping and accessories bearing the manufacturers identification. Coordinate deliveries to avoid interference or construction delays. Protect products during delivery, storage, installation and the remainder of the contract period after installation.

PART 2 - PRODUCT

2.1 MATERIALS AND EQUIPMENT

- A. As specified in all sections of DIVISION 15 – MECHANICAL.
- B. Materials and equipment shall be cataloged products of manufacturers regularly engaged in production of such materials, fixtures or equipment and shall be manufacturer's latest design that complies with the specification requirements. Materials, fixtures and equipment shall duplicate items that have been in satisfactory commercial or industrial use at least 2 years prior to bid opening. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the items need not be the products of the same manufacturer. Each item of equipment shall have the manufacturer's nameplate. Name of the distributing agent will not be acceptable.
- C. All materials shall be new, of equivalent or better quality than of materials specified. For ease of maintenance and parts replacement, select equipment from a single manufacturer as much as possible.
- D. The Contractor shall provide all necessary options and accessories to comply with the applicable equipment specification requirements. Installation of options and accessories shall be in accordance with the manufacturer's requirements. The complete assembly shall be warranted by the respective manufacturer.

2.2 NAMEPLATES

- A. Each item of equipment shall have manufacturer's nameplate of corrosion resisting metal attached in a conspicuous location. Nameplate data shall include manufacturer's name, address, model number, capacity, rating and such other performance data as required to completely identify the item. In addition, the manufacturer shall provide a separate corrosion resisting metal tag, unless specified otherwise, to carry the equipment designation as shown on drawings. Except as otherwise specified nameplate lettering shall be stamped upper case. Nameplates shall be fastened by means of corrosion resisting metal screws, rivets or minimum, 14-gauge wire.

2.3 TOOLS AND SUPPLIES

- A. Special tools and supplies shall be provided to maintain equipment provided for this project. The items shall be packaged or boxed to provide protection in storage, and shall be identified as to use. Tools and supplies shall be accompanied by information as to source of supply.

PART 3 - EXECUTION

3.1 VERIFICATION OF DIMENSIONS

- A. The Contractor shall check all dimensions at the site and shall establish all lines and levels. The Contractor shall be responsible for correctness of all dimensions and fitting of equipment

and piping into the available space. Should field measurements show conditions that require relocation of any work, such conditions shall be reported to the Engineer in advance of installation and the work shall proceed in accordance with his decisions.

3.2 PROTECTION OF WORK IN PROGRESS

- A. Pipe openings shall be closed with caps or plugs until connections are made. Equipment shall be securely covered for protection against physical or chemical damage. In areas exposed to weather, materials unused at the end of each day's work shall be stored in weather-protected locations. Damage to materials or equipment due to the Contractor's neglect shall be repaired or replaced to the satisfaction of the Engineer by, and at the expense of the Contractor.

END OF SECTION

SECTION 15400

PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. Plumbing work to include new sanitary, vent, and water piping, and installation of new plumbing fixtures and other appurtenant plumbing items (including associated plumbing lines, supports, accessories, etc.) for a complete and operable plumbing system for the DLNR Hilo Headquarters Office Building Renovation as indicated in plans and specifications.

1.2 GENERAL REQUIREMENTS

- A. Provide complete plumbing system. "Provide" shall mean "furnish and install" when used herein. Connect to utility systems as shown on drawings.
- B. Connect all fixtures and equipment to plumbing system as indicated in contract documents.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 – SUBMITTALS.
- B. Manufacturer's Data: Submit manufacturer's specifications and installation instructions for types of materials and equipment required. Include data substantiating that materials comply with specified requirements.
- C. Unless specified under Section 01300 – SUBMITTALS, submit six (8) copies of each submittal required hereinafter.
 - 1. Equipment Submittal: Before beginning work, submit for review certified literature showing dimensions of equipment, a list indicating manufacturer and model of fixtures and trim, and a list indicating all materials and items that are of a different manufacturer or model than those specified.
 - 2. Shop Drawings: After review of equipment, submit for review dimensioned installation shop drawings to scale showing details where space requirements present problems, proposed departures from the Contract Documents due to field conditions, and requirements for the concrete work, access panels, inserts in slabs and openings in structure.

3. As-Built Drawings: Record changes from the contract drawings of all concealed piping. Indicate location of isolating valves and items requiring maintenance or inspection. Dimension underground piping from a visible point on structure. Indicate invert and slope of drainage piping at sufficient location so that the invert can be calculated for any point in the system. Submit field posted as-built drawings for review as required by Section 01300 – SUBMITTALS.

- D. Certificates: Submit certificated as stipulated on item entitled “CERTIFICATES” hereinbelow.
- E. Guarantee: Submit guarantee as stipulated on item entitled “GUARANTEE” hereinbelow.

1.4 QUALITY ASSURANCE

- A. Comply with all the requirements of the County of Hawaii.
- B. Obtain and pay for all fees, permits, licenses, assessments, connection charges and inspections required for this work.
- C. Substitution of another manufacturer’s product for materials or equipment specified hereinafter and for items with “acceptable equal” after the brand name requires approval in accordance with the INTERIM GENERAL CONDITIONS. Equivalent models listed in the Index Creations Cross Reference Blue Books as similar need not be pre-qualified. Acceptable equal products of the following manufacturers are acceptable in lieu of those specified hereinafter by specific manufacturer and model number.
 1. Valves: Nibco, Watts, Hammond, Crane, Walworth, Dezurik, Lunkenheimer, or Stockham.
 2. Fixtures: American Standard, Kohler, Eljer, or Elkay
 3. Drainage System Specialties: Josam, Zurn, or J.R. Smith.
 4. Pipe Supports: Elcen, Fee and Mason, Grinnell or Unistrut.
 5. Fixture Trim: Symmons, Speakman, Bradley, Chicago, Elkay, or T&S.
- D. Comply with the recommendations and requirements of the Codes and Standards listed hereinafter in addition to detailed requirements of this specification. In the event of conflicting requirements, this specification shall prevail.
 1. American Society for Testing and Materials (ASTM) Publications:

A 74-82 Cast Iron Soil Pipe and Fittings

B 88-86 Seamless Copper Water Tube

B 306-86 Copper Drainage Tube (DWV)

C564-70 Rubber Gaskets for Cast Iron Soil Pipe and
(R-1982) Fittings

2. American National Standards Institute Publications (ANSI):

B16.18-84 Cast Copper Alloy Solder-Joint Pressure Fittings

B16.22-80 Wrought Copper and Copper Alloy Solder Joint
Pressure Fittings

B16.23-76 Cast Copper Alloy Solder Joint Drainage Fittings -
DWV

B16.26-83 Cast Copper Alloy Fittings for Flared Copper Tubes

C2-1982 National Electrical Safety Code

3. Cast-Iron Soil Pipe Institute Publication (CISPI):

Standard No. Hubless Cast Iron Soil Pipe and Fittings for Sanitary
301-90 and Storm Drain, Waste, and Vent Piping Applications

Standard No. Couplings Joint for Use in Connection with Hubless
310-90 Cast Iron Soil Pipe and Fitting

1.5 CERTIFICATES

- A. The Engineer shall have the right to require a written certificate, dated and signed by a responsible employee of this Contractor, evidencing the performance of any portion of the work or the result of any test. Whenever a regulatory agency performs inspections or tests of any portion of the work, a certificate shall be furnished by the Contractor that the inspection of test was satisfactorily passed.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Furnish new equipment, fixtures, materials, and accessories bearing the manufacturer's identification. Coordinate deliveries to avoid interference or construction delays. Protect products during delivery, storage, installation, and the remainder of the construction period after installation.

1.7 GUARANTEE

- A. All work in this section shall be guaranteed for a period of one year from date of acceptance of the work as a whole by the Engineer. Should any fixture or material fail within this period, this Contractor shall be responsible for all damage to any part of the premises caused by the failure and shall repair or replace the defects at no cost to the State.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. All equipment shall be installed in accordance with the manufacturer's written instructions. Accessories not shown or specified, but required for proper system operation shall be provided. Requirements of manufacturer's equipment that is a component of a system provided under this work is included with the system's specification hereinafter. Capacities and characteristics of the equipment are indicated on the drawings. See electrical drawings of all voltage and phase requirements of all equipment furnished under this work.

1. Electric water heater (Tankless electric water heater) Chronomite Laboratories – instant flow, 0.35 GPM flow, 7000 watts, 208/1/60, 29 amps, 55oF rise at 0.75 GPM, Model E-60L/208.

2.2 PLUMBING FIXTURES

- A. Provide chrome-plated, all brass faucets, flush valves, angle stops, tube risers, chrome plated p-traps, escutcheons and cover plates. Provide connecting fittings, china bolt caps, wall support brackets, etc. as required. Furnish masonry and concrete contractor with wall sleeves and inserts required for fixture installation. All valves shall be bronze and brass with chrome plating. All sinks and lavatories shall have 2.0 gpm cold water flow restrictors. All water closets shall be maximum 1.6 gallons per flush. Provide access panels as required for servicing of flush valves, valves, etc. Mount accessible flush valve/actuator on wider side of stall. Provide brass closet bolts, nuts, washer, bolt caps, escutcheon plates and water closet flange/seal for all water closets. Toilet seats shall be white, open front, elongated type. P-trap guard, offset drain guard and angle stop covers shall be white in color. All sinks shall have cleanouts on traps.

1. Water Closet (WC): Kohler K-3505-RA Wellworth Classic water closet, floor mounted, white vitreous china, 1.6 gallon flush, 12 inch rough-in, elongated bowl, bolt caps, 15-1/2 inch bowl height. Kohler K-4636 Cachet Quiet-Close elongated toilet seat, closed-front, while solid plastic.
2. Lavatory (LAV): American Standard 0321.026 DECLYN wall hung lavatory, 18-1/2 inches by 17 inches, 6 inch bowl depth, 4 inch centers, white vitreous china, rear overflow. Provide with Delta deck-mounted centerset faucet, model 500-DST, heavy-duty brass with chrome finish, single handle control, cache aerator. Brass-craft OCR-1912AC-C angle supply stop with oval handles and metal stem. Provide P-trap, continuous waste (17-gauge, brass, chrome plated), copper chrome plated water risers with couplings. Provide P-trap guard, offset drain guard and angle stop cover. 1-1/4 inches by 1-1/2 inches, 17 gage tubular chrome arm supports.
3. Sink (ASK): Elkay Celebrity GEGR2521 single bowl, drop-in, stainless steel, 25" x 21" dimensions, 5-3/8" depth, 20 gauge, 3-1/2" drain opening position center of the sink. Provide Elkay LK810GN08T4 gooseneck faucet with swing spout, aerator, and 4" wristblade handles and LK-18 perforated grid strainer. Provide angle stops, riser, offset p-trap, and escutcheons. See architectural drawing for mounting details.

4. Sink (MSK): Kohler K-6710 "Whitby" 28" x 28" enameled, cast-iron, floor-mounted corner service sink with K-8940 wire rim guard. K-9146 service sink strainer. Kohler K-8907 fill faucet top-mounted wall with threaded outlet, double level handle, vacuum breaker, chrome plated, and 2.0 gpm cold water flow restrictor. Provide 3" trap and Fiat #832-AA hose and hose bracket.

2.3 PLUMBING SYSTEM SPECIALTIES

- A. Exterior Hose Bibb (HB): Chicago Faucets 998 or approved equal, brass, chrome plated, non-removable vacuum breaker, 3/4" inlet, loose key handle with bronze square head stop.
- B. Floor cleanouts (FCO): J.R. Smith 4020 series or approved equal. Provide clamp device when installed in floor with waterproofing membrane. Provide nickel bronze heavy duty cleanout covers.
- C. Cleanout to Grade (COTG): J.R. Smith 4220 series or approved equal installed in concrete pad.
- D. Wall cleanouts (WCO): J.R. Smith 9776 or approved equal.
- E. Floor drains (FD): J.R. Smith 2005Y or approved equal, square top, nickel bronze strainer.

2.4 PIPE AND FITTINGS

- A. Waste and Vent Pipes Below Grade: Service weight cast iron soil pipe, ASTM A74, no-hub cast-iron soil pipe conforming to CISPI 301 with stainless steel bands.
- B. Waste and Vent Pipes Above Grade: Service weight cast iron soil pipe, ASTM A74, no-hub cast-iron soil pipe conforming to CISPI 301 with stainless steel bands. For Exposed vent piping, provide Schedule 40 galvanized steel with screwed fittings. Exposed piping to be painted to match existing background surfaces.
- C. Water Pipes: Type "L" hard-drawn copper tube ASTM B88 with soldered (95-5) joint wrought copper pressure fittings. Use Type "K" copper tube with brazing alloy on joints and pipes below grade. All solder shall be non-lead; flux shall be non-corrosive complying with Copper Development Association Standard 1.0.

2.5 INSULATION

- A. Apply in accordance with manufacturer's recommendations by skilled mechanics. Flame spread rating not to exceed 25 and smoke development rating not to exceed 50.
 1. Insulate condensate piping with 1-inch thick fiberglass insulation with all service jacket vapor barrier, Owens-Corning or equal.
 2. On pipe insulation exposed to weather, apply 16 mil embossed aluminum jacket with 2-inch overlap at longitudinal and circumferential joints, secured in place with 3/4-inch x 0.015 gauge aluminum bands on 18 inch centers. Apply humped aluminum ells or fabricated 16 mil aluminum to fittings and band in place.

3. Saddles: Provide 180 degree galvanized sheet metal protective saddles at each hanger or support on insulated piping and shall be no less than 16 gauge and no less than 12 inches long.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Visit the worksite and become fully aware of all existing conditions. Investigate the Contract Documents and make proper provisions to avoid interference or construction delays. Determine the exact route of each pipe. Make offsets and changes in direction required to maintain proper head room and pitch or to accommodate the structure and the work of other trades. Furnish other trades with information to properly locate and size openings in the structure required for this work. Furnish anchor bolts, sleeves, inserts and supports required for this work.

3.2 INSTALLATION AND REQUIREMENTS

- A. Perform work using personnel skilled in the trade involved. Provide competent supervision. Furnish new equipment, fixtures, materials and accessories bearing the manufacturer's identification and conforming to recognized commercial standards. Provide all extra materials and labor for a complete operable system at no extra cost to the State.

3.3 FIXTURE INSTALLATION

- A. Set fixtures in an approved workmanlike manner. Point up all edges against building structure with white grout. Provide adequate supports for wall-mounted fixtures. Provide supplies for all waterlines to fixtures, except those using flush valves; Brass-Craft or equivalent, compression joint type with chromium plated brass escutcheon and cover tube, loose-key angle stop valve and drawn copper tube riser. Provide chromium plated brass P-trap, waste fittings and escutcheon and cover tube, loose key angle stop valve and drawn copper tube riser. Provide chromium plated brass P-trap, waste fittings and escutcheon as required for fixture. Exposed metal including pipe shall be polished chromium plated.

3.4 PIPING INSTALLATION

- A. Conform to the requirements of the Uniform Plumbing code. Inspect all pipes inside and outside. Remove interior obstructions and ream out pipe ends. Tool markings on polished fittings are not acceptable. Cut pipe accurately so that it can be worked into place without springing or forcing. Install pipes parallel to the wall of the structure and plumb. Make changes in direction with fittings. Bushings are not permitted. Install valves with stems above horizontal. Provide proper support and adequate provisions for expansion, contraction, slope and anchorage. Provide dielectric unions where copper tubing connects to steel pipe. Wrap pipe or tubing with 1/4" thick felt, secure with tape, where it contacts other materials. Have piping tested, inspected and approved before it is furred in, buried or otherwise hidden. Provide standard weight galvanized steel pipe sleeves where water pipes pass through structure, sufficiently large to provide 1/4" clearance around pipe. Caulk watertight around pipes passing

through sleeves. Wrap pipe with polyethylene tape where it passes through sleeve and when it contacts concrete or masonry. Grout with fireproof material around all pipe penetrations through slabs and walls full length of penetrations. Provide chrome-plate brass escutcheons, set tight on the pipe and to the wall where pipes are exposed in finished areas. Provide clamping collar to membrane flange where pipe or drains penetrate waterproof membrane. Perform all welding using qualified welders in accordance with American National Standards Institute's Code B31.1 and American Welding Society Standard B3.0.

3.5 PIPING SYSTEM SUPPORTS

- A. Pipe Hangers: Steel clevis hanger with adjustable hanger rod; 3/8" for pipe 2" and smaller, 1/2" for pipe 2-1/2" through 3-1/2" and 5/8" for pipe 4" and larger.
- B. Pipe Supports: Support steel and copper pipe at maximum spacing of 6 feet for pipes 1-1/2" and smaller, 10 feet for pipes 2" through 4".

3.6 DRAINAGE, WASTE AND VENT PIPE SYSTEMS

- A. Slope drain lines at 1/4" per foot unless otherwise indicated. On roof vents and where other drains occur above the ground floor, provide clamping device with drain. Provide a four-pound lead flashing sheet extending eight inches out around drain body and secure with clamp device. On vents through roof, extend vent flashing 8-inches out all around base of vent, extend collar up vent and turn in at top.

3.7 WATER PIPING SYSTEM

- A. Secure each water line where it penetrates partitions to serve equipment, hose bibb and similar items. Wrap all lines passing through concrete with polyethylene tape. Install unions or flanges at all valves, equipment and system specialties. Set hose bibbs 18" above finished grade, unless otherwise indicated. Install dielectric unions at connections of copper and ferrous pipes.

3.8 INSULATION SYSTEM

- A. Thermal insulation shall be furnished and installed as specified. Should alternate construction methods other than called for in this specification be required, the Contractor shall so submit during prequalification and substitution portions of bidding.
- B. Where observation of work or workmen indicates specification is not being complied with, entire section or all of the installed insulation shall be removed and reinstalled as specified.
- C. All components of the insulation for piping, including facings, mastics and adhesives, shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed. Ratings shall be as determined by Underwriter's Laboratories, Inc. or other approved testing laboratory.
- D. Insulate condensate piping with 1-inch thick fiberglass insulation with all service jacket vapor barrier. Seal all joints with insulation manufacturer's approved adhesive.

- E. Insulation to be applied on clean, dry surfaces free of any foreign matter and only after tests and approvals required by the specifications have been completed.
- F. Insulate all piping in a neat, workmanlike fashion in accordance with recommended thicknesses. All joints and seams shall be butted tightly together. Jackets to be secured tightly and smooth over the insulation.
- G. All pipe insulation shall be continuous through wall and ceiling openings and sleeves.
- H. All surface finishes to be extended to protect all surfaces, ends, and raw edges of insulation.

3.9 FIELD QUALITY CONTROL

- A. Test plumbing systems in accordance with the Uniform Plumbing Code. Perform tests in the presence of, and to the satisfaction of inspectors having jurisdiction over the work. Ask for final inspection by the Engineer after all tests, adjustments, and balancing has been performed.
 - 1. Test drainage systems in accordance with Section 318 of the Plumbing Code.
 - 2. Hydrostatically test the domestic water piping system at 100 psi. Inspect the entire system while under pressure and correct all deficiencies.
 - 3. Test equipment to demonstrate its operations and compliance with the specifications.

3.10 BALANCE, ADJUST, AND CLEAN

- A. Clean up work areas and fixtures. Adjust system for proper operation, ready for use.

END OF SECTION

SECTION 15800

AIR CONDITIONING AND VENTILATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Air conditioning and ventilation work to include installation of a new split system air conditioners, exhaust fans, supply fans, ductwork and accessories and other appurtenant items for a complete and operable air conditioning and ventilation system for the DLNR Hilo Headquarters Office Building renovation as indicated in plans and specifications.

1.2 GENERAL REQUIREMENTS

- A. Provide all labor and materials necessary for a complete and operating air conditioning and ventilation system. "Provide" shall mean "furnish and install" when used herein. Project drawings show general requirements as to size, arrangement of ducts and piping, and location of equipment. Manufacturer of equipment shall have Hawaii stocked spare parts, representation and support of a service organization which has serviced manufacturer's units of comparable type, size and capacity as specified herein. Manufacturer must have other units of comparable type, size and capacity installed and operating satisfactorily in the State of Hawaii for a minimum of two years prior to bid opening. All equipment with local manufacturer's representative shall be purchased through local distributor.
- B. Electrical: Provide all indicating controls for this work. Mount control devices and provide control wiring and conduit. Furnish motor starters and enclosures for equipment under this section.

1.3 COORDINATION WITH OTHER SECTIONS

- A. Electrical Work: Mounting of starters and providing of fused or non-fused disconnect switches, circuit protection and power wiring conduit are under DIVISION 16 - ELECTRICAL.
- B. Painting: Painting of equipment and materials under Section 09900 "PAINTING."

1.4 SUBMITTALS

- A. Submit in accordance with Section 01330 - SUBMITTAL PROCEDURES.
- B. Shop Drawings and Product Data:
 - 1. Submit shop drawings and product data in one complete package. Piecemeal submittals are not acceptable.
 - 2. Reproductions of Contract Drawings for the use of shop drawings are not acceptable.
 - 3. Shop Drawings: After review of equipment, contract documents and field conditions,

submit for review dimensioned installation shop drawings to scale showing details where space requirements present problems, proposed departures from the Contract Documents due to field conditions, and requirements for the concrete work, access panels, blockouts, inserts in slabs and openings in structure. Drawings shall also indicate adequate clearances for operation, maintenance, and replacement of operating equipment. The shop drawing review is confined to arrangement of equipment only and will not relieve the Contractor from responsibility for proper fit, performance, or construction. Any deviation from Contract documents including dimensional, performance or material changes shall be clearly notes on shop drawings.

