

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

BOARD OF LAND AND NATURAL RESOURCES

Dawn N.S. Chang
Chairperson

CONTRACT SPECIFICATIONS AND PLANS

Project No. F14C728D
KEALAKEKUA BAY STATE HISTORICAL PARK
IMPROVEMENTS

South Kona, Hawai‘i
County of Hawai‘i


Architect: Engineering Partners Inc.
Civil Engineer: Engineering Partners Inc.
Electrical Engineer: Engineering Partners Inc.
Structural Engineer: Engineering Partners Inc.

JUNE 2026

State of Hawai'i
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION
Honolulu, Hawai'i

CONTRACT SPECIFICATIONS AND PLANS

Project No. F14C728D
KEALAKEKUA BAY STATE HISTORICAL PARK
IMPROVEMENTS

Approved: 

ALAN B. CARPENTER
Acting Administrator
Division of State Parks

Approved: 

DINA U. LAU, P.E.
Acting Chief Engineer
Engineering Division

JUNE 2026

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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. Project No. F14C728D, Kealakekua Bay State Historical Park Improvements, South Kona, Kailua-Kona, Hawai'i 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 Kealakekua Bay State Historical Park, South Kona, Hawai'i, County of Hawai'i, Hawai'i.

The work to be performed consists of the following tasks: The contractor, having carefully examined the Plans, Specifications, and other contract documents, hereby proposes to furnish all labor, materials, equipment, and supervision necessary to complete the work at the Ka'awaloa and Nāpō'opo'o areas. At the Ka'awaloa site, the contractor shall construct one new composting restroom facility, including all associated site work, foundations, ventilation, and waste treatment components, in accordance with the contract documents. Within the Nāpō'opo'o area, the Contractor shall construct a new paved parking area, an interpretive shelter, and a facility storage building, both of which shall include restrooms connected to a new aerobic wastewater treatment system (AWTS) to be provided and installed by the Contractor. The Contractor shall also construct a boardwalk connecting the mauka parking lot to the existing pavilion site. At the existing Pavilion, the Contractor shall remove the existing asphalt pavement and install a new asphalt overlay, including a designated loading and unloading zone with painted markings. The Contractor shall prepare the pavilion and apply two coats of exterior-grade paint, remove and replace all existing plumbing fixtures in kind, repair any concrete defects, and remove and replace the main electrical box together with the existing light timer with new code-compliant equipment.

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

A voluntary pre-bid conference will be held virtually through Microsoft Teams on May 19, 2026 at 9:00 A.M. Contact Steve Ozoa via email at steve.h.ozoa@hawaii.gov at least one day prior to obtain a meeting invite for the pre-bid conference.

The estimated cost of construction for the total base bid excluding any additives is \$3,500,000.00.

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

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. 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.
- L. 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.
- M. 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.

- N. 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.

- O. 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.

- P. 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.

- Q. 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.

- R. 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.

- S. 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.

- T. 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.

- U. 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.
- V. 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.
- W. 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.
- X. 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.
- Y. 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
- Z. 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.

- AA. 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.
- BB. 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.

- CC. 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.
- DD. 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.
- EE. 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.
- FF. 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.

GG. 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 \$12.00 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.

PROPOSAL

FOR

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION
State of Hawai‘i

PROJECT NO: F14C728D
KEALAKEKUA BAY STATE HISTORICAL PARK IMPROVEMENTS
SOUTH KONA, HAWAI‘I

_____, 2026

Chief Engineer
Engineering Division
Department of Land and Natural Resources
State of Hawai‘i
Honolulu, Hawai‘i

Dear Sir,

The undersign, having carefully examined the local conditions and all available records and information covering conditions which may affect the cost of the work to be performed, and have carefully examined the Plans and Specifications, and and other contract documents, hereby proposes to furnish all labor, materials, equipment, and supervision necessary to complete the following work at the Ka’awaloa and Nāpō’opo’o areas. At the Ka’awaloa site, the Contractor shall construct one new composting restroom facility, including all associated site work, foundation, ventilation, and waste treatment components. Within the Nāpō’opo’o area, the Contractor shall construct a new paved parking area, along with an interpretative shelter and a facility storage building; both buildings shall include restrooms that connect to a new aerobic wastewater treatment system (AWTS) to be provided and installed by the Contractor. The Contractor shall also construct a boardwalk connecting the mauka parking lot to the existing pavilion site. At the pavilion itself, the Contractor shall remove the existing asphalt pavement and install a new asphalt overlay, including the creation of a designated loading and unloading zone with painted markings. The pavilion shall be prepared and painted with two coats of exterior-grade paint, all existing plumbing fixtures shall be removed and replaced in kind, any concrete defects shall be repaired, and the main electrical box together with the existing light timer shall be removed and replaced with new code-compliant equipment.