4. Equipment Submittal: Before beginning work, submit for review certified literature showing ratings and dimensions of equipment, and of a list indicating all materials and items that are of a different manufacturer or model than those specified.

- a. Submittals shall include the following items:

1. All fans with sound data, performance data, fan curves, electrical data.
 2. Split system air conditioners with sound data, performance data, electrical data.
 3. Air devices, flex duct, insulation and duct accessories with sound data, mounting data and performance data.
 4. Control wiring, devices and diagrams.
 5. Exhaust Fans with sound data.
 6. Control diagrams, control modules and devices.

- a. Accessories and insulation

- b. Submittals shall include the following as a minimum:

1. System design information sheet with dimensional data, weights, finishes, corrosion protection, performance information with sound data.
 2. Description of system operation
 3. Electrical power and control wiring diagram, motor efficiencies, starter/enclosure ratings.
 4. Catalog information on valves, strainers and control components

- Packaged system dimension and general arrangement drawing.

C. Site Maintained Drawings:

1. Maintain an accurate record of all changes made in installation from layout and materials shown on Contract Drawings and/or approved shop drawings.

2. Indicate location of items requiring maintenance or inspection.
 3. Submit reproducible vellums of these drawings to Engineer prior to final inspection.
- D. As-Built Drawings: Record changes from the contract drawings of all ductwork and equipment. Indicate location of dampers and items requiring maintenance or inspection. Submit as-built drawings for review prior to final inspection.
- E. Operation and Maintenance Manuals: Submit eight (8) hard bound copies of the operating and maintenance manuals on all equipment and the system as a whole bound. The manual shall identify all equipment, the manufacturer's name, model, serial number, tag number, capacity, quantity, location and area served, operation and maintenance manual, and shall include the manufacturer's operation and maintenance manuals including control diagrams and source of service and replacement parts. Provide tabs separating each piece of equipment. When using published manuals covering several equipment models/options, identify which data and instructions apply to the equipment being provided. Submit complete manuals for review prior to final inspection.
1. Operating Instructions in manual shall include:
 - a. General description of the system and sequence of operations for all equipment.
 - b. Step by step procedure to follow in putting each piece of equipment in operation.
 - c. Provide schematic control diagrams for each separate fan system. Each diagram shall show locations of start-stop switches and correct operating settings for each control instrument shall be marked on this diagram.
 - d. Provide diagram for the electrical control system showing the wiring of all related electrical control items and interlocks.
 - e. Include all air balance and test reports.
- F. Provide a laminated copy of the control diagram for each component of the system. Diagrams shall be framed and hung in the Office.
- G. Certificates: Submit certificates as stipulated on item entitled "CERTIFICATES" hereinbelow.
1. Guarantee: Submit guarantee as stipulated on item entitled "GUARANTEE" in PART 3 - EXECUTION hereinbelow.
- H. Maintenance Service Contract: Submit maintenance service contract as stipulated on item entitled "ONE YEAR MAINTENANCE SERVICE CONTRACT" in PART 3 - EXECUTION hereinbelow.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: For actual fabrication, installation and testing of work under this section use only thoroughly trained and experienced workmen completely familiar with items

required and manufacturer's current recommended methods of installation. In acceptance or rejection of finished installation, no allowance will be made for lack of skill on part of the installer.

- B. The Mechanical Contractor shall provide an independent third party Testing and Balancing Contractor at their own expense to verify testing and balancing data provided under this section of the specifications. Selection of the third party Contractor shall be agreed on by both the Mechanical Contractor and the State.
- C. All equipment to be considered for this bid purposes must be of a manufacturer that has locally stocked spare parts, representative, and support of a service organization reasonably convenient to the site of installation which has serviced manufacturer's units of comparable type, size and capacity as those specified. The manufacture must have other units of comparable type, size and capacity installed and operating satisfactorily in the State of Hawaii for a minimum of two year prior to bid opening. The contractor shall provide a list of locations in Hawaii with addresses and telephone numbers when requested by the Engineer. All equipment with local manufacturer's representation shall be purchased through the local distributor.
- D. Laws, Regulations, and Permits:
 - 1. Comply with all the requirements of the City and County of Honolulu, and the latest editions of SMACNA, ASHRAE and NFPA.
 - 2. Obtain and pay for all fees, permits, licenses, assessments, connection charges and inspections required for this work.
 - 3. At completion, submit certification from approving agencies that work meets above requirements.
- E. Substitution of another manufacturer's product specified hereinafter and for items with "or acceptable equal" after the brand name requires written permission by the Engineer prior to bidding. No substitution will be considered after the bid opening. Acceptable equal products of the following manufacturers are acceptable in lieu of those specified hereinafter by the manufacturer and model number.
 - 1. Controls: Honeywell, Johnson Controls, Robert Shaw, Siebe (Ivensys), Automated Logic.
 - 2. Split system air conditioners: LG, Daikin, Fujitsu, Sanyo, Mitsubishi.
 - 3. Insulation: Certainteed, Owens-Corning, Pittsburgh Corning Corp, Pro-Tect-T-Kotes Fittings, Knauf.
 - 4. Exhaust Fans: Acme, Barry, Carnes, Chicago, Greenheck, Joy, L.C. Cook, Penn, Twin City Blower Company.
 - 5. Valves: Alco, DeZurick, Lukenheimer, Muessco, Nibco, Sporlan, Stockham, Superior, Walworth.

6. Air Distribution Devices: Anemostat, Barber-Colman, Metalaire, Titus, Tuttle and Bailey, Krueger.
 7. Pipe Supports: Elcen, Fee and Mason, Grinnell, Michigan, Unistrut.
 8. Flexible Ducts: Jen-Flex, Metal Fab, Inc., Therma-Flex.
- F. Comply with the recommendations and requirement of the Codes and Standards listed hereinafter in addition to the detailed requirements of this specification.
1. American National Standards Institute Publications (ANSI):
 - A13.1 Scheme for Identification of Piping Standards
 - B9.1 Safety Code for Mechanical Refrigeration
 - B31.1 Power Piping
 - B31.5 Refrigeration Piping
 - C 1 National Electrical Code
 2. National Fire Protection Association (NFPA) Standards:
 - 90A Air Conditioning and Ventilation System
 3. Air Moving and Conditioning Association (AMCA) Standards:
 - 210 Test Code for Moving Devices
 - 300 Test Code for Sound Rating Air Moving
 4. American Society of Heating, Refrigeration and Air Conditioning Architects (ASHRAE):
 - Handbook, Applications – latest edition
 - Handbook, Equipment – latest edition
 - 15 Safety Code for Mechanical Refrigeration
 - 34 Number Designation and Safety Classification of Refrigerants
 5. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
 - Manual for the Balancing and Adjusting of Air Distribution Systems
 - Low Velocity Duct Construction Standards – latest edition
 - Duct Liner Application Standards

6. Air Conditioning and Refrigeration Institute (ARI) Standards:

410	Forced Circulation Air Cooling and Heating Coils
520	Positive Displacement Refrigerant Compressors, Compressor Units and Condensing Units
550	Centrifugal and Rotary Water Chilling Packages

- G. Air conditioning equipment to be considered for bid purposes must be of manufacturer that has locally stocked spare parts, representation, and support of a service organization reasonably convenient to the site of installation which has serviced manufacturer's units of comparable type, size and capacity as those specified. The manufacturer must have other units of comparable type, size and capacity installed and operating satisfactorily in the State of Hawaii for a minimum of two years prior to bid opening. The Contractor shall provide a list of locations in Hawaii with addresses and telephone numbers when requested by the Engineer. All equipment with local manufacturer's representative shall be purchased through the local distributor. Provide factory start-up with certified factory-trained personnel.

1.6 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect materials and equipment before, during, and after installation and to protect installed work and materials of all other trades. Under no circumstances shall any mechanical equipment be stored outside, unprotected.
- B. Replacements: In event of damage, immediately make all repairs and replacements necessary at no cost to the State.

1.7 CERTIFICATES

The Engineer shall have the right to require a written certificate, dated and signed by a responsible employee of the Contractor, evidencing the performance of any portion of the work, or any testing; as a condition precedent to the acceptance of any work or the result of any test. Whenever a regulatory agency performs inspections or tests of any portion of the work, a certificate shall be furnished by the Contractor that the inspection or test was satisfactorily passed. Contractor shall provide AHRI 550/590 factory certified test reports.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Capacities and characteristics of equipment are indicated on the drawings. See electrical drawing for all voltage and phase requirements of all equipment furnished under this work. Provide combination magnetic part winding (above 40 HP) across-the-line starter (below 40 HP), control voltage transformer and circuit breaker for each motor of mechanical equipment unless the equipment is factory-wired to a single power connection or unless otherwise indicated hereinafter. Provide disconnect switch for all mechanical equipment. Exposed to weather starters shall be 4X stainless steel type. All steel surfaces shall be hot-dipped

galvanized. All steel exposed to weather shall be hot-dipped galvanized and shall have an additional two coats of zinc rich rust-proof paint. Provide vibration isolators as indicated hereinafter. All motors shall be high efficiency type. All motors with variable speed drives shall have undervoltage, overvoltage, phase failure, phase reversal with automatic reset. All motors used with variable frequency drives shall be rated for variable speed usage.

Isolation Equipment	Description*	Minimum Static Deflection
Exhaust Fans	Rubber-in-shear with steel spring isolator	1"
FCU	Vertically and laterally restrained with steel plate and neoprene pad	2-1/2"
ACCU	Neoprene pad	1/4"

*Isolator mounting shall be in accordance with manufacturer's dimensioned drawings. Isolators shall be sized specified static deflection from manufacturer's published loading information at each mounting point, based on operating weight. All springs shall be neoprene dipped with hot dipped galvanized housings. Provide additional layers of 3/4" thick insulation at factory or field install.

1. Split System Air Conditioner: Air Cooled Condensing Unit shall be hermetic inverter driven scroll compressor with accumulator, charging valve, crankcase heater, timer circuit, internal vibration isolation and thermal overload protection. Non-ferrous copper condenser coil with lanced or corrugated plate fins. Direct drive, variable speed, propeller type condenser fan with permanently lubricated, totally enclosed and inherently protected motor. Factory applied Blue Fin corrosion protection coating on condenser fins and tubes. Galvanized steel unit casing, bonderized and finished with a powder coated baked enamel. Mitsubishi Model PUHY-YSLMU or approved equal.
2. Fan Coil Units: The fan coil units shall be ceiling cassette, ducted or wall mounted as noted in equipment schedule. VRF Split System AC shall be Mitsubishi, LG, Daikin, Fujitsu, Sanyo or approved equal.
3. Thermostat: Provide remote on-off switches and thermostats as indicated on drawing 48" above floor. The central controller shall be programmed to operate the air conditioning units one hour before business hours, as set by the building engineer. Adjustments to the scheduling will be made on a case by case basis based on the user's preference. The individual controllers shall be used to monitor space temperature only and be locked out. The contractor shall provide all necessary power wiring, conduits and connections for system which is provided.
4. Ceiling Exhaust Fan: Ceiling fans shall have acoustically insulated housing. Air delivery shall be as indicated on the drawings and fan shall bear the AMCA certified rating seal and the U/L label. Integral backdraft damper shall be totally shatterproof with no metal to metal

contact. Fan shall have true centrifugal wheel with inlet perpendicular to or remote from inlet grille. Grille shall be of aerodynamic design of white molded plastic egg-crate shape and provide 85% free open area. Terminal box shall be provided on the housing with cord, plug, and receptacle inside the housing. Entire fan, motor, and wheel assembly shall be easily removable without disturbing the housing. Motor speed shall not exceed 1000 rpm and motor shall be suitably grounded and mounted on rubber-in-shear vibration isolators. Greenheck, Twin City, Broan, Nutone, or approved equal.

2.2 DUCTWORK AND ASSOCIATED SHEETMETAL WORK

- A. All low pressure air conditioning and exhaust ducts shall be galvanized sheet metal steel with gages and construction in accordance with SMACNA Standards "HVAC Duct Construction Standards". Caulk/seal all joints/seams in ductwork airtight. Insulate all supply and return ductwork.
- B. Damper: Opposed blade type, all aluminum with exterior lever.
- C. Duct Insulation: 2-inches thick, 1-psf density, fiberglass duct wrap with flame spread rating not to exceed 25 and smoke development rating not to exceed 50. Provide vapor barrier. Duct wrap shall include top of ceiling supply diffusers and all flex connections at air handling equipment.
- D. Flexible Duct Connections: Neoprene coated glass fabric prefabricated connections, UL approved. Flexible duct connectors shall be provided at each inlet and discharge of air handling units, fan coil units, dehumidifiers and exhaust fans. Flex connections of all air handling units and fan coil units shall be insulated with duct wrap as indicated above.
- E. Bell-Mouth Fittings: For use at all round and flexible duct take-offs. Fittings shall be complete with volume damper with locking quadrant and extension rods for wrap insulation.
- F. Splitter Dampers: Provide on all taps, including low pressure branches to diffusers. Shall be adjustable with locking quadrants.
- G. Deflectors: Provide fixed deflecting vanes at all branch take-offs and elbows. Shop fabricated blades; fit into side strips and screw or rivet to duct.
- H. Flexible Ducts: Polyester core with galvanized wire helix and 1-1/2" inch thick, 3/4 lb. density fiberglass insulation with flame resistant vapor barrier, UL approved. Flexible ducts not to exceed 6 feet in length must be supported to maintain laminar flow. Flexible ducts tied in with medium pressure system shall be rated and constructed for medium pressure applications.
- I. Duct Access Doors: Galvanized with hinges and lever locking, catch mechanism, gasket or seals on doors. Fire rated as required in fire rated walls or ceilings.

2.3 PIPE, FITTINGS AND VALVES

- A. Condensate Drain Piping (Aboveground): Type "L" hard drawn copper with copper or brass drainage fittings and 95-5 tin antimony (non-lead) solder joints. Use 45 degree elbows and cleanout plugs at all bends. Use non-corrosive flux.

- B. Refrigerant Piping (Aboveground): Hard drawn copper tubing, type K, with wrought copper fittings. Material and dimensional requirements for field assembled ACR refrigerant piping, valves, fittings, and accessories shall conform to ANSI B9.1 and ANSI B31.5.
- C. Valves: Ratings of not less than 125 psi working pressure. Provide chain wheel on valves in mechanical rooms if valves located at 8 feet above floor or higher. Provide epoxy coating on valves exposed to weather.

- 1. Ball Valves 2-Inches and Smaller: Nibco T-560-BR-Y-20.

2.4 PIPE SLEEVES

- A. Piping sleeves through walls and floors shall be steel pipe or 18-gauge galvanized metal. Piping through sleeves of fire rated walls or plenum chambers shall be caulked tight with fiberglass material. Sleeves installed through drilled holes through concrete shall be grouted and finished on both sides. Exterior sleeves shall be caulked watertight.

2.5 PIPE HANGERS AND SUPPORTS

- A. Horizontal piping shall be hung with Grinnell No. 260 hanger or equivalent; vertical piping shall be supported with Grinnell No. 261 riser clamps or approved equal.
- B. Uninsulated copper pipe shall be supported with copper plated hangers, Grinnell No. 97CP or approved equal.
- C. Under no circumstances shall piping be supported from ductwork, equipment or electrical.

2.6 FLEXIBLE CONNECTION

- A. Provide flexible pipe connectors for all mechanical equipment connections rated at 150 psig working pressure, metal reinforced and with restraining rods. Multiple Victaulic joints may be used in lieu of flexible connections.

2.7 ACCESS PANELS

- A. Provide access panels for all mechanical equipment requiring adjustment, servicing and routing maintenance. Access panels shall be 12 inch x 12 inch minimum size in walls and partitions, 24 inch x 36 inch minimum size for ceilings. Provide fire rated access panels to match rating of wall/ceiling where required.

2.8 INSULATION

- A. Apply in accordance with manufacturer's recommendations by skilled mechanics. Flame spread rating not to exceed 25 and a smoke development rating not to exceed 50.
 - 1. Condensate Drain and Refrigerant Piping: Flexible elastomeric foam insulation with all service jacket, Armaflex or equal. Provide vapor barrier and make weather-tight. Insulation thickness: 1-inch for pipe sizes 1 inch and smaller; 1-1/2 inches thick for larger pipes. Installation in accordance with manufacturer's latest recommendations.

2. Exterior Above Grade: Above grade refrigerant piping shall be insulated with 3/4" thick Armaflex. Insulation shall be covered with Airex E-Flex guard.
3. Interior Above Grade: Above grade refrigerant piping shall be insulated with 3/4" thick Armaflex.
4. On pipe insulation throughout inside and outside of building, apply 16 mil embossed aluminum jacket with 2-inch overlap at longitudinal and circumferential joints, secured in place with 3/4 inch x 0.015 gauge aluminum bands on 18 inch centers. Apply humped aluminum ells or fabricated 16 mil aluminum to fittings and band in place.
5. Saddles: Provide 180 degree galvanized sheetmetal protective saddles at each hanger or support on insulated piping and shall be no less than 16 gauge and no less than 12 inches long. Insulation at saddles shall be 9 pcf density minimum.
6. Shields: An aluminum shield shall be fitted tightly around each piece of pipe covering where exposed to injury in mechanical rooms. On vertical pipes, shield shall extend a height of 6 feet. Longitudinal seams shall be lapped 1 inch or more secured with sheet-metal screws spaced 4 inches apart, except on vapor sealed coverings, bands shall be used.

2.9 AIR DISTRIBUTION DEVICES

- A. Manufacturer: Barber-Colman, Titus, Metal-Aire, Kreuger, Anemostat, Airlume, Carnes or approved equal.
- B. Construction: Aluminum construction "off-white" color for face plates, frames and grilles; except as noted.
 1. Return Register, Exhaust Register, and Transfer Grille: Fixed blade type, 45 degree angle, 3/4 inch blade spacing with opposed blade volume control damper.
 2. Supply Diffuser: Square, louver face diffuser with opposed blade volume damper, 4-way throw unless otherwise indicated, with off-white finish. Provide factory insulation at the backside of the air device.
 3. Supply Air Register: Adjustable, double blade type, front blades horizontal, rear blades vertical, 3/4 inch blade spacing with opposed blade volume control damper.
 4. Return Air Register: Fixed blade type, 45 degree angle, 3/4 inch blade spacing with opposed blade volume control damper. Provide perforated face registers for air devices serving animal (mammal/reptile) holding rooms with 3/16" diameter perforations staggered on 1/4" centers.

2.10 SPECIAL TOOLS

- A. If any part of equipment furnished under these specifications requires a special tool for assembly, adjustment, setting or maintenance thereof and such tool is not readily available on commercial tool market, furnish necessary tool with equipment as standard accessory.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Space reserved for ducts, piping and necessary lighting above furred ceilings are critical. Install ducts and piping through scissor frame. Location of light fixtures cannot be changed. If space allocated is too small for ducts and piping, make necessary move to fit into general pattern. All duct modifications shall be accomplished using 45 degree fittings; 90 degree fittings shall not be used unless prior approval from the Engineer is obtained. All changes shall be submitted to the Engineer for approval.
- B. Do not scale drawings. Check all measurements at building and adjust work to fit into space allotted. Close cooperation between trades will be required. Any work without regard for work of other trades shall be moved without extra charge, if necessary to permit proper installation of other work.
- C. Investigate the Contract Documents and make proper provisions to avoid interferences or construction delays. Determine the exact route of each duct and pipe. Make offsets and changes in direction required to maintain proper head room and pitch or to accommodate the structure and the work of other trades. When changing the size of ductwork, provide ducts having the same friction loss as the size of the duct shown on the Contract Documents. Furnish other trades with information to properly locate and size openings in the structure required for the work under this section. Furnish anchor bolts, sleeves, inserts and support required for the work under this section. Provide access panels for concealed items provided under this section that require maintenance, adjustment or inspection.

3.2 INSTALLATION

- A. Perform work using personnel skilled in the trade involved. Provide competent supervision. Furnish new equipment, fixtures, materials and accessories bearing the manufacturer's identification and conforming to recognized commercial standards. Provide OSHA approved guard or rails all around exposed moving machinery parts, pulleys, belts and around high-temperature equipment and materials. No piping, electrical conduit, ceiling supports or similar items shall be supported from equipment or ductwork. Provide additional materials and labor for a complete, operable (including starting, testing, balancing and adjusting), and fully accepted system at no extra cost to the State.
- B. Equipment: Install equipment in the space allotted with sufficient clearance for proper operation and maintenance. Where equipment differs in arrangement or connections from those shown, provide all required changes in appurtenances. Provide equipment accessories necessary for proper operation and support. Concrete equipment bases and supports are under DIVISION 3 - CONCRETE. Direct trade providing concrete in the proper locations, dimensions, load carrying capacity and anchor bolt locations. Concrete pads shall be not less than four inches beyond the base of the equipment. Provide vibration isolators for all mechanical equipment as indicated hereinbefore. Secure floor mounted isolators to base and to equipment.
- C. Piping: Conform to recognized commercial standards. Inspect all pipes inside and outside.

Remove interior obstructions and ream out pipe ends. Cut pipe accurately so that it can be worked into place without springing or forcing. Install pipes parallel to the wall of the structure and plumb. Make changes in direction with fittings. Bushings are not permitted. Install valves with stems above horizontal. Provide proper support and adequate provisions for expansion, contraction, slope and anchoring. Provide dielectric unions between dissimilar metals. Have piping tested, inspected and approved before it is furred in, buried or otherwise hidden. Provide 24 gauge galvanized steel sleeves where pipes pass through structure, sufficiently large to provide 1/4 inch clearance around pipe. Caulk watertight around pipes passing through sleeves. Wrap pipe with polyethylene tape where it passes through sleeve and when it contacts concrete and CMU. Provide non asbestos rope packing around all sleeves and seal with elastomeric caulk. All penetrations through the walls shall be packed with neoprene sponge, closed cell, conforming to ASTM Designation D01056 Grade SCE41. Provide chrome plated brass escutcheons, set tight on the pipe and to the wall where pipes are exposed in finished areas. Perform all welding using qualified welders in accordance with American National Standards Institute's Code B31.1 and American Welding Society Standard B31.0.

- D. Piping System: Pipe Supports Factory fabricated by Elcen, Fee and Mason, Grinnel or Unistrut; no chains or straps permitted. Provide concrete inserts, beam clamps, channel framing, hanger rods and accessories required for proper pipe support. Ramset or explosive type anchors are not permitted. Support vertical piping with hanger at base of riser and with pipe clamp at each floor. At each support point on insulated pipe provide Owens-Corning Kaylo pipe insulation (minimum 9 pcf density) or equal around pipe with 18 gauge sheet metal jacket, each two pipe diameters in length. Pipe Hanger Steel clevis hanger with adjustable hanger rod; 3/8" for pipe 2" and smaller, 1/2" for pipe 2 1/2" through 3 1/2" and 5/8" for pipe 4" and larger. Groups of lines may be supported from steel channel with pipe clamps.
1. Condensate Drain Piping System: Slope drain lines at 1/8 inch per foot unless otherwise directed. Provide a water seal (P trap) with water column 1 inch greater than the total static pressure of the fan in inches of water. Terminate condensate drain over nearest plumbing drain when not otherwise indicated. See insulation specified hereinafter. Cleanouts at all changes in directions.
 2. Water Piping System: Provide unions or flanges at all connections to equipment and accessories. At all low points in the piping system, provide drain consisting of 1/2 inch gate valve with hose adaptor. Provide air vents at all high points in the piping system; manual type unless otherwise indicated. Extend a discharge line to a drain from each vent. Provide chainwheel with guides on all valves in equipment rooms that are 8 feet or more in height. Provide chains extending to 5 feet above floor.
 3. Electric Valve Operator: Modulating low voltage electric motor with spring return and sufficient capacity to operate the control device under all conditions. Provide built-in transformer as required.

3.3 ELECTRICAL WORK

- A. Conform to the requirements of NFPA-70, National Electrical Code, and to the requirements of DIVISION 16 - ELECTRICAL of these specifications. Obtain equipment manufacturer's control wiring diagrams for the equipment furnished. Prepare a control and interlock control

diagram for the complete system. Indicate terminal connection points to factory wired equipment. Submit control diagram to the Engineer for review. Contractor shall supply and mount all motors and provide all control wiring with conduits and controls for equipment furnished by him except that shown on the Electrical Drawings. All power wiring, including final connection to the mechanical equipment shall be provided by the Electrical Contractor. Refer to DIVISION 16 - ELECTRICAL and to the electrical drawings as well as mechanical drawings for requirements and division of work for each application. Should any equipment supplied by the Mechanical Contractor require electrical service or wiring than as shown on the Electrical Drawings, advise the Electrical Contractor of such changes and pay all costs for any additions or alterations necessary in the wiring or controls. All control devices must be installed to operate within the manufacturer's rated load and voltage. All control circuits must be through the respective equipment disconnect to insure the control circuit being off when the equipment is off. Wiring materials and methods shall conform to DIVISION 16 - ELECTRICAL, to the applicable codes and to ASA, National Electrical Code and NEMA Standards and Specifications.

- B. Electric Motor Characteristics and Drive: Motor voltages shall be as indicated, and to be verified with the Electrical Contractor and his drawings. Use high efficiency type motors. Service factor of 1.15 with wick oiled sleeve type bearings or grease packed ball bearings not to exceed 1800 RPM, unless otherwise indicated. V-belt drives designed for 150 percent of motor horsepower with provisions made to adjust belt tension. Where multiple V-belts are used, match the belts. 3/4 HP and larger motors shall have a minimum of two belts. Pulley diameters not smaller than 3 inches O.D. for A-belts, 5 inches for B-belts and 8 inches for C-belts. Drive ration shall not be greater than 1 to 7. All pulley cast iron or steel and properly aligned.
- C. Motor Starters and Wiring:
 - 1. Furnish motor starters, enclosures, disconnect switches, necessary relays, and other devices, including remote push-button stations; deliver to Electrician for installation and wiring.
 - 2. Furnish, install, wire and interconnect panels, relays, timers, and other necessary control devices; integrate with motor starting equipment to produce a complete control system.

3.4 DUCTWORK

- A. Duct Connections: Flexible at both discharge and inlet of air moving equipment, applied in accordance with manufacturer's instructions. Allow 2-inches of free space between collars connected. Install 2 lb. density sheet lead band completely around collar at each end of connections and fasten to collars with screws through band and glass fabric, placed no more than 3-inches on centers.
- B. Keep ductwork openings closed with sheet metal during construction to prevent injury, and take all possible precautions to keep interior of ducts, air intake chambers and fan housings free from dirt and dust.
- C. Dampers and Deflectors: Provide splitter, butterfly and louver dampers, deflecting vanes for

control of air volume and direction, and for balancing system where indicated, specified and directed.

1. Dampers of galvanized steel, at least one gauge heavier than that for duct size in which damper is installed, reinforced where directed; with indicating quadrant in accessible location, and locking device for adjusting locking damper in position.
 2. Deflectors: Where fixed deflecting vanes are indicated, provide shop-fabricated blades; fit into side strips and screw or rivet to duct elbow in field.
 3. Air Extractors: Provide operable volume extractor at each branch take-off from main duct.
- D. Duct Supports: Support horizontal ducts with hangers spaced not more than 8 feet apart; place hangers at changes in direction. Use strap hangers for ducts up to 30 inches wide; angle hangers for ducts over 30 inches wide. Strap hanger shall be one inch wide of 16 gauge galvanized sheet steel; extend down both sides of duct and turn under bottom at least 4 inches, fasten to side and bottom with sheet metal screws. Angle hangers may be formed by extending vertical bracing angles or by rods passing through bottom bracing angles.
- E. Erect all ducts with necessary elbows, dampers, etc. and all fans, air outlets, filters, dampers, etc., furnished under other articles of this section. Cross-break ducts exposed to weather to shed water.
- F. Provide sizes, runs and connections of ducts that adhere to drawings as closely as possible. Install to indicate heights as permitted by structure. Fabricate ductwork in workmanlike manner with air tight joints, presenting smooth surface on inside, neatly finished on outside; construct with curves and bends to ease flow of air.
- G. Openings through construction required for ductwork will be provided by others; shop drawings shall locate such duct openings. Obtain approval in ample time to meet building construction schedule. Ductwork shall have rectangular cross section unless otherwise indicated.
- H. Low Pressure Ductwork:
1. Details of construction and materials not specified herein shall be in accordance with ASHRAE Guide and SMACNA recommended and as approved.
 2. Unless otherwise indicated, make inside radius of curves and bends not less than width of ducts. Where square elbows are used, provide fixed double radius turning vanes. Construct, brace and support ducts and air chambers so they will not sag or vibrate when fans are operating.
 3. Fabricate, unless otherwise indicated or specified, in accordance with SMACNA "Low Velocity and Duct Construction Standards", latest edition. Ducts 18 inches wide and larger which are not insulated shall be cross broken. Distances between joints on any size duct shall not exceed 8 feet. Seal and caulk all ductwork airtight including all longitudinal seams and transverse joints. Conduct pressure tests for zero leakage at 2" water gage.

4. Duct Insulation: Insulate all supply air/return air ducts with 2 inch thick duct wrap. Line all supply air/return air ducts exposed to view with 1 inch thick duct liner. Exhaust ducts do not require insulation unless otherwise indicated.

3.5 CORROSION PROTECTION COATINGS

- A. Since the coatings specified herein are of a specialized nature, it is essential that only qualified and experienced applicators be acceptable for this type of work. Coat inside and outside of unit.
- B. A clean area, specialized equipment, techniques, including fog spray, are required to apply the coating properly, and without defects.
- C. Proper surface preparation is necessary. Surfaces shall be thoroughly cleaned and if there is evidence of rust or scaling on ferrous steel surfaces, they must be wire brushed, shot blasted or sandblasted, and primed with rust inhibitive primer. Non-ferrous surfaces shall be cleaned in preparation for the coating system.
- D. In order to coat effectively, the entire apparatus being coated should be disassembled to the maximum degree without disturbing wiring or piping. Upon completion of the coating, the apparatus should be reassembled with care so that the coating surface is not damaged.
- E. Surfaces to be coated shall receive multiple passes of Siloxane coating with a total volume solids of 21.7%. Total dry film thickness shall not exceed 6 mils. All materials shall be applied in strict accordance with manufacture's recommendations.
- F. Corrosion protection coatings shall offer protection from all concentrations of salt solutions, fumes, splash, or spillage of dilute acids, alkalies, and other corrosive chemicals, as well as water, weathering, abrasion and radiation.
- G. The most critical area in coating this type of equipment is the non-ferrous, extended surface heat exchanger (finned coils). It is essential that the coatings be sprayed uniformly and completely over all surfaces of the fins and tubes. This will require several passes through each side of the coil in order to gain effective penetration through the inner coil rows without excessive build-up of fins edges. Care should be taken not to coat too quickly inasmuch as heat exchange will be impaired if the coating is not applied in the thicknesses specified hereafter. Material viscosity must be adjusted to compensate for temperature and humidity conditions. Coat inside and outside of unit.
- H. Cabinet Interior and Exterior Surfaces:
 1. Unit cabinet shall be coated with Ameron PSX 700 Engineered Siloxane. Metal preparation to provide a surface profile that shall include degreasing and etching.
 2. The coating shall be applied to all exterior surfaces until a total of 6-8 mils D.F.T. is achieved. Coating shall be applied in strict accordance with coating manufacturer's recommendations.

3. After the coating has totally cured, the equipment shall be assembled using care not to damage the coating during assembly. Fasteners shall be stainless steel with bonderized rubber washer attached. Any touch up required shall be performed in accordance with the manufacturer's recommendations.
4. The coating shall be performed by a qualified and experienced applicator.

3.6 PIPE INSULATION SYSTEM

- A. Install insulation system in accordance with manufacturer's recommendations using tradesmen skilled in this trade and approved by the insulation manufacturer. Provide insulation products with a composite (insulation, jacket and adhesive) fire and smoke hazard rating as tested under ASTM E84, NFPA 255 and UL 723, not exceeding a Flame Spread of 25 and Smoke Development of 50. Owens Corning, Johns Manville, Certainteed, Knauf, Armstrong, Pittsburgh Corning Corp, equal.
 1. Insulate condensate drain piping with 1" thick fiberglass with all service jacket for pipe sizes 1 inch and smaller and 1-1/2" thick for larger pipes. Seal all joints with insulation manufacturer's approved adhesive.
 2. On pipe insulation exposed to weather, apply 16 mil embossed aluminum jacket with 2" overlap at longitudinal and circumferential joints, secured in place with 3/4" x 0.015 aluminum bands on 18 inch centers. Apply humped aluminum ells or fabricated 16 mil aluminum to fittings and band in place.

3.7 PIPE AND FITTINGS

- A. Vertical lines shall be supported by a hanger in the horizontal line near the riser and riser clamp at floor. Groups of lines may be supported with approved hangers, brackets, supports constructed of angles or pipe. Saddles of not less than 13-gauge galvanized steel shall be 6 inches or two-pipe diameters in length, whichever is greater.
- B. Piping shall be supported to maintain proper grading or pitch, to prevent vibration and to allow for expansion and contraction. Holes where piping passes through partitions, walls, ceiling or floor shall be caulked sleeves, and in finished areas, shall be covered with escutcheons to minimize sound travel.
 1. Refrigerant Piping:
 - a. Quality Control: Prior to initial operation examine and inspect piping system for conformance to plans and specifications and ASME/ANSI B31.5. Equipment, material, or work rejected because of defects or nonconformance with plans, specifications, and ANSI Codes for pressure piping shall be corrected as directed by the Engineer.
 - b. Tests: After completion of piping installation and prior to initial operation. Conduct tests on piping system. Furnish materials and equipment required for tests. Correct defects disclosed by the test. Perform test after installation and prior to acceptance in

the presence of the Engineer and subject to his approval.

- c. Test Pressures: Refrigerant system test pressures for tightness shall not be less than test pressures specified in ANSI/ASHRAE 15 or ASME/ANSI B31.5.
 - d. Evacuation: After completion of leak testing of refrigerant system, remove all air and moisture from system with a high vacuum pump. Pump shall be capable reducing absolute pressure in system to a point where any water present in lines will vaporize at a temperature appreciably below ambient temperature and will be withdrawn from system. Before conducting evacuation test, inspect vacuum pump oil for purity and provide new oil charge if existing charge is contaminated. Evacuate system to a maximum absolute pressure of 0.202 inch of Mercury (500 microns) or lower. During evacuation, ambient temperature shall not drop below 35 degrees F. Use pressure gauges for measurement of pressure. Upon achieving evacuation of system, valve off vacuum pump from system for a period of at least 12 hours. Consider system tight, dry, and free of air, if absolute pressure has not increased by more than 0.002 inches of mercury (50 microns) at the expiration of this period. Repeat pressure test if pressure rise exceeds 0.02 inches of mercury, indicating a leak in system or presence of moisture. If no leaks are found, resume evacuation test and continue until dryness of system is achieved. When a satisfactory vacuum has been obtained, break vacuum by introducing vapor (no liquid) and subsequently seal off system.
 - e. Start-Up and Operational Test: Start up and initially operate refrigeration system. During this time, periodically clean strainers until no further accumulation of foreign materials occurs. Exercise care so that minimum loss of refrigerant occurs when strainers are cleaned. Adjust safety and automatic control instruments as necessary to place them in required operation and sequence.
2. Condensate Drain Piping: Shall slope in the direction of flow at 1/8 inch per foot unless otherwise approved. Cleanouts at all changes of direction. P-traps shall be provided at all fan coil units.
- C. Sequence of Operation: Air conditioning contractor shall provide all necessary controls sequence for new equipment as required for a complete and operating system. Exhaust Fans for restrooms shall be interlocked with occupancy sensors. Supply Fan shall be interlocked with air conditioner outdoor unit.
- D. Spacing of hangers for steel pipe shall not exceed eight feet on pipe 1-1/2 inches or smaller and not greater than 10 feet on larger pipes.
- 3.8 BALANCE, ADJUST AND TESTING
- A. Scope: The Contractor shall obtain the services of an independent, qualified test and balance agency that specializes in, and whose business is the testing and balancing of air conditioning and ventilation systems, to test mechanical systems to determine quantitative performance. Compare observed quantities with design quantities. Adjust systems to produce observed quantities that will conform to design quantities within tolerances specified. Balance the flow to conform to design, lock and mark adjustments, and leave systems in balance. Complete

preliminary balancing, adjusting and testing prior to final inspection by the Architect and also perform final test and balance after building is occupied. Provide complete balancing, adjusting and testing at the end of the first year of the maintenance contract.

- B. Job Conditions: Ventilation and air conditioning equipment shall have been completely installed and shall be put into continuous operation as required to accomplish the test adjustment and balance work specified. Test, adjust and balance shall be performed when outside conditions approximate design conditions indicated for cooling functions.
- C. Certified Reports: Submit test reports on approved forms with certification by the testing contractor that the methods used and the results are as specified. Reports shall be on forms as approved by the Engineer.
- D. Procedures: Air Systems - Test and balance new split system air conditioners, exhaust fans, and supply fans in accordance with SMACNA manual for the Balancing and Adjustment of Air Distribution Systems.
 - 1. Preliminary: Size, type and manufacturer of air terminals and all tested equipment shall be identified and listed. Manufacturer's ratings on all equipment shall be used to make required calculations unless field tests show ratings to be impractical.
 - 2. Verification: Prepare summation of readings of observed CFM for each system, compare with required CFM and verify that duct losses are within specified allowable range.
 - 3. Six copies of the complete test report shall be submitted to the State prior to final acceptance of the project.
 - 4. Balancing: Water piping systems shall be balanced to produce water quantities as indicated with all manual and automatic control valves open.
- E. Automatic Control System:
 - 1. In accordance with the control manufacturer's representative, set and adjust automatically operated devices to achieve required sequence of operations. Testing organization shall verify all controls for proper calibration and list those controls requiring adjustment by control system installer. Permanently mark set-point.
 - a. Reports: Fill in test results on approved report forms. Submit three certified copies of required test reports to the Engineer for review.
 - b. Adjust factory set pressure controller for inlet guide vanes in accordance with design conditions.
- F. Test Data: The Contractor shall provide the State with typewritten schedules of readings taken during the balancing and testing operations indicating the required or specified reading, the first reading taken, and final balanced reading for the following items:
 - 1. Fan Coil Unit:

- a. Manufacturer and Model.
 - b. Motor H.P., Voltage, Phase, and Full Load Amps.
 - c. Part Load Amperes (measured during tests)
 - d. SA/RA/OA cfm's, temperatures (db/wb) and static pressure.
 - 2. Exhaust Fans:
 - a. Manufacturer and Model.
 - b. Motor H.P., Voltage, Phase, and Full Load Amps.
 - c. EA cfm's and static pressures.
 - G. System Performance Report: After conclusion of balancing operations, make temporary installation of portable recorders and simultaneously record summer temperatures and humidity at representative locations in each system and outdoors. Test location shall be as approved by the State. Recordings shall be made summer for a 5 day period, continuous over a weekend, and including at least one period of operation conditions within 2 F DB of maximum summer design condition.
- 3.9 CLEAN UP
- A. Clean up the work provided under this section. Touch up with matching paint all damaged factory finishes. Adjust for quiet and effective operation.
- 3.10 PAINTING AND IDENTIFYING
- A. The following items furnished under this section are to be painted and identified under Section 09900 - PAINTING. Do not paint over name plates or other identifying labels.
 - 1. Painting of exposed bare metal surfaces in finished areas shall be provided herein if it is not specified under Section 09900 - PAINTING. Included in this work shall be bare metal registers, louvers, access panels for mechanical equipment, control covers and thermostat covers, sheet metal ductwork jacket, piping, hangers, etc. Prepare surface as required in paint schedule. Provide two final coats matching adjoining surface finish.
 - 2. Provide piping identification and flow arrows. Stencil all exposed piping with painted black letters indicating the service and with an arrow indicating the direction of flow. Stencil where pipes enter and leave each area and at not over 30 ft. intervals within an area. Paint color band at stencils; green for water systems. Width of color band, size of legend letters, and position of legend shall conform to the requirements of ANSI A13.1, Scheme for the Identification of Piping Systems.
 - 3. Provide piping identification for abandoned piping with the existing stubouts on the condenser risers and indicates as "abandoned". Contractor shall coordinate with Engineer for the work. Width of color band, size of legend letters, and position of legend shall

conform to the requirements of ANSI A13.1, Scheme for the Identification of Piping Systems.

3.11 VALVE TAG AND VALVE LOCATION LOG

- A. Provide identification tags on all valves. Contractor to provide a complete log of all valves to include: valve number, valve type, valve size, valve service and location.

3.12 INSTRUCTIONS

- A. Instruct the State or State's representative in the proper operation and maintenance of the system. Review the maintenance manuals with the State's representative. Post starting and stopping instructions adjacent to the equipment, mounted in frame with glass cover plate. Submit a list of manufacturer's warranties for the equipment furnished.

3.13 GUARANTEE

- A. All work in this section shall be guaranteed for a period of one (1) year commencing after 30 consecutive days of trouble free operation after the date of acceptance of the work as a whole by the State. Warranty period and one-year maintenance service shall start only after 30 consecutive days of trouble free operation after system acceptance. Both periods to run concurrent with same start dates. Start-up and operation of a system component prior to acceptance of the whole system shall not constitute the start of the one year guarantee of that component. Correction of undue noise or vibration is included in the guarantee. Should any equipment or material fail within this period, the Contractor shall replace or repair at no cost to the State. The Contractor shall be responsible for all damage to any part of the premises caused by leaks in piping or equipment for a period of one year after final acceptance of the work as a whole by the State.