All necessary appurtenances will be included to complete the project, as required or called for in this Proposal, all according to the true intent and meaning of the Notice to Bidders, Information and Instructions to Bidders, Proposal, Detailed Specifications, Interim General Conditions, Plans, and any and all addenda for:

on file in the office of the Engineering Division for the TOTAL BASE BID (Items 1 to 23) of:

_____ Dollars (\$ _____)

and will fully complete all work under this contact within 365 consecutive calendar days from the date of written notice to proceed, including date of said order, said total sum being itemized on the following pages.

ADDITIVE BID ITEMS

The Bidder further proposes to incorporate in the work the Additive Bid Items as described on the drawings and Specifications Section 01230 ADDITIVE BID ITEMS for the following amounts.

The Bidders must complete fill in the dollar amounts for each Additive Bid Items, where the work will be performed at no cost to the State, fill in "\$00.00" as the dollar amount. If additive dollar amounts are left blank, the proposal will be rejected as being an "irregular proposal".

Additive Bid Item #1

_____ Dollars (\$ _____)

Additive Bid Item #2

_____ Dollars (\$ _____)

PROPOSAL

BASE BID

Item No.	Quantity	Unit	Title Description	Unit Price	Total
1	1	LS	Furnish, install, monitor and maintain all temporary erosion and sediment control devices, in satisfactory working order, complete in place and in accordance with contract documents (BMP Plans).	Lump Sum	\$
2	1	LS	Pavilion Site: Demolition of all associated items indicated within the contract documents, including hauling and disposal of all unsalvageable materials.	Lump Sum	\$
3	1	LS	Pavilion Parking Lot (Nāpō‘opo‘o): Site civil work to include but not limited to: final grading, compaction, asphalt pavement, subbase, subgrade, and posts, complete in place and in accordance with contract documents.	Lump Sum	\$
4	1	LS	Pavilion Building Improvements: Site Architectural, Electrical, Plumbing and Civil work to include but not limited to: upgrading of all plumbing fixtures; painting of the exterior and interior structure following State Parks color scheme; upgrade main electrical panel and timer; remove and replace two (2) existing concrete grills; remove and replace outdoor shower system with trench drains and seepage pit; comply with all ADA regulations; complete in place and in accordance with contract documents.	Lump Sum	\$
5	1	LS	Pavilion Asphalt Removal & Overlay: Remove existing asphalt pavement at pavilion area; install new asphalt overlay; create designated loading/unloading zone with painting markings – complete in place and in accordance with contract documents.	Lump Sum	\$
6	1	LS	Pavilion Electrical System Upgrade: Remove and replace main electrical box and existing light timer with new code-compliant equipment; all necessary conduit, wiring, breakers, and grounding – complete as shown and specified.	Lump Sum	\$
7	1	LS	Project Sign; complete in place and in accordance with contract documents.	Lump Sum	\$
8	1	LS	Nāpō‘opo‘o Interpretive Shelter Building: New shelter with restrooms including all site work; foundation, framing, finishes, roofing, plumbing rough-in and finish fixtures, electrical, ventilation, and ADA access – complete in place and in accordance with contract documents.	Lump Sum	\$