3.14 ONE YEAR MAINTENANCE SERVICE CONTRACT

- A. In addition to the Guarantee on material and workmanship, the Installer shall submit seven (7) copies of the Maintenance Service Contract, countersigned by the General Contractor that will validate said Guarantee.
- B. The maintenance services shall extend for a period of one year commencing after 30 consecutive days of trouble free operation after date of acceptance of the work as a whole by the Engineer, and shall include all labor, materials, equipment and parts to necessary to service the complete system, in accordance with the attached Operation and Maintenance Manual (see ATTACHMENT NO. 1), so as to secure proper operation and function of the system. Filters shall be changed every month. Servicing of all equipment shall be done once a month. All costs for the periodic maintenance, including emergency calls, shall be borne by the Contractor. This maintenance period and the guarantee period shall run concurrently (same start and end dates). Trouble-free operation is defined as a non-disabling condition or a non-recurring failure or disruption and the following:

1. The system shall be free of all discrepancies, contamination and debris which require

correction in excess to those described for the monthly service which is included in the Schedule of Maintenance.

2. The system is maintaining operational conditions and other parameters as measured during acceptance tests.
- C. The Installer shall include a listing of the following items along with the Maintenance Service Contract:
1. Name of servicing contractor.
 2. Mechanical system acceptance date.
 3. Service contract expiration date.
 4. Monthly inspection schedule for the maintenance period
 5. Itemized listing of the equipment covered under the service contract, including a description of the equipment identified, its serial number(s) and manufacturer's name(s).
- D. The Maintenance Service Contract shall be submitted along with the Operations and Maintenance Manual on/or before the Project Acceptance Date.

Distribution of Submittal:

1 copy:	Contractor
1 copy:	DAGS Inspection Branch Engineers Files
2 copies:	User (DLNR)
2 copies:	User's Facility Maintenance Agency
1 copy:	DAGS Quality Control Branch

3.15 OPERATION AND MAINTENANCE MANUAL

Refer to paragraph entitled "SUBMITTALS", subparagraph "Operation and Maintenance Manuals" in PART 1 - GENERAL.

ATTACHMENT NO.1

OPERATION AND MAINTENANCE MANUAL

1.1 SCHEDULE OF MAINTENANCE SERVICE

- A. All services performed by the Contractor shall include applicable items listed but shall not be limited to the following maintenance tasks.

1. Fan Coil Units:

Monthly Service

- a. Clean and clear all drip pans and flush all related condensate drain lines with nitrogen. (Note: Contractor may be liable for water damage due to clogged drains). Install pan tables if necessary to control algae growth.
- b. Change all disposable air filters at least once a month; use Farr 30/30 or equal.
- c. Lubricate and oil all fan and motor bearings and connections of dampers and vanes.
- d. Check all drives for wear; adjust belt tension. Replace belt as required.
- e. Operate equipment to check for proper operation, unusual noise and vibration; adjust or repair all equipment and controls as required; clean up all equipment.
- f. Check time clock for proper operation and time settings.
- g. Certify performance of monthly services and that all discrepancies are reported and corrected.

Annual Service

- a. Adjust alignment of bearings and sheaves; lubricate fan and motor bearings. Replace worn or noisy bearings or sheaves.
- b. Clean cooling coils of dirt accumulation using nitrogen, high pressure air/water, steam, or chemical coil cleaner solution.
- c. Check pressure and temperature differential across cooling coils and log readings. Clean strainers, check vents and drains on all chilled water coils.
- d. Clean supply and return air grilles, registers and diffusers and fresh air in-take grilles and dampers and repair or replace deteriorated bird screens.
- e. Clean and adjust water valve, clean strainer (chilled water) and clean all fan wheels and interior and exterior of equipment housings.
- f. Secure all loose housing, seal leaks and touch-up paint after cleaning all rust.

- g. Check and calibrate all pneumatic and/or electric temperature controls.
 - h. Certify performance of annual service and correct and report all discrepancies.
- B. Ventilating Fans (Exhaust):
- 1. Quarterly Service:
 - a. Check motor controlled and backdraft dampers for proper operation; lubricate linkage for free movement.
 - b. Lubricate fan motors and bearings.
 - c. Check belt wear and tension; adjust or replace as needed.
 - d. Check sheaves for wear, replace as needed.
 - e. Check fan collar, bearings and shaft for wear, repair or replace as needed.
 - f. Replace air filters where installed; remove and wash intake grilles.
 - g. Certify performance of quarterly fan maintenance service and correct and report all discrepancies.
 - 2. Semi-Annual Service:
 - a. Check and clean all fan wheels and housings of dust, dirt, and grease.
 - b. Remove and wash all intake grilles and dampers and repair or replace deteriorated bird screens.
 - c. Certify performance of semi-annual fan maintenance service and correct and report all discrepancies.
- C. Temperature Controls
- 1. Quarterly Service:
 - a. Check control devices.
 - b. Lubricate fan motors and bearings.
 - c. Check belt wear and tension; adjust or replace as needed.
 - d. Check sheaves for wear, replace as needed.
 - e. Check fan collar, bearings and shaft for wear, repair or replace as needed.
 - f. Replace air filters where installed; remove and wash intake grilles.
 - g. Certify performance of quarterly fan maintenance service and correct and report all

discrepancies.

2. Semi-Annual Service:

- a. Check and clean all fan wheels and housings of dust, dirt, and grease.
- b. Remove and wash all intake grilles and dampers and repair or replace deteriorated bird screens.
- c. Certify performance of semi-annual fan maintenance service and correct and report all discrepancies.
- d. Adjust alignment of bearings and sheaves; lubricate fan and pump bearings. Replace worn or noisy bearings.
- e. Check pressure and temperature differential across coils and log readings. Clean stainers, check vents and drains on unit.
- f. Check and calibrate all electric temperature controls.
- g. Secure all loose housing, seal leaks and touch-up paint after cleaning all rust.

1.2 WORK SCHEDULE

All maintenance work shall be performed between the hours of 7:30 a.m. and 4:00 p.m., on normal working days, Monday through Friday.

1.3 TROUBLE CALLS

- A. Emergency service and repairs required between regular service calls shall be rendered within 24 hours after the Contractor is notified, non-work days excluded.
- B. The Contractor shall call the Manager-in-charge the next working day after being notified of the problem and report the status of repairs.

1.4 MAINTENANCE REPORT/CHECKLIST

- A. The Contractor shall prepare and maintain a maintenance service report/checklist which shall include the following:
 1. Date maintenance service was performed.
 2. The name of the mechanic who performed said maintenance.
 3. The type and cost (labor, materials, parts, and equipment) of repair work performed on the unit, if any.
 4. Documents and other data pertaining to the maintenance performed.
- B. It will be the responsibility of the Contractor to maintain the report/checklist by recording the

above noted data after each scheduled maintenance and emergency repair, and have the checklist available for inspection at the building site. The report shall be sufficiently detailed to properly reflect the past maintenance history of the equipment.

- C. Reports/Checklists shall be prepared on contractor furnished standardized forms and certified by a representative of the facility being served. A copy of the report/checklist shall be submitted after each visit to the Manager-in-charge.

1.5 CLEANUP AND WORK PRACTICES

- A. The Contractor shall keep the job site free of debris, litter, discarded parts, etc. and shall clean all oil drippings during the daily progress of work. The Contractor shall remove all tools, parts, and equipment from the service areas upon completion of the work.
- B. The Contractor shall exercise caution during the progress of his maintenance and repair work to prevent damage to the ceilings, roofing, and other building structure. The Contractor shall restore all damages caused by his negligence to its original condition at his own expense.

END OF SECTION

SECTION 15950

HVAC TESTING/ADJUSTING/BALANCING

PART 1 - GENERAL

1.1 SUMMARY

- A. The work includes testing, adjusting, and balancing (TAB) of new ventilating distribution systems including equipment, ducts, and piping which are located within, on, under, between, and adjacent to buildings.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Mechanical work as specified in Section 15000 - GENERAL MECHANICAL REQUIREMENTS unless specified otherwise in other sections of DIVISION 15.
- B. Air conditioning and ventilation equipment specified in Section 15800 - AIR CONDITIONING AND VENTILATION.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 - SUBMITTALS. Also refer to Section 15000 - GENERAL MECHANICAL REQUIREMENTS.
- B. Statements: Submit the following in accordance with Section 15000 - GENERAL MECHANICAL REQUIREMENTS.
 - 1. Independent TAB agency personnel qualifications
 - 2. Design review report
 - 3. Pre-field TAB engineering report
 - 4. Advanced notice TAB field work
 - 5. Check out list
- C. Independent TAB Agency Personnel Qualifications: For agency proposed for approval, submit information certifying that: the TAB agency is a first tier subcontractor who is not affiliated with any other company participating in work on this contract; the work to be performed by the TAB agency shall be limited to testing, adjusting, and balancing of HVAC air systems to satisfy the requirements of this specification section. Submit the following, for the agency, to the Engineer for approval in compliance with paragraph entitled "TAB Personnel Qualification Requirements."
 - 1. Independent AABC of/or NEBB certified TAB agency:

- a. TAB Agency: AABC registration number and expiration date of current certification; or NEBB certification number and expiration date of current certification.
 - b. TAB Team Supervisor: Name and copy of AABC or NEBB TAB supervisor certificate and expiration date of current certification.
 - c. TAB team field leader: Name and documented evidence that the team field leader meets the qualification requirements.
 - d. TAB Team Field Technicians: Names and documented evidence that each field technician meets the qualification requirements.
 - e. Current Certificates: Registrations and certifications shall be current, and valid for the duration of this contract. Certifications which expire prior to completion of the TAB work, shall be renewed in a timely manner so that there is no lapse in registration or certification. TAB agency or TAB team personnel without a current registration or current certification shall not perform TAB work on this contract.
 - f. Replacement of TAB Team Members: Replacement of members may occur if each new member complies with the applicable personnel qualifications and each is approved by the Engineer.
- D. Design Review Report: Submit typed report describing omissions and deficiencies in the HVAC and industrial ventilation system's design that would preclude the TAB team from accomplishing the TAB work requirements of this section. Provide a complete explanation including supporting documentation detailing the design deficiency. State that no deficiencies are evident if that is the case.
- E. Pre-Field TAB Engineering Report: Submit report containing the following information:
- 1. Step-By-Step TAB Procedure:
 - a. Strategy: Describe the method of approach to the TAB fieldwork from start to finish. Include in this description a complete methodology for accomplishing each TAB fieldwork session.
 - b. Procedural Steps: Delineate fully the intended procedural steps to be taken by the TAB field team to accomplish the required TAB work of each air distribution system. Include intended procedural steps for TAB work for subsystems and system components.
 - 2. Pre-Field Data: Submit AABC or NEBB or SMACNA HVACTAB data report forms with the following pre-field information filled in:
 - a. Design data obtained from system drawings, specifications, and approved submittals.
 - b. Notations detailing additional data to be obtained from the contract site by the TAB field team.

- c. Designate the actual data to be measured in the TAB fieldwork.
 - d. Provide a list of the types of instruments, and the measuring range of each, which are anticipated to be used for measuring in the TAB fieldwork. By means of a keying scheme, specify on each TAB data report form submitted, which instruments will be used for measuring each item of TAB data. If the selection of which instrument to used, is to be made in the field, specify from which instruments the choice will be made. The instrument key number shall be placed in the blank space where the measured data would be entered.
3. Prerequisite HVAC and Industrial Ventilation System Work Checkout List: A list of inspections and work items which are to be completed by the Contractor, and submitted and approved by the Engineer prior to the TAB team coming to the contract site. At a minimum, a list of the applicable inspections and work items listed in the NEBB TABES, Section III, "Preliminary TAB Procedures" under paragraphs entitled "Air Distribution System Inspection" and "Hydronic Distribution System Inspection." Also, list as prerequisite work items, the deficiencies pointed out by the TAB engineer in his design review report.
- F. Advanced Notices: Submit "Advanced Notice for TAB Field Work" in writing.
- G. Completed Check Out Lists: Submit "Prerequisite HVAC and Industrial Ventilation Work Checkout List" and certify in writing that each item has been checked and is operating as designed.
- H. Field Test Reports: Certified TAB report.
- I. Submit certified reports in the specified format including the above data. Submit Certified TAB Report in the following manner:
- 1. Report Format: Submit the complete pre-field data forms approved in the pre-field TAB Engineering Report completed by TAB field team, reviewed and certified by the TAB supervisor. Bind the report with a waterproof front and back cover. Include a table of contents identifying by page number the location of each report. Report forms and report data shall be typewritten. Handwritten report forms or report data are not acceptable.
 - 2. Design Review Report Temperatures: On each TAB report form reporting TAB work accomplished on HVAC thermal energy transfer equipment, include the indoor and outdoor dry bulb temperature range and indoor and outdoor wet bulb temperature range within which the TAB data was recorded.
 - 3. Instruments: List the types of instruments actually used to measure the tab data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date.
 - 4. Certification: Include the typed name of the TAB supervisor and the dated signature of the TAB supervisor.

J. TAB Submittal and Work Schedule: Compliance with the following schedule is the Contractor's responsibility.

1. TAB Field Work: At a minimum of 30 calendar days prior to start of field check, accomplish TAB fieldwork; submit certified TAB report; and conduct field check.

1.4 REFERENCES

A. Comply with the recommendations and requirements of the codes and Standards listed hereinafter in addition to detailed requirements of this specification. In the event of conflicting requirements, this specification shall prevail.

1. ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-1	(1989) Testing and Balancing Heating, Ventilating and Air Conditioning System
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2. AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR CONDITIONING ENGINEERS, INC. (ASHRAE)

ASHRAE HA	(1991) Handbook, HVAC Applications
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3. NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB CMSV	(1993) Calculations and Measurements of Sound and Vibration
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NEBB TABLES	(1991) Testing, Adjusting, Balancing of Environmental Systems
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4. SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC. (SMACNA)

SMACNA	(1985) HVAC Air Duct Leakage Test Manual
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HVACADLTM

SMACNA	(1993) HVAC Systems Testing, Adjusting and
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HVACTAB	Balancing
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1.5 QUALITY ASSURANCE

A. Modifications of References: Accomplish work in accordance with referenced publications of AABC or NEBB except as modified by this section. In the references referred to herein, consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may" wherever they appear.

Interpret reference to the “authority having jurisdiction,” the “Administrative Authority,” the “Contracting Officer,” or the “Design Engineer” to mean the “Engineer.”

B. TAB Personnel Qualification Requirements:

1. Independent AABC or NEBB Certified TAB Agency: Provide services of a TAB agency certified by AABC or NEBB to perform and manage TAB work on HVAC air systems. This TAB agency shall not be affiliated with any company participating in any other phase of this contract, including design, furnishing equipment or construction.
2. TAB Team Personnel: TAB team approved to accomplish work on this contract shall be full-time employees of the TAB agency. No other personnel shall do TAB work on this contract.
 - a. TAB Team Supervisor: Supervisor shall be qualified by AABC or NEBB as a TAB supervisor or a TAB engineer.
 - b. TAB Team Field Leader: Leader shall have satisfactorily performed full-time supervision of TAB work in the field for not less than 3 years immediately preceding this contract’s bid opening date.
 - c. TAB Team Field Technician: Technician shall have satisfactorily assisted a TAB team field leader in performance of TAB work in the field for not less than one year immediately preceding this contract’s bid opening date.
3. Responsibilities: The Contractor shall be responsible for ensuring compliance with the requirements of this section. The following delineation of specific work responsibilities is specified to facilitate execution of the various work efforts by personnel from separate organizations. This breakdown of specific duties is specified to facilitate adherence to the schedule.
 - a. Contractor:
 1. TAB Personnel: Ensure that the TAB work is accomplished by a group meeting the requirements specified in paragraph entitled “TAB Personnel Qualification Requirements.”
 2. Pre-TAB Meeting: Attend the meeting with the TAB Supervisor, and ensure that a representative is present for the sheetmetal contractor, mechanical contractor, electrical contractor, and automatic temperature controls contractor.
 3. HVAC and Industrial Ventilation System Documentation: Furnish one complete set of the following HVAC and industrial ventilation system-related documentation to the TAB Agency:
 - a. Contract drawings and specifications
 - b. Approved submittal data for equipment

- c. Construction work schedule
 - d. Up-to-date revisions and change orders for the previously listed items
4. Submittal and Work Schedules: Ensure that the schedule for submittals and work required by this section are met.
 5. Coordination of Supporting Personnel: Provide the technical personnel, such as factory representatives or HVAC controls installer required by the TAB field team to support the TAB field measurement work. Provide equipment mechanics to operate HVAC and industrial ventilation equipment to enable TAB field team to accomplish the TAB field measurement work. Ensure these support personnel are present at the times required by the TAB team, and cause no delay in the TAB fieldwork. Conversely, ensure that the HVAC controls installer has required support from the TAB team field leader to complete the controls check out.
 6. Deficiencies: Ensure that equipment defects, installation deficiencies, and design deficiencies reported by the TAB team field leader are brought to the attention of the Engineer. Ensure that design deficiencies reported by the TAB field leader, or the TAB team supervisor, are transmitted to the Engineer within 7 calendar days from date of receipt from the TAB agency.
 7. Prerequisite HVAC and Industrial Ventilation Work: Complete check out and debugging of HVAC and industrial ventilation equipment, ducts, and controls prior to the TAB engineer arriving at the project site to begin the TAB work. Debugging includes searching for and eliminating malfunctioning elements in the HVAC and industrial ventilation system installations, and verifying all adjustable devices are functioning as designed. Prior to the TAB field team's arrival, ensure completion of the applicable inspections and work items listed in the TAB team supervisor's pre-field engineering report. List as prerequisite work items, the deficiencies, pointed out by the TAB team supervisor in the design review report. Ensure that the TAB Agency gets a copy of the prerequisite HVAC and industrial ventilation work checklist specified in the paragraph entitled "Submittals." Do not allow the TAB team to commence TAB fieldwork until all of the following are completed:
 - a. HVAC system installations are fully complete.
 - b. HVAC prerequisite checkout work lists have been completed, submitted, and approved.
 - c. HVAC system filters are clean for TAB fieldwork.
 - d. Industrial ventilation system installations are fully complete.
 - e. Control systems installations are fully complete.

8. Advance Notice: Furnish to the Engineer with advance written notice for each event, the commencement of the fieldwork and for the commencement of the TAB fieldwork.
- b. TAB Agency: Provide the services of a TAB team which complies with the requirements of paragraph entitled "TAB Personnel Qualification Requirements."
 1. TAB Team Supervisor:
 - a. Overall management: Supervise and manage the overall TAB team work effort, including preliminary and technical TAB procedures and TAB team fieldwork.
 - b. Pre-TAB meeting: Attend meeting with Contractor. Design review report: Review project specifications and accompanying drawings to verify that the air systems are designed in such a way that the TAB Team Field Leader can accomplish the work in compliance with the requirements of this section. Verify the presence and location of permanently installed test ports and other devices needed, including gauge cocks, thermometer wells, flow control devices, circuit setters, balancing valves, and manual volume dampers.
 - c. Support required: Specify the technical support personnel required from the Contractor rather than the TAB agency; such as factory representatives for temperature controls or for complex equipment. Inform the Contractor in writing of the support personnel needed and when they are needed. Furnish the notice as soon as the need is anticipated, either with the design review report, or the pre-field engineering report or during the TAB fieldwork.
 - d. Pre-field engineering report: Utilizing the following HVAC and industrial ventilation-related documentation; contract drawings and specifications, approved submittal data for equipment, up-to-date revisions and change orders; prepare this report.
 - e. Prerequisite HVAC and industrial ventilation work checklist: Ensure the Contractor gets a copy of this checklist at the same time as the pre-field engineering report is submitted.
 - f. Technical assistance for TAB work: Provide immediate technical assistant to the TAB field team for the TAB work.
 - g. Certified TAB report: Certify the TAB report. This certification includes the following work:
 1. Review: Review the TAB field data report. From this field report, prepare the certified TAB report.
 2. Verification: Verify adherence, by the TAB field team, to the TAB plan prescribed by the pre-field engineering report and verify adherence to the procedures specified in this section.

- h. Design deficiencies: Submit in writing as soon as possible, to the Contractor and the Engineer, each design deficiency reported by the TAB field team. Provide, in this submittal, a complete explanation including supporting documentation detailing the deficiency.
 - i. TAB field check: The TAB team supervisor shall attend and supervise TAB field check.
 - 3. TAB Team Field Leader:
 - a. Field manager: Manage, in the field, the accomplishment of the work specified in PART 3 - EXECUTION.
 - b. Full time: Be present at the contract site when TAB field work is being performed by the TAB team; ensure day-to-day TAB team work accomplishments are in compliance with this section.
 - c. Prerequisite HVAC and industrial ventilation work: Do not bring the TAB team to the contract site until a copy of the prerequisite HVAC and Industrial Ventilation Checklist, with all work items certified by the Contractor to be working as designed, reaches the office of the TAB Agency.
- C. Re-TAB Meeting: Meet with the State's TAB representative and the designing engineer of the HVAC and industrial ventilation systems to develop a mutual understanding relative to the details of the TAB work requirements. Ensure that the TAB supervisor is present at this meeting. Requirements to be discussed include required submittals, work schedule, and field quality control.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TAB PROCEDURES

- A. TAB Field Work: Test, adjust, and balance the listed HVAC systems to the state of operation indicated on and specified in the contract design documents. Air systems shall be proportionately balanced and reported in the certified TAB report. Provide instruments and consumables required to accomplish the TAB work. Conduct TAB work on the listed HVAC and industrial ventilation systems in conformance with the AABC MN-1, or NEBB TABES, and NEBB CMSV, except as modified by this section:
 - 1. Maintenance and calibration of instruments.
 - 2. Accuracy of measurements.
 - 3. Preliminary Procedures: Use the approved pre-field engineering report as instructions and procedures for accomplishing TAB field work. Test ports required for testing by the TAB

engineer shall be located in the field by the TAB engineer during TAB fieldwork. It shall be the responsibility of the sheetmetal contractor to provide and install test ports as required by the TAB supervisor.

4. Air Distribution Systems TAB Work: Ventilating systems including fans, ducts, plenums, and registers, grilles, and louvers for outside air and exhaust air systems.
- B. Data From TAB Field Work: After completion of the TAB work, prepare a pre-final TAB report using the reporting forms approved in the pre-field engineering report. Data required by those approved data report forms shall be furnished by the TAB team. Except as approved otherwise in writing by the Engineer, the TAB work and the TAB report shall be considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph entitled "Workmanship" of this section. Prepare the report neatly and legibly; the pre-final TAB report shall be the final TAB report minus the TAB supervisor's review and certification. Obtain, at the contract site, the TAB supervisor's review and certification of the TAB report. Verbally notify the Engineer's TAB representative that the field check of the certified TAB Report data can commence; give this verbal notice 48 hours in advance of when the field checking shall commence. Do not schedule field check of the certified TAB report until the specified workmanship requirements have been met or written approval of the deviations from the requirements have been received from the Engineer.
- C. Quality Assurance For TAB Field Work:
1. Field Check: Test shall be made to demonstrate that capacities and general performance of air systems comply with the contract requirements.
 - a. Recheck: During field check, the Contractor shall recheck, in the presence of the Engineer, random selections of data (water, air quantities, air motion, sound level readings) recorded in the certified report.
 - b. Areas of Recheck: Points and areas of recheck shall be selected by the Engineer.
 - c. Procedures: Measurement and test procedures shall be the same as approved for work for forming basis of the certified report.
 - d. Recheck Selections: Selections for recheck will not exceed 25 percent of the total number of reported data entries tabulated in the report.
 - e. Re-Tests: If random tests reveal a measured quantity which is out-of-tolerance, the report is subject to disapproval at the Engineers discretion. In the event the report is disapproved, all systems shall be readjusted and tested, new data recorded, new certified reports submitted, and a new field check conducted at no additional cost to the State.
 2. Approval Prerequisite: Compliance with the field checking requirements of this section is a prerequisite to the final approval of the certified TAB report submitted.
- D. Marking of Settings: Permanently mark the settings of HVAC adjustment devices including valves, splitters, and dampers so that adjustment can be restored if disturbed at any time. The

permanent markings shall indicate the settings on the adjustment devices which result in the data reported on the submitted certified TAB report.

- E. Marking of Test Ports: The TAB team shall permanently and legibly mark and identify the location points of the duct test ports. If the ducts have exterior insulation, these markings shall be made on the exterior side of the duct insulation. The location of test ports shall be shown on the as-built mechanical drawings with dimensions given where the test port is covered by exterior insulation.

END OF SECTION

SECTION 16100

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

As specified in Section 01019.

1.2 SUMMARY

- A. Materials, equipment fabrication, installation and tests in conformity with applicable codes and authorities having jurisdiction.
- B. Raceways.
- C. Wire and cable.
- D. Boxes.
- E. Low voltage distribution equipment.
- F. Motor controllers.
- G. Cabinets and Enclosures.
- H. Wiring Devices.
- I. Supporting Devices.
- J. Telecommunication (voice and data) raceway system.
- K. Grounding.
- L. Related Sections:
 - 1. Division 09 - FINISHES.
 - 2. Furnishing and setting of motors under the sections corresponding to equipment that have motors.

1.3 DEFINITIONS

- A. Specifications are of a simplified form and include incomplete sentences. Words such as, "shall be", "furnish", "a", "an", "the", etc., have been omitted for brevity.
 - 1. "Furnish" or "provide": To supply, install and connect up complete and ready for safe and regular operation of particular work referred to unless specifically otherwise noted.

2. "Install": To erect, mount and connect complete with related accessories.
3. "Supply": To purchase, procure, acquire and deliver complete with related accessories.
4. "Work": Labor, materials, equipment, apparatus, controls, accessories, and other items required for proper and complete installation.
5. "Wiring": Raceway, fittings, wire, boxes and related items.
6. "Concealed": Embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces, or in enclosures.
7. "Exposed": Not installed under ground or "concealed" as defined above.
8. "Indicated", "shown" or "noted": As indicated, shown or noted on Drawings or Specifications.
9. "Similar" or "equal": Of base bid manufacture, equal in materials, weight, size, design, and efficiency of specified product, conforming with "Base Bid Manufacturers".
10. "Reviewed", "satisfactory", "accepted" or "directed": As reviewed, satisfactory, accepted, or directed by or to Contracting Officer.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01300 - SUBMITTALS.
- B. Submittals shall be complete. Contractor shall review submittals for conformance with Contract Documents, make necessary revisions and submit to Contracting Officer, indicating the following:
 1. Manufacturer's name, brand name and catalog reference of equipment supplied.
 2. Drawings pertinent to deviations from the Contract. Comply with all applicable references mentioned in this Section. Coordinate with other trades and field conditions and show dimensions and details including building construction and access for servicing.
 - a. Record Documents (As-Built Drawings): During progress of the work, maintain an accurate record of changes made in the work of this Section from the layout shown on the Drawings and the materials and methods described in this Section. Changes shall be recorded daily to assure completeness and accuracy.
 - b. Upon the completion of the work, submit to the Contracting Officer for approval a reproducible set of the contract drawings modified to reflect all changes accrued during the work progress.
 3. Detailed description of items supplied, including specifications, performance characteristics, materials, wiring diagrams and schedules.

4. Operation and maintenance instructions for circuit breakers and motor starters.
5. Installation, testing instructions and field test procedures for circuit breakers and motor starters.
6. List of manufacturer's recommended spare parts and address of nearest representative.

1.5 QUALITY ASSURANCE

- A. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.
- B. Supply all equipment and accessories new, free from defects and listed by Underwriters' Laboratories, Inc., or bearing its label.
- C. Supply all equipment and accessories in compliance with the applicable standards listed in this Section and with all applicable United States and local codes.
- D. All items of a given type shall be the products of the same manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be shipped in its original packages, to prevent damaging or entrance of foreign matter. All handling and shipping shall be performed in accordance with manufacturer's recommendations. Provide protective coverings during construction.
- B. Replace at no expense to State, equipment or material damaged during storage or handling, as directed by the Contracting Officer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Raceways:
 1. Complete with boxes, fittings and accessories.
 2. Rigid Steel Conduit: Full weight pipe, galvanized, threaded, minimum diameter 3/4 inch. Use for all exposed feeders, submains, branch circuits above finish slab to a height of eight feet.
 3. Electrical Metallic Tubing (EMT): Thin wall pipe, galvanized, threadless, minimum diameter 3/4 inch.
 4. Polyvinyl Chloride Conduit (PVC): Use for all feeders, submains, branch circuits below grade and below concrete slabs on grade, 3/4 inch minimum diameter.
 - a. Direct Burial: Schedule 80.

- b. Concrete Encased: Schedule 40.
 - 5. Flexible Steel Conduit: Continuous single strip, 5 feet maximum per NEC, galvanized, 3/4 inch minimum diameter or larger as required for wiring. PVC covered for liquid tight. Provide ground wire in all flexible conduits.
 - 6. Wireways: Complete with all fittings and accessories. Size as noted, baked enamel finish inside and outside, approved for support at minimum 10 feet on centers.
 - a. Interior Use: Hinged cover and base, minimum thickness 16 gauge galvanized steel.
 - b. Acceptable Manufacturer: Similar to Circle AW, Hoffman Engineering Co., Square D. Co., and Universal Mfg. Co.
 - 7. Polyvinyl Chloride Covered Rigid Steel Conduit: Full weight pipe, galvanized, threaded, polyvinyl chloride covered on exterior, minimum diameter 3/4 inch. Use for underground locations.
 - 8. Surface Metal Raceways: Two channel dual service raceway with prewired electrical section and connectivity section. Wiremold AL4520 Series.
- B. Fittings and Accessories:
- 1. Raceway Fittings:
 - a. Rigid Conduit: Steel or malleable iron, galvanized. Zinc die cast fittings; not permitted.
 - b. EMT: Set screw type.
 - c. Flexible Metallic Conduit: Angle wedge type with insulated throat.
 - d. Bushings: Metallic insulated type. Weatherproof or dusttight installations; liquid-tight with sealing ring and insulated throat.
 - e. Expansion and Deflection Fittings: O.Z./Gedney Type "DX" or accepted equal.
 - 2. Sleeves:
 - a. Exterior Non-Membrane Waterproofed Walls: Galvanized cast iron, galvanized steel or wrought iron with continuously welded center flange.
 - b. Exterior Membrane Waterproof Walls, Floors and Roofs: Galvanized cast iron, flashing flange and clamping ring. Similar to Josam 1870 Series.
 - c. Exterior Non-Membrane Waterproof Roofs: Galvanized cast iron, flashing flange and clamping ring. Similar to Josam 1830 Series.
 - d. Locations: As indicated, where required and accessible.

- e. Outdoors and Damp Locations: Galvanized cast iron or aluminum with threaded hubs and gaskets.
- f. Provide barriers between wiring energized from different systems; 12, 24, 120/208 volt wiring.
- 3. Floor Boxes: Galvanized cast iron with round brass covers, flanges, and flap hinges suitable for conduit and devices indicated. Similar to Harvey Hubbell, Dualevel Series.
- 4. Dual Service Boxes: Cast iron with hidden access type box, hinged cover, suitable for one duplex and one telecom outlet (with multiple ports). Similar to Steel City 664 Series.

2.2 600 VOLT WIRE AND CABLE

- A. Complete with accessories, size AWG, except as noted.
- B. Conductors:
 - 1. Solid copper for sizes No. 10 and smaller and stranded copper for sizes No. 8 and larger.
 - 2. General Uses: Minimum size No. 12. At 120 volts and over 100 feet circuit length, minimum size No. 10.
 - 3. Control and Alarm Wires: Minimum size No. 14. At 120 volts and over 200 feet circuit length, minimum size No. 12.
 - 4. Increase raceway sizes as required for larger wires, as indicated, or in accordance with NEC Table 5 based on RHW wires.
 - 5. Aluminum cables will not be permitted.
- C. Insulation: 600 volt insulation types.
 - 1. Branch Circuits: Type XHHW, THHN, or THWN.
 - 2. Feeders and Gutters: THW, THWN or XHHW.
 - 3. Type RHW-USE or XLP-USE: Raceways located in concrete in direct contact with the earth, in raceways direct buried in earth and in raceways in permanently wet locations. Type XHHW, 90 degrees C rated for conductors entering enclosures housing 100 percent rated devices.
 - 4. Color Coding: As per code. Where color coded insulation is unavailable, overlap color taping conductors (minimum length, six inches) in accessible and visible locations.
- D. Accessories:
 - 1. Tags:

- a. Flameproof linen or fiber in accessible locations.
 - b. Feeders: Indicate number, size, phase and points of origin and terminations. Control or alarm: Indicate type of controls or alarm and points of origin and terminations with Brady wire markers in all junction boxes, cabinets, and equipment.
2. Terminations, Splices and Tapes:
- a. Copper Conductors No. 10 and Smaller: Compression type connectors and clear nylon insulated covering.
 - b. Copper Conductors No. 8 and Larger: Hydraulic compression type using manufacturers recommended tooling.
 - c. Cable Lugs and Connectors: Compression type of same metal as conductor to match cables with marking indicating size and type.
 - d. For copper lug connections to bus bars provide anti-seize compound.
- E. Manufacturer: Similar to General Cable, Anaconda, Anixter.
- 2.3 BOXES
- A. Outlet and small junction boxes shall be zinc-coated pressed steel of ample size. Light outlets shall be fitted with no-bolt type fixture studs as necessary for fixture support. Minimum size of outlet boxes, 4 11/16 inch square by 2 inch deep.
 - B. Extension or raised rings for pressed boxes pressed from NEC gauge steel and galvanized.
 - C. Large junction boxes and covers shall be zinc-coated.
 - D. Provide all boxes in finished walls with plaster rings. Provide plaster ring and finish blank device plates for all small flush junction boxes.
 - E. Telecommunication outlets shall be as indicated and 4-11/16 inch square by 2 inch deep minimum junction boxes unless noted otherwise.
 - F. Exposed boxes and weather exposed boxes - galvanized cast steel or cast aluminum with threaded hubs for conduits. Provide gaskets for boxes exposed to weather with weatherproof cover.
- 2.4 LOW VOLTAGE DISTRIBUTION EQUIPMENT
- A. Disconnect Switches:
 - 1. Non-fused or fused as indicated.
 - 2. Voltage: 250 volts rated on 120/208 volt circuits.

3. Heavy-duty, quick-make quick-break.
 4. Horsepower rated for motor loads.
 5. NEMA 1 indoors and NEMA 4X stainless steel in exterior locations.
 6. Knife Blade Type Switches:
 - a. Load break type with arc quenchers.
 - b. Manufacturer: Similar to Eaton Cutler-Hammer, Square D, or General Electric.
- B. Circuit Breakers - Molded Case:
1. Thermal-magnetic, 400 amp frame and below; solid state, 600 amp frame and above. Bolt-on, quick-make quick-break for both types.
 2. Manually operated with insulated trip free handle and rated for switching duty.
 3. Multi-Pole Types: With internal trip bar.
 4. Terminals: Suitable for copper or aluminum cable.
 5. Auxiliary devices as indicated.
 6. Enclosures: Dead front, NEMA Type I for indoors and NEMA 4X stainless steel for exteriors, except as noted.
 7. Frames as indicated, interchangeable trips and interrupting capacity not less than noted available symmetrical short circuit current.
 8. Manufacturer: Similar to Eaton Cutler-Hammer, Square D, or General Electric.
- C. Panelboards: Circuit breaker type, rating as noted.
1. Bus Bars: Hard drawn copper, minimum 98 percent conductivity, silver plated joints.
 2. Enclosures:
 - a. Cabinets with:
 1. Galvanized sheet steel back box.
 2. Door and trim.
 3. Lapped and welded corners.
 - b. Hardware: Chrome plated with:
 1. Flush lock and catch: Up to 48 inch high doors.

2. Vault handle, lock and 3-point catch: Larger than 48 inch high doors.
- c. Hinges:
 1. Semi-concealed, five knuckle steel with non-ferrous pins.
 2. 180 degree opening.
 3. Locate maximum 26 inch on centers.
- d. Minimum Gutter Spaces:
 1. Lighting Panels: 5-3/4 inch sides, top and bottom.
 2. Power Panels: 200 amp mains: 9 inch sides, 8 inch top and bottom.
 3. Increase sizes where required by code and through feeders.
- e. Directory:
 1. Holder: With clear plastic, transparent cover.
 2. Typewritten list indicating feeder cable and conduit size, circuit numbers, outlets supplied and their locations.
 3. Provide label on panel cover to indicate service voltage and location of power source.
- f. Panelboards shall be manufactured by Eaton Cutler-Hammer, Square D, or General Electric.

2.5 CABINETS AND ENCLOSURES

- A. Terminal Cabinets: Terminal cabinet construction, lock and finish shall match panelboard cabinets. Provide 3/4 inch wolmanized plywood backboard. Locks shall match panelboard cabinet.

2.6 WIRING DEVICES

- A. Local Wall Switches:
 1. Heavy duty, toggle, quiet type, specification grade. White.
 2. 20 amp, 120/277 volt, AC.
 3. Similar to Hubbell catalog numbers as follows:
 - a. Single pole, No. 1221-W.
 - b. Double pole, No. 1222-W.

- c. Three-way, No. 1223-W.
- 4. Motion Sensor Light Switches:
 - a. Appropriate for use size and geometry of the room.
 - b. Infrared, ultrasonic or dual technology type as appropriate for the use, size and geometry of the room.
 - c. Eaton Cooper Lighting Controls, Watt Stopper or approved equal.
- B. Insertion Receptacles:
 - 1. Grounded, except as noted.
 - 2. Similar to Harvey Hubbell catalog numbers as follows:
 - a. Duplex convenience; specification grade.
 - 1. 125 volts, 2 pole, 3 wire, U-ground slot.
 - 2. 15 amp, similar to 5262-W.
 - 3. 20 amp, similar to 5362-W.
 - b. Single convenience; specification grade.
 - 1. 15 amp, 125 volts, 2 pole, 3 wire, U-ground slot, similar to 5261-W.
 - 2. 30 amp, 125 volts, 2 pole, 3 wire, similar to 9308.
 - c. Special Receptacles: Specification grade, rating and type as indicated or to suit equipment served by the receptacle.
 - 1. Dual service floor outlets shall be concealed access, dual use type. Cover shall accept flooring insert to match. Steel City 664 series.
- NOTE: Contractor responsible to verify exact configuration of special receptacles against plug types on equipment or provide matching plug and connection of plug to equipment.
- e. Wet Locations: Corrosion resistant devices.
 - f. Outdoors: Weatherproof lift cover plastic hinged covers which fully close over inserted cord and plug.
- 3. Ground Fault Interrupter Receptacles: 15 amp, 125 volts, 2 pole, 3 wire, self-testing GFCI, similar to Hubbell GFRST15W.
- C. Device Plates:

1. One piece solid.
 2. Public Areas, Offices, Break Room, Reception, Conference Room: Smooth plastic to match surface. Label all device plates with circuit designation using Kroy or equal type labels.
 3. Secured Storage: Satin stainless steel, composition 18-8.
 4. Securing screws shall match color of faceplate.
- D. Acceptable Manufacturers: Similar to local wall switches, receptacles, device plate.
1. Arrow-Hart Inc.
 2. Bryant Electric.
 3. Harvey Hubbell Inc.
 4. Leviton.
 5. Cooper Wiring Devices.

2.7 INSERTS AND SUPPORTS

- A. Maximum Loading: 75 percent of rating.
- B. Inserts:
1. Expansion Cases and Concrete Fasteners: Grinnel Figure 117 and Series R or approved equal.
 2. Concrete drilled to receive required expansion cases of concrete fasteners.
 3. All inserts shall be approved by the Structural Engineer.
- C. Supports from Building Construction: Beam clamps, cantilever brackets, or other acceptable means after review.
- D. Grouped Lines and Services: Supported by trapeze hangers of bolted angle or channels.
- E. Where building construction is inadequate, provide additional acceptable framing after review.
- F. All electrical equipment shall be installed as indicated and per Island of Hawaii earthquake zone requirements.

2.8 TELECOMMUNICATION (VOICE, DATA AND TELEVISION) SYSTEM

- A. Empty conduit raceway system following BICSI EIA/TIA standards as indicated on the

drawings.

B. Components:

1. Terminal Boards: Fireproof new plywood painted gray, wolmanized, size as indicated.
2. Terminal Strip Cabinets: Size as indicated.
 - a. Galvanized prime coated sheet steel.
 - b. Flush mounted in finished areas, surface mounted as indicated.
 - c. Hinged and snap ring latch covers.
3. Wall Outlets: 4-11/16 inch square with plastic ring and bushed coverplate.
4. Device plates for telecommunication outlets shall be single gang provided by telecommunication contractor. Coordinate with telecommunication contractor
5. Grounding per BICSI EIA/TIA 606 Standard.

2.9 NAMEPLATES

A. Nameplates provided for:

1. Disconnect switches.
2. Circuit breakers.
3. Panelboards.
4. Pullboxes and large junction boxes.
5. Cabinets.
6. Motor controllers.
7. Switchboards.

2.10 TIME SWITCHES

- A. Time switches shall be two pole 30 amperes, 120 volt, astronomic dial for 21 degrees North Latitude, with a 10 hour spring carry over motor.

2.11 CONTACTORS

- A. Contactors shall be rated as indicated, multipole, ASCO No. 917 (20 amps) or No. 920 (30 amps), Eaton Cutler-Hammer or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Drawings are diagrammatic and indicate general arrangement of systems and work included. Follow Drawings in laying out work and check Drawings of other trades relating to work to verify spaces in which work will be installed. Maintain headroom and space condition to all points.
- B. Set and layout work on premises. Base all measurements from approved bench marks and correct setting or work to agree with established lines and levels. Should discrepancy exist between actual measurements and those indicated, notify Contracting Officer in writing and do not proceed with work affected until written instructions are received from Contracting Officer.
- C. All minor appurtenances not specifically mentioned herein that are necessary to make a complete working installation, are included in the work with any necessary field engineering or detail drawings required. Submit Drawings as specified in this Section.
- D. Install equipment, rigid and secure, plumb and level, and in true alignment with related and adjoining work. No welding of electrical materials for attachment or support is permitted.
- E. Provide supporting members as required to set and connect rigidly the work.
- F. Correct noise and vibration exceeding specified limits or due to faulty equipment at no expense to State.
- G. Cutting: Cutting shall conform with requirements as approved by Contracting Officer.
- H. Patching: Patching shall conform with requirements as approved by Contracting Officer.