9	1	LS	Mauka Parking Lot (Nāpō‘opo‘o): Site civil work – final grading, compaction, pavement paver system, subbase, sidewalks, subgrade in place, guard posts, drainage facilities, new site fencing to protect archaeologist sites including access gate; complete in place and in accordance with contract documents.	Lump Sum	\$
10	1	LS	Aerobic Wastewater Treatment System (AWTS) (Nāpō‘opo‘o): Furnish and install new AWTS sized for the two new Nāpō‘opo‘o buildings (interpretive shelter + storage building) including all tanks, piping, aeration, controls, effluent disposal, permits, and testing – complete in place and in accordance with contract documents.	Lump Sum	\$
11	1	LS	Graded Earth Berm with Hydroseeding: Construct an earthen berm per plan including clearing, excavation, fill placement, compaction, and final grading. Immediately after grading, apply hydro-seed to all berm surfaces. Maintain hydro-seed application until uniform coverage is established. Re-seed any failed areas at Contractor’s expense; complete in place and in accordance with contract documents.	Lump Sum	\$
12	1	LS	Installation of fire protection system, including but not limited to a filled with water – fire protection tank, tank appurtenances, tank concrete foundation, hauler tank connection valving; fittings, drawings, and all incidental work, complete in place and in accordance with contract documents.	Lump Sum	\$
13	1	LS	Boardwalk (Mauka parking lot to existing pavilion) (Nāpō‘opo‘o): New boardwalk construction including foundations, framing, decking, railing, site grading, and transition to pavilion- complete in place and in accordance with contract documents.	Lump Sum	\$
14	1	LS	Pavilion Electrical System Upgrade: Remove and replace main electrical box and existing light timer with new code-compliant equipment; all necessary conduit, wiring, breakers, and grounding – complete in place and in accordance with contract documents.	Lump Sum	\$
15	1	LS	Installation of a 4’ protective fencing w/gate around the Gaspar archaeological site including but not limit to staking and layout, concrete, fencing, post rails, bracing, hardware and all incidental work, complete in place and in accordance with contract documents.	Lump Sum	\$

16	1	LS	Soil Preparation and amendment: Furnish and apply all soil amendments, including importing topsoil and organic compost/soil conditioner over all landscape area, tilled into the existing soil; complete in place and in accordance with contract documents.	Lump Sum	\$
17	1	LS	Plant Materials (All Plants): Furnish and install all palms, canopy trees, accent trees, shrubs, and ground cover as to species, sizes, quantities, spacing, and locations; complete in place and in accordance with contract documents.	Lump Sum	\$
18	1	LS	Temporary Irrigation System: Furnish, install, operate, maintain, and remove a temporary above-ground irrigation system for plant establishment ninety (90) days. Includes all hoses, drip tubing, timers, backflow prevention, fittings, connection to water source, water usage, and final removal, site restoration and all incidental work in accordance with contract documents.	Lump Sum	\$
19	1	LS	Project Sign complete and in place.	Lump Sum	\$
20	1	FA	Additional Archaeological Monitoring including coordination with archaeologist, archaeologist's reports and archaeologist's coordination with State Historic Preservation Division	Force Account	\$ 150,000
21	1	FA	Unforeseen conditions	Force Account	\$ 100,000
22	1	FA	HECO Fees (Power poles, overhead lines, transformer installation)	Force Account	\$ 200,000
Subtotal Base Bid (Items 1-22)					\$
23	1	LS	Mobilization and Demobilization (not to exceed 10% of Subtotal Base Bid).	Lump Sum	\$
Total Base Bid (Items 1-23)					\$

ADDITIVE BID NO. 1

1	1	LS	Nāpō‘opo‘o Facility Storage Building: New storage building with restrooms including site work, foundation, structure, finishes, plumbing fixtures, electrical, and connection to AWTS; complete in place and in accordance with contract documents.	Lump Sum	\$
Total Additive Bid No. 1					\$

ADDITIVE BID NO. 2

1	1	LS	Ka’awaloa Composting Restroom Facility: New composting restroom building including all site work, foundation, ventilations systems, waste treatment components, internal fixtures, signage, and connection to existing utilities, complete in place and in accordance with contract documents.	Lump Sum	\$
Total Additive Bid No. 2					\$

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, 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 (Items 1 to 23) selected by the Board of Land and Natural Resources. Write the total of bid items 1 to 23 on page P-1.

In the event the low bid is below the available funds certified by the appropriate fiscal officer, the head of the purchasing agency responsible for the procurement in question is authorized to award Additives to the lowest bidder. The award of Additives may be in any order or combination such that the Base Bid plus Additives do not exceed the available funds.

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 three hundred sixty-five (365) 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 eighteen (18) months 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 five hundred and zero cents (\$500.00) 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.

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 1

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

Additive 2

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.

Exact Legal Name of Company, Joint Venture or Partnership

Company is:

Sole Proprietor Partnership Corporation Joint Venture Other _____

Contractor's License No.: _____

Federal I.D. No.: _____

Hawaii General Excise Tax License I.D. No.: _____

Payment address (other than street address below): _____

City, State, Zip Code: _____

Business Address (street address): _____

City, State, Zip Code: _____

Respectfully submitted,

By _____

Authorized (Original) Signature (*4)

Title: _____

Print Name: _____

Date: _____

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 “three hundred sixty-five (365)” 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 three hundred sixty-five (365) 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 eighteen (18) months 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 18 months 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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SECTION 01019