3.2 EXCAVATION AND BACKFILL

- A. Excavate, backfill and restore surfaces outside building.
- B. If Rock Encountered:
 - 1. Excavate to six inches below bottom of wiring.
 - 2. Refill with well tamped sand and fine gravel.
- C. Bank excavated materials adjacent to trench, as directed.
- D. Bank Support: Sheet pile, brace, and properly support.
- E. Keep excavation free of water with attended pumping equipment.
- F. Remove bog or other swampy conditions encountered in excavating to one foot below bottom of wiring. Backfill with tamped sand, finely crushed stone or gravel.

G. Immediately after Wiring Installed, Inspected and Accepted:

1. Remove sheet piling and bracing, as required.
2. Backfill around wiring with special care to solidly fill voids without injury to wiring.
3. Backfill: Only good clean loam, clay, sand or gravel, free from frozen materials, lumps of clay, rocks, boulders, cinders, slog, ashes, vegetable or organic materials, building debris or refuse. Composition of backfill shall be as detailed on the drawings.
 - a. Up to two feet above wiring, hand fill in four inch layers.
 - b. Remainder, fill in 12 inch layers.
 - c. Tamp and puddle each layer before placing next layer.
 - d. No stones larger than two inches diameter allowed in fill up to two feet above wiring.
 - e. No stones larger than four inches diameter allowed in fill above.
 - f. Backfill in manner to prevent future settlement.

H. Restore surfaces, sidewalks, pavements, curbing, lawns, and shrubs if disturbed or damaged.

I. Dispose of acceptable surplus excavation on site as directed.

J. Remove surplus and unsuitable excavated materials from site, as directed.

3.3 INSTALLATION OF RACEWAYS

A. Underground Raceways: Provide cushioning fill around raceways as indicated on the drawings.

B. Run raceways concealed, except as noted.

C. Supports: Supports shall have adequate strength to support equipment wiring and enclosures against earthquake forces.

1. Ceiling trapeze, strap hangers, or wall brackets.
2. U-bolt or pipe straps at each floor level of riser raceways.
3. Secure raceways to supports with pipe straps or U-bolts.,
4. Maximum Spacing: 7 feet on centers for metallic conduit and wireways.
5. Mount support to structure with:
 - a. Toggle bolts on hollow masonry.

- b. Expansion shields or insets on concrete.
 - c. Machine screws on metal.
 - d. Wood screws on wood.
 - e. Nails, Rawl plugs or wood plugs; not permitted.
- D. Run exposed raceways parallel with or at right angles to walls.
- E. Clearance from Water, Steam or Other Piping: Minimum three inches separation from hot water pipes, except four inches from pipe cover at crossings.
- F. Keep raceways clear of motor foundations and underside of boilers.
- G. Raceways for outlets in hung ceiling shall be run in hung ceilings. Provide supports to structure. Do not support to ceiling systems.
- H. Run raceways in walls vertically.
- I. Maintain grounding continuity of interrupted metallic raceways with minimum No. 2 AWG insulated, copper ground conductor and ground bushings at conduit terminations.
- J. Empty Raceways Over 10 Feet Long: Provide with pull wire or 200 pound strength nylon pull line.
- K. Seal around raceway penetrations through walls and provide fire rated, approved compound consistent with penetrated fire rated walls.
- L. Raceways for telecommunication system shall comply with requirements for premise wiring/Category 6 type cabling as required by BICSI EIA/TIA standards.
- M. Steel Conduit:
- 1. Paint threads of field threaded conduit with graphite base pipe compound.
 - 2. Install in exposed locations subject to physical damage, such as from floor to 8 feet above floor.
 - 3. Direct Buried Conduit: Provide continuously with waterproofing tape, half lapped, or two coats of asphaltum paint, dried thoroughly between paintings and before backfilling.
 - 4. Not permitted in concrete.
 - 5. Minimum one inch cover in concrete fill.
- N. EMT: Install generally for interior dry locations; above dry ceilings, in dry walls and in concrete above ground floor.

O. Flexible Steel Conduit:

1. For short connections where rigid conduit is impracticable, maximum length limited to five feet.
2. From outlet box to recessed lighting fixture, minimum four feet, maximum six feet length.
3. For final connection to motor terminal box and transformers with polyvinyl sheathing, minimum length 18 inches with minimum 50 percent slack.
4. For wet locations provide flexible steel conduit, galvanized, 3/4 inch minimum, PVC covered for liquid tight.
5. Provide ground wire in all flexible conduits.
4. Not permitted except as stated above.

P. PVC Conduit:

1. Cut ends square, reamed smooth, wiped clean and apply approved solvent cement. Turned 1/4 before drawing up tight.
2. Convert to steel conduit when entering building with approved adapters or when entering above floor slab from underground locations.
3. Clearance from Hot Water: Three feet.
4. General Interior Use: Not permitted except for telephone or data.

Q. Surface Metal Raceways:

1. Install at coordinated elevation.
2. Wiring shall be per circuit assignments and diagram.
3. Provide and coordinate telecom outlets accessories.

R. Outlet Boxes:

1. Set square and true with building finish and secure to building structure by adjustable strap irons.
2. Verify outlet locations in finished spaces with Drawings of interior details and finishes.
3. Provide barriers between switches connected to different phase for voltages exceeding 150 volts to ground.

S. Panel, Junction and Pull Boxes:

1. Location: Clear of other work. Conceal junction and pull boxes in finished spaces and maintain accessibility.
2. Support from building structure, independent of conduit. Do not support to ceiling systems.
3. Outlet boxes for fixtures recessed in hung ceiling; accessible through opening created by removal of fixture.
4. Motor Terminal Boxes: Coordinate with motor branch circuit conduit and wiring.

3.4 INSTALLATION OF WIRE AND CABLE

- A. Low voltage cable shall be installed in separate raceways.

3.5 INSTALLATION OF LOW VOLTAGE DISTRIBUTION EQUIPMENT

- A. Distribution panels shall be installed as follows:
 1. Circuit numbers are for identification purposes.
 2. Provide multi-cable lugs where required. Double lugging shall not be permitted.
 3. Mounting height shall be maximum 6 feet, 6 inches from floor to top switch unit.

3.6 INSTALLATION OF POWER AND CONTROL WIRING SYSTEMS

- A. General: Complete wiring from service to distribution and utilization equipment and as described below.
- B. Motor Wiring:
 1. Under Electrical Work, unless otherwise noted:
 - a. Disconnect switches.
 - b. Motor controllers unless furnished by other trades or equipment supplier.
 - c. Wiring from power source to motors, disconnect switches and control devices.
 2. Motor Terminal Boxes: Provide motor suppliers with minimum requirements to receive indicated wiring.
 3. Raceways:
 - a. Rigid conduit or electric metallic tubing except flexible (with slack) for final motor connection.
 - b. Install clear of motor foundations.

- c. Allow clearance for motor removal and maintenance.
- C. Wiring Diagrams: Obtain required wiring diagrams for respective work of other trades and provide wiring as indicated by these diagrams and in accordance with applicable Specifications.

3.7 GROUNDING

- A. Motors, metallic enclosures, raceways and electrical equipment grounded according to requirements of National Electrical Code, Article 250. Ground connection to equipment, raceways, motors, grounding type receptacles and other metallic parts directly exposed to ungrounded electric conductors by continuous metal raceways, or No. 14 AWG minimum, AWG copper, NEC type TW, green insulated. At water meter and "Di-electric" union joints, install pipe clamps, Thomas & Betts Co. No. 3900 series, on both sides of meter on metallic pipes and connect together with No. 1/0 bare copper. Connection shall not interfere with installation or removal of water meter. Install ground wire, size in accordance with NEC.
- B. All grounding wire runs within buildings shall be in steel conduits with circuit conductors.
- C. A No. 1/0 bare copper wire shall be used to connect ground to all telecommunication cabinet and terminal boards. A six-foot slack of grounding wire shall be left. Grounding shall follow EIA/TIA Standard 606.

3.8 FINISHING

- A. Patch, repair and restore all structural and architectural elements cut or drilled for installation of electrical system. Drilling, cutting, patching, repairing and restoring shall be subject to approval of Contracting Officer.
- B. Attach electrical equipment to wood by wood screws, and attach to concrete by embedded or expansion inserts and bolts. Use power-driven charge with approval only. Close unused knock-outs on boxes or enclosures with metal cap. Powder actuated fasteners shall not be used on precast concrete. Do not use powder activated fasteners to attach enclosures and boxes to the building.
- C. Wipe clean all exposed raceways and enclosures with rag and solvent. Prime painting and finishing of unfinished raceways, and enclosures shall conform to DIVISION 9 - FINISHES. Factory finished enclosures shall not be painted except in finished spaces, such as offices, etc. Panelboards, switches, circuit breakers, junction boxes, and equipment shall be identified by stenciling with engraved plastic nameplates on cover or door. Voltage and phase shall be indicated on nameplates for panelboards, switches and circuit breakers.
- D. Connect circuits to circuit assignments shown on drawings. Provide neatly typewritten circuit directory for all panelboards. Circuit directory shall indicate location of loads served by each circuit.
- E. Label all panels and service equipment with neatly printed or lettered labels. Securely attach labels to equipment.

3.9 CLEANING

- A. Brush and clean work prior to concealing, painting and acceptance. Performed in stages if directed.
- B. Clean and repair soiled or damaged painted exposed work and match adjoining work before final acceptance.
- C. Remove debris from inside and outside of material, equipment and structures.

3.10 FIELD TESTS

- A. General: Perform field tests in the presence of the Contracting Officer except as otherwise specified. Provide required labor, materials equipment and connections to perform tests, document results and submit them to Contracting Officer for approval and repair or replace all defective work.
- B. Test on Wire and Cable: Perform the following test prior to connecting the equipment:
 - 1. All wiring shall be tested to ensure proper operation according to functions specified.
 - 2. Measure insulation resistance of all feeder wires. All feeder cables, #4 or larger shall have insulation resistance of 1.5 megohms or higher. Insulation resistance shall be measured by 500 volts megger. Resistance of feeder cables shall be recorded and turned over in four copies to the Contracting Officer during final inspection. Proper operation of all electrical devices shall be demonstrated at request of Contracting Officer during final inspection.
 - 3. Balance loading on each feeder.
- C. Tests on Low Voltage Distribution Equipment: Open and close switching devices under load.

END OF SECTION

SECTION 16400

SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

As specified in Section 01019.

1.2 SUMMARY

- A. Materials, equipment, fabrication, installation and tests in conformity with applicable codes and authorities having jurisdiction.
- B. Electric service system, including ductlines, concrete pads, pullboxes, handholes, and pullwires.
- C. Grounding system.
- D. Provisions of feeder distribution systems including ducts, overhead service wires, handholes, and pullboxes.
- E. Related Work Described Elsewhere: Section 16100 - BASIC MATERIALS AND METHODS.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01330 - SUBMITTALS.
- B. Submittals shall be complete. Contractor shall review submittals for conformance with Contract Documents, make necessary revisions and submit to the Contracting Officer, indicating the following:
 - 1. Manufacturer's name, brand name and catalog reference of equipment supplied.
 - 2. Drawings pertaining to deviations from the Contract: Comply with all applicable references mentioned in this Section. Coordinate with other trades and field conditions and show dimensions and details including building construction and access for servicing.
 - 3. Detailed description of items supplied, including specifications, performance characteristics, materials, wiring diagrams and schedules.

1.4 QUALITY ASSURANCE

- A. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.
- B. Supply all equipment and accessories new, free from defects and listed by Underwriters'

Laboratories, Inc., or bearing its label.

- C. Supply all equipment and accessories in compliance with the applicable standards listed in this Section and with all applicable United States and local codes.
- D. All items of a given type shall be the products of the same manufacturer.
- E. Approvals: Obtain from Hawaii Electric Light Company and authorities having jurisdiction and pay all Utility Company charges. Submit evidence of approvals to the Contracting Officer.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Ship equipment in its original packages to prevent damaging or entrance of foreign matter. All handling and shipping performed in accordance with manufacturer's recommendations. Provide protective coverings during construction.
- B. Replace at no expense to State, equipment or material damaged during storage or installation, as directed by the Contracting Officer.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1 sections.

1.7 WARRANTY

- A. Warranty of all equipment and labor by manufacturer for one year from written notification of acceptance by the Contracting Officer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All equipment and materials shall be new unless indicated or specified otherwise. Insulating liquids containing polychlorinated biphenyls (PCB) shall not be provided in any equipment.

2.2 ELECTRIC SERVICE SYSTEM

- A. Equipment and wiring furnished and installed in part by Hawaii Electric Light Company, referred to as the Utility Company, and in part under this Contract.
- B. Work in accordance with rules and regulations of the Utility Company and verify service requirements and facilities prior to bid.
- C. Voltages:
 - 1. Service Voltage: 208/120 volts, 3 phase, 4 wire.
 - 2. Utilization Voltages:

- a. 208/120 volts, 3 phase, 4 wire, solidly grounded.
- D. Work by Utility Company:
 - 1. Supply and install watt hour and demand meter.
 - 2. Final connections to metering equipment.
- E. Work Under This Contract:
 - 1. Arrange with Utility Company for service facilities and pay all charges.
 - 2. Extend service from Utility Company terminations.
 - 3. Sleeves, as required, for service entrance raceways.
 - 4. Obtain Utility Company approval of service equipment shop drawings.
 - 5. Assure that equipment selected will fit spaces allocated for the equipment and provide equipment that will fit spaces allotted.

2.3 NAMEPLATES

- A. Screwed on, engraved black lamicoid sheet with 3/4 inch high white lettering. Inscription; subject to review. Nameplates provided for:
 - 1. Panelboards.
 - 2. Disconnect Switches.
 - 3. Pullboxes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide with flexible, final connections with minimum 50 percent slack
- B. Wall Mounting: On channel supports. Submit shop drawing for review prior to installation.

3.2 UNDERGROUND CONSTRUCTION

- A. Ductlines:
 - 1. Ductlines shall be polyvinyl chloride (PVC) ducts in concrete jackets and shall be installed by qualified electrician. Excavations for ducts and holes were dug by foundation contractor and backfilled with crushed rock. Contractor shall verify and utilize previously excavated holes and trenches for the ductlines and boxes. Lay ducts and/or conduits in trenches on

plastic saddles or on concrete spacers. Spacing between ducts shall be as indicated. Slope ducts 4 inches per hundred feet to drain into holes. After laying, bind ducts with steel wire and anchor to prevent movement during concrete pouring. Coat tapered ends of ducts or conduits with sealing compound before coupling is applied to insure watertight joint. Reinforcing steel, shoring and forming where required, shall be installed according to DIVISION 3 - CONCRETE. Concrete shall be poured without the use of mechanical vibrators. Tamp concrete manually with wooden rods. Thickness of concrete encasement shown is minimum and may be increased to fit actual shape of trench. Changes in direction of runs exceeding 5 degrees shall be accomplished by using special couplings or bends manufactured for this purpose. If it is necessary to cut tapered end on piece of conduit at site, cut shall be made with saw and tapered with lathe designed to match original taper. After ductline is installed, pull a mandrel not less than 12 inches long having diameter 1/4 inch less than inside diameter of conduit through each conduit. After this, pull brush with stiff bristles through to make certain that no particles of earth, sand or gravel have been left in line. Install stranded nylon pull line in all empty raceways. Plug all spare raceways with non-corrodible plugs manufactured for the purpose.

2. After cables have been installed, seal all ducts with mastic compound to prevent entry of water from ductline to termination of ducts in areas below grade.

B. Wire Splicing for Cables Rated 600 Volts or Less:

1. Form wire neatly in enclosures and boxes.
2. Splices in underground locations shall be waterproof.

C. Underground Handholes/Pullboxes: Boxes shall consist of precast concrete or cast in place boxes as indicated in the drawings and shall be installed by qualified electrician. Boxes shall be constructed where shown on the drawings. Exact location of each box shall be approved by the University before construction is commenced. Box shall be in accordance with applicable details shown on drawings and requirements of respective utility companies. Top of box shall be approximately 2 inch above finished grade except when part of pavement, at which location they shall be even with the finished top of pavement. Top of boxes in landscape areas shall be below finished grade as indicated or directed by the University.

D. Coordinate holes and ducts for utility companies with respective utility companies and install in accordance with their drawings and instructions. Arrange for underground work to be inspected by inspectors of utility companies prior to start of work and prior to backfill and covering.

3.3 TESTS

- A. By manufacturer's qualified representative: test pickup settings of switchgear protective devices and ground fault systems. Contractor shall employ a skilled relay technician or engineer actively engaged in testing and calibrating relays. Notify Contracting Officer prior to test.
- B. Test grounding system for overall ground resistance not to exceed five ohms.

END OF SECTION

SECTION 16500

LIGHTING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

As specified in Section 01019.

1.2 SUMMARY

- A. Materials, equipment, fabrication, installation and tests in conformity with applicable codes and authorities having jurisdiction.
- B. Lighting fixtures (luminaires).
- C. Components.
- D. Contractor shall take delivery, store, assemble, install, connect luminaires.
- E. Provide all required labor to aim and adjust exterior luminaires as required in the evenings.
- F. Related Work Described Elsewhere: Section 16100 - BASIC MATERIALS AND METHODS.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300 - SUBMITTALS.
- B. Submittals shall be complete. Contractor shall review submittals for conformance with Contract Documents, make necessary revisions and submit to Contracting Officer, indicating the following:
 - 1. Manufacturer's name, brand name, and catalog reference of equipment supplied.
 - 2. Details of construction and finishes of fixtures.
 - 3. Photometric data, including optical performance rendered by independent testing laboratory developed according to IES Methods as follows:
 - a. For down and semi-down lights used for general illumination:
 - 1. Coefficients of utilization.
 - 2. Candlepower data, presented graphically and numerically, in 10 degree increments (5 degree, 15 degree, etc.). Data developed for up and down quadrants normal, parallel, and at 45 degree to lamps if light output is asymmetric.
 - 3. Zonal lumens stated numerically in 10 degree increments (5 degree, 15 degree, etc.)

as above.

b. For Other Fixtures: Candlepower curves, presented graphically and numerically, in 10 degree increments (5 degree, 15 degree, etc.), or smaller increments for narrow-beam fixtures.

c. For Area and Roadway Luminaires: Isocandela charts, coefficients of utilization, and IES roadway distribution classifications.

4. Luminaire Lists: Submit list of luminaires and quantities.

5. Warranty: Submit warranty as noted under item entitled "WARRANTY" hereinbelow.

1.4 QUALITY ASSURANCE

A. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.

B. Supply all equipment and accessories new, free from defects and listed by Underwriters' Laboratories, Inc., or bearing its label.

C. Supply all equipment and accessories in compliance with the applicable standards listed in this Section and with all applicable United States and local codes.

D. All items of a given type shall be the products of the same manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Ship equipment in its original packages to prevent damaging or entrance of foreign matter. All handling performed in accordance with manufacturer's recommendations. Provide protective coverings during construction.

B. Replace at no expense to State, equipment or materials damaged during storage or installation as directed by the Contracting Officer.

1.6 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include replacement parts list.

1.7 WARRANTY

A. Warranty of equipment and labor by manufacturer for one year from written notification of acceptance by the Contracting Officer.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Type of fixtures indicated by letters or letters followed by numbers. See drawings for tabulation of fixture types.
- B. LED fixtures shall be in compliance with IESNA Standard LM-80 and demonstrate L70 life after 50,000 hours.
- C. LED lamps shall be a color temperature of 4000 degrees Kelvin, a CRI of 80 minimum, and lumen maintenance L70 rating of 50,000 hours minimum.
- D. Sheet Metal Luminaire Housings: Welded construction, with exceptions noted under luminaire types.
- E. Luminaire catalog numbers used to illustrate equipment type do not necessarily denote required mounting equipment or accessories. Provide accessories to suit.
- F. Removable from Luminaire Housings: Chains, springs, hinges or other fastening devices required on apertures, reflectors and baffles.

2.2 FIXTURE CONSTRUCTION

- A. Free of light leaks.
- B. Ventilation For:
 - 1. LED drivers.
- C. Weatherproof and Vaportight Fixture Finishes: Weatherproof enamel, galvanized or epoxy, including hangers.

2.3 LED DRIVERS

- A. Driver shall be of the constant current type.
 - 1. Voltage: 120/277.
 - 2. Constant Current.
 - 3. Driver Current: 350mA-700mA.
 - 4. Maximum THD: 10 percent.
 - 5. Minimum Power Factor: 0.9
- B. Acceptable Manufacturers:

1. Philips Advance – Xitanium
2. Lutron Hi-Lume
3. Sylvania/Osram

C. Dimmable LED Drivers: Driver shall be of the constant current type.

1. Voltage: 120/277
2. Driver Current: 350mA-700mA
3. 0-10v dimming cable down to 10 percent
4. Maximum THD: 10 percent
5. Minimum Power Factor: 0.9

2.4 LIGHTING CONTROLS

A. Switches:

1. Single Pole Wall Switches: Specification grade commercial Style Line decorator side and back wired. Flush mounting, heat-resistant plastic housing and self-grounding metal, strap. Silver or silver alloy contact. Rated 20A, at 120-277V. Use single pole as indicated on drawings or required. Hubbell DS120W or approved equal.
2. Dimmer Switch: Linear slide with thin profile design. Eaton slide dimmer SAL06P-LA (White) or approved equal. Provide compatible dimmer switch for LED luminaires.
3. Ceiling occupancy sensor: Ultrasonic and passive infrared, adjustable time delay, 120VAC, Hubbell OMNIDT1000QTI-MP120QTI, white or approved equal.
4. Wall switch occupancy sensor: Automatic passive infrared, dual 120/277 VAC, adjustable time delay and sensitivity. Hubbell IWSZP3PW or approved equal.

B. Wall Plates: Smooth Plastic.

2.6 WIRING

- A. 120/208 Volt Luminaire Wiring: 300 volt, 302 degree F (150 degree C), Type AP or SFF, beginning at separately mounted outlet box.
- B. Splices: Mechanical spring pressure connector or crimp connector.
- C. Minimum 3/8 inch (9.5 mm) flexible conduit connections for recessed fixtures except as indicated. Maximum length: 6 feet, 0 inches (1.85 M).

2.7 SUPPORTS

- A. All fixture supports shall be suitable for earthquake Zone 3.
- B. All Ceiling Mounted Fixtures: Carry weight of fixture to building structure, clear of ducts or pipes. Do not support to ceiling systems or supports for mechanical systems. For fluorescent troffers, provide a minimum of three suspensions and for incandescent small luminaires. Provide minimum of one suspension support to concrete ceiling or roof structure.
- C. Pendant Mounted Fixtures: With conduit stems supported to building structure. Self-leveling fittings.
- D. Wall Mounted Fixtures: Support fixture directly to structure of wall (i.e., studs).

2.8 FINISHES

- A. Painted Surfaces, Except As Noted:
 - 1. Synthetic enamel, with acrylic, aklyd, epoxy, polyester, or polyurethane base, light stabilized, baked on at 350 degrees F (177 degrees C) minimum, catalytically or photochemically polymerized after application.
 - 2. White Finishes: Minimum of 85 percent reflectance.
 - 3. Metal Parts: Cleaned and treated with phosphate or chromate bonding process after fabrication for maximum paint adhesion.
- B. Unpainted Aluminum Surfaces:
 - 1. Satin anodized, except as noted.
 - 2. In outdoor locations, to meet Aluminum Association standards for outdoor coatings.
- C. Plastic Lenses and Diffusers: Destaticize, clear acrylic unless otherwise noted. Polycarbonate plastic shall be U.V. stabilized.
- D. Reflectors: Free of marks, labels or blemishes.
- E. Field paint all luminaire trims to match ceiling finish in public areas.

2.9 BASE BID MANUFACTURERS

- A. Base bid for lighting fixtures on manufacturers indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF LIGHTING FIXTURES

A. Locations:

1. On Drawings: Dimensioned and Diagrammatical.
2. Coordinate with Architectural Reflected Ceiling Drawings and Mechanical Drawings.
3. Coordinated space conditions with other trades.
4. Fixture Rows: In straight lines except as noted.
5. Pendant or Surface Mounting: As noted.

B. Mounting:

1. Ceiling Construction:
 - a. Refer to Architectural Drawings for finish schedules.
 - b. Refer to manufacturer's installation details and applicable codes for required fixture mounting accessories.
 - c. Provide proper type of trim and accessories to match suspended ceilings.

END OF SECTION

SECTION 16700

PHOTOVOLTAIC SYSTEM (ADDITIVE BID NO. 3)

PART 1 - GENERAL

1.1 PROJECT IDENTIFICATION

- A. Project: Hawaii District Land Office, Renovate Single Story Office Building - Roof Mounted, PV System.

1.2 BACKGROUND

- A. Objective. Contractor shall provide a total “turnkey” project including all necessary equipment, materials, design, manufacturing and installation services for the installation of a utility-interactive photovoltaic system. The system shall be designed and coordinated with a PV company under the contractor. The contractor should prepare system summary detailing each location, applicable equipment/size, predicted system energy production (kWh). System shall be roof mounted. See roofing specification. This project shall meet all requirements of this section and other specifications included that apply.
- B. Scope. The contractor shall perform all professional services as necessary to provide State with a complete design package including the requirements outlined in this Statement of Work. The contractor shall install the project such that it is operational and compliant with all applicable standards, building codes, UTILITY interconnection requirements, and STATE requirements. The contractor shall include specifications, calculations and drawings in the design package, and turn it over to State. After approval by State of the final design package, the contractor shall provide all necessary construction to successfully complete the photovoltaic system installation. The awarded contractor shall apply for and manage the rebate funding under a utility and with renewable energy certificates (RECs) paperwork.

1.3 DESIGN GUIDELINES

- A. Design Guidelines for Rooftop PV. Contractor shall develop a design for a new photovoltaic system at The State of Hawaii’s Department of Land and Natural Resources Hawaii District Land Office in Hilo, HI. See drawings indicating available areas for installation on the existing roof structure. These drawings are meant for informational purposes only and must be field verified by the contractor.
 - 1. Mounting system shall limit roof penetrations and shall be fully ballasted. Mounting system design needs to meet applicable local building code requirements with respect to snow, wind, and earthquake factors.
 - 2. Conduit penetrations shall be minimized.

3. If system is not building integrated or membrane sealed, system shall be fixed tilt (minimum 5 degrees tilt for flat roof or flush mounted for sloped roof) with an orientation that maximizes annual energy production.
4. All roof access points shall be securely locked at the end of each day.
5. System layout shall meet local fire department, code and ordinance requirements for roof access.

B. Performance Criteria. The following performance criteria shall be met for all arrays:

1. Power provided shall be either 208V, 480V or 13.8 kV three phase compatible with the onsite distribution system. See drawings for options for connection voltage and location.
2. Proposal shall provide estimated energy delivery for each array, for each month of the year and total for the year at the delivered voltage (208V, 480V or 13.8 kV). The estimated annual energy delivery for all arrays shall be a minimum of [enter min production] kWhAC/year at point of interconnection (POI).
3. The STC-rated power value will be entered into PVWatts (<http://pvwatts.nrel.gov/>) using the nearest weather file to determine estimated energy delivery in kWh AC. A default value for the system losses of 14% shall be used.
4. PV array shall mean one or more PV modules having that same orientation and on the same maximum power point tracking (MPPT) system. Every array with differing orientation shall have a separate MPPT system.
5. All proposed/implemented PV array locations shall be shade free from 9AM until 3PM (solar time). Contractor shall provide documentation of shading calculations for exterior extents for each proposed array. These calculations may be modified for shading obstructions that will be removed and mitigated as part of the project. Suggested documentation would include sun path diagrams for exterior array locations or SunEye measurements.
6. All PV hardware components shall be either stainless steel or aluminum. PV structural components shall be corrosion resistant (galvanized steel, stainless steel, composites, or aluminum).
7. The project, including supports and power conductors, shall not interfere with roof drains, water drainage, expansion joints, air intakes, existing electrical and mechanical equipment, existing antennas, and planned areas for future installation of equipment shown on drawings.

C. Production Metering. The project shall have:

1. At least one production meter at POI.

- D. Construction. Perform all construction necessary for the successful installation of the system based upon paragraph 1.3A.

1.4 TECHNICAL REQUIREMENTS AND REFERENCE MATERIALS

- A. Code Compliance. Installation and equipment shall comply with applicable building, mechanical, fire, seismic, structural and electrical codes. Only products that are listed, tested, identified, or labeled by UL, FM, ETL, or another Nationally Recognized Testing Laboratory shall be used as components in the project. Non-listed products are only permitted for use as project components when a comparable useable listed component does not exist. Non-listed products proposed for use as components must be identified as such in all submittals.
- B. The contractor shall use project components that are or are made of materials that are recyclable, contain recycled materials, and that are EPA or Energy Star rated if they are available on the market.
- C. The publications listed below form a part of this document and are hereby incorporated by reference:
 - 1. National Electrical Code (NEC)
 - 2. UL 1703 Flat – Plate PV Modules and Panels
 - 3. UL 1741 – Standard for Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems
 - 4. FM Approved – Fire Protection Tests for Solar Component Products
 - 5. IEC 62446 Grid Connected Photovoltaic Systems- Minimum Requirements for System Documentation, Commissioning Tests, and Inspections
- D. Other technical codes that shall apply include:
 - 1. ASME PTC 50 (solar PV performance)
 - 2. ANSI Z21.83 (solar PV performance and safety)
 - 3. NFPA 853 (solar PV systems near buildings)
 - 4. IEEE 1547 (interconnections)
 - 5. ASCE/ SEI-7 – American Society of Civil Engineers – “Minimum Design Loads for Buildings and Other Structures”.
 - 6. NRCA – National Roofing Contractors Association

1.5 ROLES AND RESPONSIBILITIES

- A. Contractor. The contractor is required to provide:

1. Design concepts
2. Construction documents and engineering calculations that are signed and sealed by a architect or engineer licensed in the State of Hawaii.
3. Submittals for materials and products
4. Construction materials, equipment and labor
5. Design and construction supervision / contract management
6. Quality control plan (QCP)
7. Safety plan
8. Inspections and tests (per QCP)
9. Manuals (design calculations, operation/maintenance, shop drawing, etc.)
10. Commissioning of project
11. Mentoring and training tribal building operating staff for operation and maintenance
12. Operation and Maintenance during first year and optional service plan after the first year
13. Web-based monitoring system for 20 years

B. State will:

1. Review for approval design submittals and QCP
2. Witness inspections and test witnesses to verify attainment of performance requirements
3. Make progress payments for design / construction as agreed

1.6 PROPOSAL CONCEPT DRAWINGS AND SPECIFICATIONS SUBMISSIONS: The following shall be submitted within five (5) calendar days after bid opening.

- A. Concept Drawings. The contractor shall provide State with concept drawings. The drawings must indicate the proposed location of the PV array(s) and access points along with a one-line electrical diagram showing inverters, transformers, meters, and interconnection locations. All drawings shall be submitted with dimensions shown in English units.
- B. Concept Information. Include major equipment information, proposed installation/interconnection information, applicable incentive information, and performance characteristics of the system. Identify an appropriate location for the solar PV inverter equipment and its related components and environmental control systems that will meet the following criteria:

1. Ease of maintenance and monitoring
 2. Efficient operation
 3. Low operating losses
 4. Secured location and hardware
 5. Compatibility with existing facilities
 6. Avoidance of flood-prone areas
 7. Visual harmony
- C. All products shall comply with the technical requirements shown under section 1.11, "Solar Electric Module Array". At a minimum, the proposed concept information shall include:
1. Equipment Information:
 - a. System description
 - b. Layout of installation
 - c. Selection of key equipment and layout of equipment
 - d. Performance of equipment components, and subsystems
 - e. Specifications for equipment procurement and installation
 - f. All engineering associated with structural and mounting details
 - g. Controls, monitors, and instrumentation
 - h. Operation and maintenance service plan
 2. Installation Interconnection Information:
 - a. Solar electric array orientation (degrees)
 - b. Solar electric module tilt (degrees)
 - c. Electrical grid interconnection requirements
 - d. Integration of solar PV system with other power sources
 - e. System type and mode of operation (utility interactive)
 3. Performance Characteristics
 - a. Shading calculation documentation

- b. Total system output
 - c. Estimated kWh/month per array (shown over a 12 month period)
 - d. Warranties and guarantees
 - 4. Applicable Incentives
 - a. Identify all applicable incentives
 - 5. Interconnection Agreement
 - a. Provide confirmation that the PV systems will be designed to comply with applicable UTILITY interconnection requirements.
 - 6. Cost: Total bid price of project including operation and maintenance for the first year, and optional service plan after the first year
- 1.7 DESIGN SERVICES: Following the award of the contract, Contractor shall provide the following design services:
- A. Solar PV system shall be designed and engineered to maximize the solar energy resources, taking into consideration the customer's electrical demand and load patterns, proposed installation site, available solar resources, existing site conditions, proposed future site improvements, and other relevant factors.
 - B. Design Services for this project shall require a preliminary design submission, a design development submission, a check set submission and a final submission. A final set of as-built drawings shall also be provided to State. These submissions shall be delivered to State based on the project schedule submitted and approved by State. The design package shall include the following details (4.1-4.6).
 - 1. Timeline/Project Schedule. Contractor is required to provide an estimate on project timeline and schedule.
 - 2. Specifications. A full set of specifications shall not be required for this project. However, specifications that express all information and demonstrate sufficient detail so as to direct the construction work outlined in this Statement of Work shall be required. The specifications package shall be coherent enough that any contractor not familiar with the project would be able to construct the project design. The specifications shall include all equipment information, proposed installation and interconnection information, and performance characteristics of the system.
 - a. All drawings, estimates, calculations, and specifications shall be in English units.
 - b. The contract shall take into account a construction plan producing a minimum disruption of day-to-day activities, utilities, services, etc.
 - 3. Construction Drawings

- a. Provide drawings for each discipline as required (architectural, structural, electrical, etc.), with separate plans for new work and demolition as well as special types of drawings where necessary, such as enlarged plans, equipment curbing and flashing details, roof penetration details etc. Drawings shall clearly distinguish between new and existing work.
- b. Each drawing shall indicate project title, project number, array identification and location, A/E firm, A/E's address and/or phone number, contract number, drawing title, drawing type, drawing number, and key plan. A cover sheet shall be provided and shall include a list of the drawings, legend, vicinity map, and location map in addition to all items required for each drawing. Each A/E submission shall be clearly dated and labeled (e.g. 75% Design Development Submission, 100% Check Set Submission, Construction Document Submission, As-Built Drawings, etc.). Each drawing sheet submitted shall include a graphic scale in the lower right-hand portion of the sheet. The final set shall be stamped by a registered engineer and/or registered architect for the state in which the building/carport is located. At a minimum, the following drawings are required:
 1. Site plan including utility locations and connections – shall show staging and phasing requirements.
 2. Electrical plans – including single line diagram and utility interconnection.
 3. Electrical details.
 4. Roof plan – showing the full layout of the system and detailing any obstacles that must be permanently or temporarily removed or relocated.
 5. Array support and mounting details.
 6. Any drawings that may be required to install a complete project.
 7. Water proofing details as required.
4. The contract documents shall sufficiently define the Statement of Work and shall stand on their own.
5. Specifically address the means to keep the existing building accessible during construction.
6. Calculations: The contractor will provide the following calculations.
 - a. System Electrical Calculations. Provide with design development and again with 100% check set.
 1. PVWatts calculation
 2. System energy production calculation showing estimated monthly and yearly energy output for each array

7. Include roof structural loading calculations. These calculations shall specifically address roof loading from the PV array and confirmation that the loading does not exceed existing roof framing capacity as determined by your analysis. The documents included in this contract include a preliminary Roof Structural Analysis. This document provides some preliminary indications on the existing roofs capability to carry additional loading and is intended to assist during the proposal process in developing your concept design. It is not intended to alleviate the need to do array specific structural calculations during the subsequent design phases.
8. Registration Seals: Each final working drawing and each submitted specification and calculation document shall be signed by, bear the seal of, and show the state certificate number of the architect and/or engineer who prepared the document and / or is responsible for its preparation.

1.8 DESIGN SUBMISSIONS

- A. Awarded contractor will secure from governing agencies and the utility company all required rights, permits, approvals, and interconnection agreements at no additional cost to State. The awarded Contractor will complete and submit in a timely manner all documentation required to qualify for available rebates and incentives.
 1. Design Reviews. For each design / drawing submissions, State reserves the right to make comments and request changes after the receipt of the submission. Reviews will be made by State staff. As part of its review, State may offer submission reviews to local code officials. State shall provide review comments within fourteen (14) calendar days of receipt of the 35% Preliminary Submission and the 100% Final Submission.
 2. Purpose. State will review the contractor design submissions to verify adherence to contract requirements. Design reviews by State are not to be interpreted as resulting in an approval of the contractor's apparent progress toward meeting contract requirements but are intended to discover any information that can be brought to the contractor's attention that might prevent errors, misdirection, or rework later in the project. The contractor shall remain completely responsible for designing, constructing, operating and maintaining the project in accordance with the requirements of this Statement of Work.
 3. Resolution of Comments. The contractor shall respond to all design review comments in writing, indicating one of the following: (1) adoption and action taken, (2) adoption with modifications and action taken, (3) alternative resolution and action taken, or (4) rejection. In cases other than unqualified adoption, the contractor shall provide a statement as to why the reviewer's comment is inappropriate. If the contractor believes that any State design comments or requested changes will result in a change in the contract cost, they shall notify State within seven calendar days of receiving the comment(s) and provide a detailed cost estimate of anticipated contract modifications. Rejection items shall not go forward to the construction phase until adequate resolution to the rejected item has been approved by State. Design review comments shall not relieve the contractor from compliance with terms and conditions of this contract. The contractor's comment resolution shall be transmitted to State within seven (7) calendar days of comment receipt and incorporate discussions from the scheduled design comment review meetings.

1.9 UTILITY INTERCONNECTION AGREEMENT

- A. The contractor shall coordinate with UTILITY to ensure that the project satisfies all UTILITY criteria for interconnection of the project to the UTILITY electric distribution system. This includes coordinating all negotiations, meeting with UTILITY, design reviews, and participating in any needed interaction between UTILITY and State.
- B. The contractor shall manage interconnection and startup of project in coordination with the Site and UTILITY. The contractor shall at its own expense pay any interconnection, processing, and other fees and expenses as may be required by UTILITY for interconnection and operation of the project.

1.10 QUALITY CONTROL PLAN

- A. Content. For each performance and installation requirement, the QCP shall identify: item/system to be tested, exact test(s) to be performed, measured parameters, inspection/testing organization, and the stage of construction development when tests are to be performed. Each inspection/test shall be included in the overall construction schedule. The contractor is not relieved from required performance tests should these not be included in the plan.
 - B. The QCP is intended to document those inspections and tests necessary to assure State that product delivery, quality and performance are as required. It also serves as an inspection coordination tool between the contractor and State. An example of these inspections/tests is the final test/inspection for overall performance compliance of the system. Results from tests and inspections shall be submitted within 24 hours of performing the tests and inspections.
 - C. At a minimum, the QCP should conform to “IEC 62446 Grid Connected Photovoltaic Systems - Minimum Requirements for System Documentation, Commissioning Tests, and Inspections (2009)”.
 - D. Performance tests will be conducted at the final commissioning/acceptance testing, and one year after the acceptance date. Performance tests will include I-V curve traces for all PV strings. For project acceptance, measured performance at maximum power point must be at least 90% of expected performance, which will be adjusted for concurrently measured cell temperature and plane of array (POA) irradiance. This can be accomplished using a current industry standard I-V curve tracer with capability to compare measured PV string I-V curves with nameplate performance of PV string compensated for concurrent cell temperature and POA irradiance measurements. If performance is less than 90% at the one year performance tests (measured using the same method as for project acceptance), contractor shall promptly troubleshoot and correct any malfunction or issues as necessary to return project to 90% measured performance or better. The contractor shall supply State with detailed documentation of malfunction or errors and all corrective actions taken.
1. Submissions. The QCP shall be prepared and submitted within 21 calendar days of the post award conference meeting and prior to any construction on-site. The QCP may be rejected as incomplete and returned for resubmission if there is any performance, condition or operating test that is not covered therein.

2. Updating. During construction, the contractor shall update QCP if any changes are necessary due to any changes or schedule constraints. State shall be notified immediately of any schedule and/or procedural changes.

1.11 SOLAR ELECTRIC MODULE ARRAY

- A. Photovoltaic Modules
- B. PV modules shall be a commercial off-the-shelf product, shall be UL listed, and shall be on the Hawaiian Electric Light Company list of eligible photovoltaic modules to be eligible for Construction Specifications Institute (CSI), and shall be properly installed according to manufacturer's instructions, NEC, and as specified herein.
- C. The PV modules shall be installed such that the maximum amount of sunlight available year-round on a daily basis should not be obstructed. At a minimum, all PV arrays shall be shade free from 9 a.m. until 3 p.m. (solar time). All projects must include documentation of the impact from any obstruction on the seasonal or annual performance of the solar electric array.
- D. The solar electric system shall produce the minimum annual AC energy output. If the system is proposed to produce more than the minimum required energy output to reduce the cost per delivered kWh then the system shall produce the "proposed" energy. The output will be adjusted if the actual yearly solar insulation received is less than that indicated by PVWatts. A normalizing calculation will be made to correct the output, so a contractor is not penalized for an extremely cloudy year.
- E. System wiring shall be installed in accordance with the provisions of the NEC.
- F. All modules installed in a series string shall be installed in the same plane/orientation.
- G. PV modules shall have a 25-year limited warranty that modules will generate no less than 80% of rated output under STC. PV modules that do not satisfy this warranty condition shall be replaced.
- H. Panel installation design shall allow for the best ventilation possible of panels to avoid adverse performance impacts.
- I. Provide State with 1% extra PV panels.
- J. Warranty. Provide a panel manufacturer's warranty as a minimum: No module will generate less than 90% of its specified minimum power when purchased. PV modules shall have a 25-year limited warranty guarantying a minimum performance of at least 80% of the original power for at least twenty-five (25) years. Measurement made under actual installation and temperature will be normalized to standard test conditions using the temperature and coefficients published in the module specifications.
- K. Inverter and Controls
 1. Each inverter and associated controls shall be properly installed according to manufacturer's instructions.