GENERAL SPECIFICATIONS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

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 Engineer 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 Engineer and give at least three (3) working days' notice before starting any work.
- D. Disruption of Utility Services: All work related to the disconnection of the water system shall be pre-arranged with the Engineer and DLNR State Parks staff so that any disruption of such services will be kept to a minimum. In the event of temporary water service hook-ups are required, the Contractor shall provide the necessary services.
- E. General Project Scope to include but is not limited to :
 - 1. The work shall be as follows:
 - a. Ka'awaloa Site
 - 1. At the Ka'awaloa site, the Contractor shall construct one new composting restroom facility, including all associated site work, foundation, ventilation, and waste treatment components, in accordance with the contract documents.
 - b. Nāpō'opo'o Area
 - 1. Within the Nāpō'opo'o area, the Contractor shall construct a new paved parking area, an interpretive shelter, and a facility storage building—both of which shall include restrooms connected to a new aerobic wastewater treatment system (AWTS) to be provided and installed by the Contractor. The Contractor shall also construct a boardwalk connecting the mauka parking lot to the existing pavilion site.
 - c. Pavilion Work
 - 1. At the pavilion, the Contractor shall remove the existing asphalt pavement and install a new asphalt overlay, including a designated loading and unloading zone with painted markings. The Contractor shall prepare the pavilion and apply two coats of exterior-grade paint, remove and replace all

existing plumbing fixtures in kind, repair any concrete defects, and remove and replace the main electrical box together with the existing light timer with new code-compliant equipment.

- d. The Kealakekua Bay Historical State Park project site is extremely sensitive, and all work shall be performed with the highest level of respect for Hawaiian culture and archaeological resources. No work shall commence without the prior written approval of the Department of State Parks team and the presence and approval of the project archaeologist on site. The Contractor shall ensure that all personnel are briefed on cultural and archaeological protocols, and any inadvertent discoveries shall be immediately reported and left undisturbed pending further direction.

F. 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 park for the user agency personnel and the public at all times.

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 Engineer. Any areas damaged by the Contractor shall be restored as instructed by the Engineer at no cost to the State.

H. Toilet Accommodations: The Contractor shall provide toilet facilities and is the Contractor's responsibility to always keep same clean and in a sanitary condition.

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. Should the Contractor discover any discrepancy in the plans or specifications, the Contractor shall immediately notify the Engineer 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 Engineer 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 Engineer 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 together with the marked-up field office plans to the Engineer.
 - 4) Any as-built drawing which the Engineer 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
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

<u>Abbreviation</u>	<u>Company</u>
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	American 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
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

<u>Abbreviation</u>	<u>Company</u>
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
EI	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

<u>Abbreviation</u>	<u>Company</u>
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
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

<u>Abbreviation</u>	<u>Company</u>
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
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

<u>Abbreviation</u>	<u>Company</u>
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
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 -

Standard References
01090-6

SECTION 01100

ARCHAEOLOGICAL PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the requirements for the protection, preservation, and monitoring of archaeological resources, historic properties, burial sites, and cultural values during all phases of construction, demolition, grading, excavation, and ground-disturbing activities for the Kealakekua Bay State Historical Park Improvement Project.
- B. Compliance with HRS Chapter 6E and HAR Title 13, Chapter 279, is mandatory.

1.2 DEFINITIONS

- A. Archaeological Monitoring Plan (AMP): A written plan, subject to SHPD approval, that specifies anticipated remains, field methods, chain of command for halting work, coordination protocols, laboratory analysis, reporting, and archiving.
- B. Archaeological Inventory Survey (AIS): Identification and documentation of archaeological historic properties and burial sites, gathering sufficient information to evaluate significance, and compiling a written report for review by the Department.
- C. Burial Site: Any specific unmarked location where prehistoric or historic human skeletal remains and associated burial goods are interred, deemed a unique class of historic property.
- D. Iwi Kūpuna: Native Hawaiian ancestral remains, which must be treated with the greatest level of honor, care, dignity, and respect.
- E. Qualified Archaeologist: An archaeologist meeting the Secretary of the Interior's Professional Qualification Standards, with a minimum of five years of full-time professional experience in Hawaiian/Pacific archaeology. Principal investigators must have a minimum of ten years of relevant experience.
- F. The archaeologist must hold a current archaeological permit issued by the State Historic Preservation Division for conducting work in Hawai'i.