2. Inverters shall be commercial off-the-shelf product, listed to UL 1741 and IEEE 1547, and shall be on the Hawaii Electric Light Company compliant List of Eligible Inverters.
3. The inverter shall have at a minimum the following features:
 - a. UL/ETL listed
 - b. Peak efficiency of 96% or higher
 - c. Inverter shall have operational indicators of performance and have built-in data acquisition and remote monitoring.
 - d. The inverter shall be capable of parallel operation with the existing AC power. Each inverter shall automatically synchronize its output waveform with that of the utility upon restoration of utility power.
- L. Warning labels shall be posted on the control panels and junction boxes indicating that the circuits are energized by an alternate power source independent of utility-provided power.
- M. Operating instructions shall be posted on or near the system, and on file with facilities operation and maintenance documents.
- N. Provide detailed lock out /tag out instructions for all equipment.
- O. Power provided shall be compatible with onsite electric distribution systems.
 1. Install inverters and control panels in most optimum locations with appropriate environmental protection. Roofs may be used if structurally sufficient. If inverters are mounted outside they shall be shaded from direct sun from 10 a.m. to 6 p.m. in the months of June to August and be able to be secured.
 2. The inverter and system shall utilize an astronomical timer or other means to shut down the inverter during night time to avoid energy usage at night.
 3. Warranty. A 10-year manufacturers' warranty shall be provided.
- P. Control Panel to Solar Electric Array Wire Runs
 1. Areas where wiring passes through ceilings, walls or other areas of the building shall be properly restored, booted, sealed and returned to their original condition.
 2. All wiring between carports and the point of interconnection shall be underground and meet applicable codes.
 3. Thermal insulation in areas where wiring is installed shall be replaced to "as found or better condition." Access doors to these areas shall be properly sealed and gasketed.
 4. All field electrical devices shall have the capability to be locked as appropriate.

Q. PV Monitoring

1. The PV systems installed shall provide for monitoring by State as well as by the general public on a vendor provided website. The public site is intended for education and outreach regarding renewable energy production and information on avoided greenhouse gas production. The public site shall be maintained for ten years.
2. Monitor by an IP addressable device and displayed graphically in a user-friendly manner the following parameters:
3. AC energy
4. Solar irradiance
5. Show status of all equipment
6. Provide electrical one line showing operation and performance of all equipment
7. Data shall be available both in real time and in archived in 15-minute averages. All monitoring hardware and monitoring equipment shall be provided by the contractor.
8. System shall also include metering for remote data collection and display on vendor-provided web site of system performance. System performance shall allow display during different monitoring periods from one hour to one year.
9. Provide networking equipment, engineering, programming, wiring, and software to allow remote connection by State to the local area network.

R. Meters shall be installed in the main distribution panel (MDP) when possible. Meters shall not be mounted to the transformer housing without prior approval when there is no other reasonable place to mount it.

S. Transformers

1. Stand-alone boost up transformers not incorporated into the inverters shall be National Electrical Manufacturers Association (NEMA) premium efficiency. Exterior transformers shall be housed in a NEMA 3R enclosure and be pad mounted. They shall be located next to switchgear housings where indicated on drawings.

T. Structural Requirements

1. All structures, including array structures, shall be designed in accordance with all applicable state and local codes and standards.
2. The contractor shall provide structural calculations, stamped by a licensed professional structural engineer in the State of Hawaii.

3. All structural components shall be non corrosive (galvanized steel, stainless steel or aluminum). All hardware shall be stainless steel or aluminum. All components shall be designed to obtain a minimum 40 year design life.
4. [Include for roof mounted systems] All roof penetrations shall be designed and constructed in collaboration with the roofing professional or manufacturer responsible for the roof and roofing material warranty for the specific site. The number and size of the penetrations necessary to extend the power and control cable into the building must be kept to a minimum and grouped in a single location when practicable. All roof installations and weather proofing of penetrations shall not compromise the roof warranty, or if roof has no warranty, accepted best practice. The roof penetrations and roof connections shall be warranted for weather tightness for ten (10) years from the installer including parts and labor.
5. [Include for roof mounted system] Rooftop installations where there is no parapet or the parapet is less than 42", a 6' safety zone from the roof edge to the PV system shall be maintained. A 3' clear path of travel shall be maintained to and around all rooftop equipment. Design shall address access for maintenance and replacement of the equipment. Appropriate fall protection or temporary platforms shall be incorporated into the design to allow for this maintenance and replacement work. If the inverters are mounted on the roof this equipment shall have permanent access walkways installed to facilitate monitoring and maintenance.

U. [Include for roof mounted system] Attachment to Roof

1. The system shall be mounted using the best means practicable, such as direct attachment or a fully ballasted system. All penetrations and structural connections associated with supports and conduit shall be kept to a minimum and shall be water-proof.

V. Lightning Protection. Provide surge protection on all electrical systems.

W. PV System Installation Warranty. The PV systems shall carry a ten (10) year workmanship warranty by both the manufacturer and the installer including parts and labor.

1.12 QUALIFICATIONS FOR INCENTIVES

- A. Incentives and Benefits: Contractor shall determine and select all incentives and benefits available to the project, except that it shall select from among any mutually exclusive incentives for which the project might qualify in a way reasonably expected to maximize net present value to State of all incentives and benefits, RECs, energy cost savings that might be realized in relation to the project.
- B. Contractor shall make application and pay all deposits and fees for the selected incentives and ensure that State receives all benefits of incentives to the extent reasonably within Contractor's control.

1.13 SHOP DRAWINGS/PRODUCT DATA

- A. Submissions. The Contractor shall submit shop drawings and product data / submittals, catalog cuts, etc. as stipulated herein. Shop drawing/product data submissions to State shall be made after review and approval by the contractor. All approved product data and shop drawings shall be delivered to State in one submission electronically. The contractor shall combine all product data submission material into hard copy manuals for reference during all phases of construction. Shop drawings shall be bound with product data.
- B. Reviews. Reviews of shop drawings and product data by State are not to be interpreted as an approval of the Contractor's product selections. The contractor shall remain completely responsible for constructing the PV system in accordance with all contract performance requirements.
- C. Products for Submission. The contractor shall provide shop drawings and product data for all systems, equipment and materials.

1.14 INSPECTIONS AND TESTS

- A. General. The contractor shall perform inspections and tests throughout the construction process including: existing conditions/needs assessments, construction installation placement/qualification measurements and final inspections/tests performance certification. Periodic "quality" inspections shall also be conducted to support progress payments as identified in the contractor's QCP.
- B. State Witness. All inspections and tests, to verify documented contract assumptions, to establish work accomplishment, or to certify performance attainment shall be witnessed by State and/or construction management (CM) and coordinated through the QCP.
- C. Final Inspections and Tests. In order to ensure compliance with provisions of the NEC, an inspection by a licensed electrical inspector is mandatory after construction is complete. Unless otherwise identified, manufacturer recommendations shall be followed for all inspection and test procedures. The NEC inspection shall be conducted by an independent third party electrical inspector familiar with PV systems. Provide qualifications of the proposed third party inspector for review and approval prior to conducting the NEC inspections.
- D. Tests shall include a commissioning of the array. Commissioning tests shall conform with the requirements in the QCP. Commissioning shall be performed for the entire PV system. This data shall be used to confirm proper performance of the PV system.
- E. Documentation. Inspections/tests required in the QCP shall result in a written record of data/observations. The Contractor shall provide two (2) copies of documents containing all test reports/findings. Test results shall typically include: item/system tested, location, date of test, test parameters/measured data, state of construction completion, operating mode, contractor inspector/State witness, test equipment description and measurement technique.

1.15 PROJECT CLOSEOUT

- A. Preparation for Final Inspection and Tests. The following steps shall be taken to assure the project is in a condition to receive inspections and tests.
- B. Finalize record drawings and manuals, indicating all “as-built” conditions.
- C. Record Drawings. The contractor shall maintain on site the working record drawings of all changes/deviations from the original design. Notations on record drawings shall be made in erasable red pencil or other color to correspond to different changes or categories of work. Marked-up drawings shall always be maintained at the contractor’s on site construction office, available for State and/or CM to review. Record drawings shall note related change order designations on impacted work. When shop drawings indicate significant variations over design drawings, shop drawings may be incorporated as part of record drawings. Review of record drawings may be required before monthly payments can be processed.
- D. As-Built Drawings and Specifications. The Contractor shall provide "as-built drawings" and documents based upon actual site installation. Should State determine that variations exist between finished construction and the as-built drawings, the contractor shall correct drawings to the satisfaction of State.
- E. The contractor shall submit six (6) hard copies and two (2) CDs containing the “as-built” drawings and specifications as CAD and PDF files.
- F. Warranties and Guarantees. Submit specific warranties and guarantees, final certifications and similar documents to State upon substantial completion and prior to final payment. Include copies with operations and maintenance manual. All warranties shall be signed by a principal of the contractor’s firm and sealed if a corporation.
- G. Maintenance Manual. Provide a detailed operation and maintenance manual including diagram of system components, description of normal operation; description of operational indicators and normal status of each, table of modes of operation, safety considerations, preventative maintenance requirements, troubleshooting and corrective actions; sources of spare parts and cut-sheets for all components. The contractor shall prepare six (6) hardcopies and two (2) CDs containing the detailed Maintenance Manual. Submit to State.
- H. Spare Parts. The contractor shall provide a recommend list of spare parts. At the minimum a set of combiner box fuses for each array shall be provided along with the required spare panels as noted.
- I. Demonstration and Training. Provide State approved training for designated personnel in the operation of the entire photovoltaic energy system, including operation and maintenance of inverter(s), transfer switches, panel board, disconnects and other features as requested by State. Instruct the designated State personnel in removal and installation of panels, including wiring and all connections. Provide State with written instructions and procedures for shut-down and start-up activities for all components of the system. State shall be permitted to video tape this training for official use.

J. Operations and Maintenance Service.

1. Provide operation and maintenance of the solar array systems for one year. Work shall include all manufacturer recommended maintenance as well as a 12 month performance commissioning as outlined. State shall be invited to witness all performance commissionings. A maintenance log shall be maintained to note dates, equipment and issues being resolved. Contractor should be available within 48 hours to respond to natural disasters (extreme storm, hail, wind events) to inspect array for damage.

PART 2 - PRODUCT (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION



The listed roof manufacturer is for basis of design purposes only

To: Building Owner

Re: Letter of Compliance – Photovoltaic Installation on Carlisle Warranted Roof

This memo outlines Carlisle's recommendations concerning the installation of Photovoltaic (PV) systems over a Carlisle warranted roofing system in order to facilitate the installation of the PV system with limited disturbance to the Carlisle roofing system. The determination of the most suitable PV technology, racking and installation method is the responsibility of the Building Owner or its designated representative. Listed below are the recommendations along with conditions that may impact the Carlisle warranty.

Please note that this list is not an exhaustive one:

1. Determine the building's structural ability to withstand the PV system.
2. The roofing system should be protected during installation of the PV system to prevent damage. This includes the staging and assembly areas and other areas heavily traveled.
3. To avoid PV system removal costs to the building owner, the PV system should provide adequate clearance for access to the roof membrane should maintenance or repair be required.
4. Field seams that may be concealed by the PV system, and therefore harder to access, should be overlaid by a Carlisle authorized roofing applicator using approved details and products.
5. For non-penetrating PV racking systems, a protection course consisting of Carlisle's Pressure-Sensitive Molded Walkway Pads is recommended between the PV support system and the roofing membrane. Walkway pads of thickness and density equal or greater to those which can be provided by Carlisle SynTec may be used to prevent damage to the roofing membrane.
6. Non-penetrating attachment methods that rely solely on a heat welded seam for anchoring to a thermoplastic membrane shall not be allowed. Any anchoring system, whether used as a primary or ancillary securement method, should tie directly to a structural component of the building. Failure to comply will result in negating the issuance of a membrane system warranty or termination of all existing warranties.
7. PV laminates must not be adhered directly to the Carlisle primary membrane. A compatible Carlisle membrane shall be used as a slip sheet and spliced to existing membrane.
8. Walkway pads, protection pads, slip sheets and sacrificial sheets shall be of the same color as the roofing membrane.
9. Racking systems that require penetration of the roofing membrane must be flashed in accordance with the appropriate Carlisle published detail. All flashing details must be performed by a Carlisle authorized roofing applicator.

It is recommended that areas frequently accessed for the purpose of operation or maintenance of the PV system be protected by walkways installed in accordance with the Carlisle published specifications and details. Should Carlisle be contacted to investigate a warranty claim, or to make warranty related repairs, providing access to the membrane (removal and replacement of the PV System) is the responsibility of the Building Owner.

Field Assessment & Inspection Fees

Upon completion of the roof alteration, an inspection must be scheduled and performed by a Carlisle Field Service Representative. Please be advised that if the Post Inspection is not approved, the warranty will be suspended until repairs are made and a re-inspection completed and approved by a Carlisle Field Service Representative.

Inspection fee is \$.05 per square foot of the entire roofing system as listed on the original warranty application. Inspection fees must be pre-paid via credit card or check prior to being scheduled.

Building Owner: By completing this form and typing your name in the signature block below, you acknowledge the recommendations cited herein. Failure to sign and return this document to Carlisle will result in suspension of service to the warranty.

Warranty #:

Building Name & Address:

Building Owner Name & Address:

Owner Contact Name (printed):

Signature:

Date:

Phone:

Email:

Solar Company Name & Address:

Solar Company Contact:

Phone:

Email:

PV System Square Footage:

Mounting System Type:

Name/Address of Carlisle Approved Applicator assisting with PV install:

Warranty Document

Upon inspection and acceptance, and payment of all fees, a warranty continuance letter will be issued by Carlisle to the Building Owner. The continuance letter will outline additional warranty terms and should be retained along with the original warranty for future reference.

Return this form via email to: PVLOC-WarrantyServices@CarlisleCCM.com



Preparing for Roof-Mounted Photovoltaic Installations

November 2013

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Preparing for Roof-Mounted Photovoltaic Installations

July 2013

A. General

Information included in this document is to be used as a guideline for consideration when a Photovoltaic (PV) system is to be installed on top of a new or an existing Carlisle roofing system.

A PV installation will subject the roofing assembly to extensive alteration work and an increase in foot traffic for the purpose of monitoring and maintaining the PV array(s). When assessing a roof assembly for a possible PV installation, consideration must be given to not only operation of the PV system, but also to the accessibility of the roofing assembly and the drains in order to perform adequate inspections, maintenance and repair.

Whenever additional loads are placed on a building or modifications are made to existing systems, prudent best practices mandate a comprehensive review by a licensed design professional. Prior to committing to or proceeding beyond a preliminary design of a PV system, a structural analysis by a registered Professional Engineer should be performed to ensure structural load limitations will not be exceeded.

Climatic and geological conditions, structural load limitations, module tilt, roof height, the racking/mounting method, frequency of membrane penetration, and the roof slope should all be taken into consideration.

B. Design Considerations

In addition to the design considerations outlined in each of the Carlisle published roofing system specifications, listed below are additional design recommendations which should be considered when a PV system is to be installed on a new or an existing Carlisle roof.

The proposed design may be presented to Carlisle for assessment and specific recommendations, but at no time will Carlisle approve or warrant any PV system design. It is the building owner's, by its retained design professional, responsibility to ensure that the roofing membrane is adequately protected during construction of the PV array and throughout the serviceable lives of both the PV and roofing systems.

1. It is Carlisle's recommendation that roofs expecting an immediate PV system installation and roofs being installed as 'PV ready', should specify the use of a adhered rigid insulation board, e.g.

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DensDeck, SECUROCK or HP Recovery board, and an adhered membrane of sufficient thickness as to match the expected warranted life of a PV system.

2. On projects with an existing Carlisle roofing membrane, membrane condition and installation details should be assessed to determine possible splice overlayment or the removal and replacement of certain membrane sections. A Roof assessment should be coordinated through Carlisle and performed by a Carlisle Field Service Representative prior to finalizing any upgrades/repairs to the existing roofing system.
3. Rack-supported PV arrays should provide proper clearance to access the roof membrane for the purpose of maintenance or repairs if necessary with the goal of eliminating costly removal and re-installation of PV modules.
4. When penetration of the membrane is required to secure a racking system to the roof deck or building structure beneath the roofing membrane, the use of circular steel tubing will provide the best possible flashing option and facilitate the use of pre-molded accessories. In such instances, Carlisle specifications and details should be followed and the flashing performed by a Carlisle authorized roofing applicator to ensure that the warranty will not be voided.
5. Areas, of the roofing membrane, which are heavily traveled during array installation and subsequent periodic maintenance, should be protected with walkway pads and/or concrete pavers. If pavers are selected, they should be used in conjunction with pedestals or sections of walkway pads, used to elevate the pavers.
6. Ballasted PV systems should utilize a protection course between the ballast trays of the racking system and the roofing membrane to provide protection and facilitate drainage. A protection course shall be of sufficient construction so as to prevent contact between any component of the PV racking system and the roofing membrane for the life of the roofing system. Examples of protection courses are Carlisle's Sure-Weld TPO Walkway Roll, Sure-White Molded Walkway Pad or a component supplied by the racking system manufacturer. Any component supplied by the racking system manufacturer and its interaction with Carlisle's roofing system will not be covered under the Carlisle warranty.
7. Non-penetrating attachment methods that rely solely on a heat welded seam for anchoring to a thermoplastic membrane shall not be allowed. Any anchoring system, whether used as a primary or ancillary securement method, should tie directly to the roof deck or a structural component of the building. The anchoring system should possess adequate holding power to resist any loads to which the PV system may be exposed. Any anchoring system supplied by a manufacturer other than Carlisle will not be covered under the Carlisle warranty.

8. PV laminates should not be directly adhered to a Carlisle roofing membrane. Regardless of age or condition, roofing membranes should be overlaid with similar material prior to adhering the PV laminates. This practice of using sacrificial sheets will facilitate the removal and re-installation of the laminates should access to the roofing membrane be required.
9. In order to minimize interruptions to a PV system's production, it is strongly recommended to position the array(s) so that field seams and penetrations are accessible for roofing inspections, maintenance and repair. When not feasible, all existing seams should be overlaid (stripped in) with pressure-sensitive flashing or other acceptable flashing details approved by Carlisle.

C. Carlisle Roof Assessment

Prior to commencement of any work, new and existing roof installations with a valid Carlisle membrane system warranty it is recommended to have a roof assessment performed by a Carlisle Field Service Representative (FSR) to assess roof condition and to review the proposed installation.

D. Warranty Inspections

1. All work shall be completed by a Carlisle authorized roofing applicator and must be performed in accordance with Carlisle specifications or previously issued roof assessment reports written by a Carlisle FSR.
2. Upon completion of the work, and notification by a Carlisle authorized roofing applicator, an inspection will be performed by Carlisle to assess the work performed. Upon acceptance by Carlisle, a membrane system warranty will be issued for new roofing installations or a reinstatement of warranty for existing projects.
3. All field inspections are conducted by Carlisle for a fee. Should multiple inspections be required, a fee will be charged for each occurrence.

E. Warranties

Installation of a PV system will subject the roofing membrane to excessive traffic during installation, operation, and maintenance of the PV array(s). Access for membrane repairs may require the dismantling of panels and/or the remove of modules; therefore, it is important to enhance the membrane system durability to minimize the potential for damage or the probability of leaks.

For new or existing projects, the Carlisle roof system warranty will cover deficiencies in Carlisle-supplied material or labor performed by the Carlisle authorized roofing applicator associated with the installation of those materials.

1. Damages to the roofing system resulting from PV operation or maintenance are beyond the coverage of a new or existing Carlisle warranty.
2. Should the dismantling of panels and/or the remove of modules be required to complete repairs covered by the membrane system warranty, costs associated with removal and replacement and any increase in repair costs due to limited access shall be the owner's responsibility and are not covered by the warranty.

F. Quality Assurance

The building owner, by its designated design professional should coordinate through the Authority Having Jurisdiction (AHJ) to ensure compliance with all applicable codes.

When selecting a PV system, the PV module manufacturer should be consulted to verify that the use of their product will not adversely impact the fire code classification of the roof assembly.

G. Cautions & Warnings

Please note that this list is not an exhaustive one:

1. Areas designated for staging of roofing or restoration materials and PV array components prior to construction should be protected to prevent damage to the membrane or the insulation below.
2. Maximum distributed, lateral and point loads should be determined by the building owner or his/her design professional to avoid exceeding the maximum compressive strength of the roofing assembly or the maximum loads for which the structure has been designed.
3. Coordination between various trades (Carlisle authorized roofing applicator and PV system installer/electrician) is essential to minimize delays, avoid unnecessary rooftop traffic over/through completed sections, prevent excessive soiling of highly reflective membranes and avert possible physical damage to the roofing membrane.
4. On new or existing membrane installations, attachment of slip-sheets, walkway pads, sacrificial sheets and all necessary flashings/terminations or modification to the roofing assembly must be

performed by a Carlisle authorized roofing applicator. **Failure to comply will result in negating the issuance of a membrane system warranty or termination of all existing warranties.**

5. Non-penetrating attachment methods that rely solely on a heat welded seam for anchoring to a thermoplastic membrane shall not be allowed. Any anchoring system, whether used as a primary or ancillary securement method, should tie directly to a structural component of the building. **Failure to comply will result in negating the issuance of a membrane system warranty or termination of all existing warranties.**
6. Walkway pads, protection pads, slip sheets and sacrificial sheets shall be of the same color as the roofing membrane.
7. Carlisle will not warrant or approve the integrity, installation or performance of any PV system or PV system component.

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