1.3 PROJECT BACKGROUND AND CULTURAL SENSITIVITY

- A. The project area lies within Kealakekua Bay State Historical Park, the site of first extensive contact between Hawaiians and Westerners (Captain Cook, 1779).
- B. The surrounding area contains numerous archaeological sites, including religious heiau, agricultural terraces, habitation sites, and burial areas.
- C. Ka'awaloa peninsula within the bay has an abundance of fragile and significant archaeological sites.
- D. Given this sensitivity, the Contractor shall exercise heightened care and follow the requirements of this section.

1.4 APPLICABLE LAWS, RULES, AND REGULATIONS

- A. The Contractor shall comply with all applicable laws, including but not limited to the following:
 - HRS Chapter 6E, Historic Preservation.

- HAR Title 13, Subtitle 13, State Historic Preservation Division (SHPD) Rules.
- HAR Chapter 13-279, Standards for Archaeological Monitoring Studies and Reports.
- HAR Chapter 13-300, Rules Relating to Burial Sites and Human Remains.
- HAR Chapter 13-275, Standards for Archaeological Inventory Surveys.
 - Any other federal, state, or county requirements as identified by State Historic Preservation Division (SHPD).

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION SUBMITTALS

- A. Prior to any ground-disturbing activity, the Contractor shall ensure that an Archaeological Inventory Survey (AIS) has been completed, reviewed, and accepted by SHPD for the entire Area of Potential Effect (APE) of the Project.
- B. Division of State Parks will prepare the Archaeological Inventory Survey (AIS), Archaeological Monitoring Plan, and Archaeological Preservation Plan. The contractor shall retain a qualified archaeologist to monitor construction in compliance with the approved AMP and to prepare an Archaeological Monitoring Report (AMR) within 60 days upon completion of the project.
- C. Construction activities shall not commence in areas subject to monitoring until SHPD has issued final approval of the AMP.

3.2 ARCHAEOLOGICAL MONITORING

- A. Archaeological monitoring shall be conducted by or under the direction of the Principal Investigator, who meets the standards of a qualified archaeologist as defined in the contract,
- B. Archaeological monitoring shall be conducted in all areas with potential for buried cultural deposits, including the following:
 - 1. Previously undisturbed ground.
 - 2. Areas within 100 feet of known burial sites.
 - 3. Areas of proposed grading, excavation, trenching, utility installation, and other ground-disturbing activities.
 - 4. Construction staging areas and access roads.
- C. Monitoring procedures shall include the following:
 - 1. The Qualified Project Archaeologist shall be present on site during all ground-disturbing activities within monitoring areas.
 - 2. The Qualified Archaeologist shall observe all excavation, grading, and soil disturbance.

3. The Qualified Archaeologist shall document stratigraphy, features, and any encountered cultural materials.
4. The Qualified Archaeologist shall collect and catalog artifacts in accordance with SHPD standards.
5. The Qualified Archaeologist shall have the authority to halt ground-disturbing activities in the immediate area of any archaeological find, including the discovery of iwi kūpuna or suspected historic properties.
6. The Qualified Archaeologist shall direct that project activities shift to other areas while the find is assessed.

3.3 DISCOVERY OF ARTIFACTS OR HUMAN REMAINS

- A. Pursuant to Chapter 6E of the Hawaii Revised Statutes (HRS), in the event any artifacts or human remains are uncovered during construction operations, the Contractor shall immediately suspend work and notify the following authorities:
 - Hawaii Police Department at 808-935-3311, if human remains are found.
 - The Department of Planning and Permitting's Civil Engineering Branch at 808-768-8084.
 - The Department of Land and Natural Resources (DLNR), State Historic Preservation Division (SHPD) Burial Program at 808-587-0166.
- B. The Contractor shall immediately notify the SHPD-approved Qualified Archaeologist, of any cultural finds, who shall document the discovery and notify SHPD Archaeology Branch.
- C. Any iwi kūpuna discovered during construction shall be treated with the greatest level of honor, care, dignity, and respect.
- D. Disturbance of iwi kūpuna without authorization from SHPD and the applicable Island Burial Council constitutes a violation of HRS §6E-72 and §6E-73, subject to civil and criminal penalties.
- E. The Contractor shall not move, remove, or otherwise disturb any iwi kūpuna or associated burial goods except as directed by SHPD and the Island Burial Council.
- F. A Burial Treatment Plan (BTP) shall be prepared by SHPD in consultation with the appropriate Island Burial Council and cultural descendants.
- G. Work shall not resume in the area of the discovery until SHPD, the Island Burial Council, and, if required, the Hawaii Police Department have authorized resumption, and a Burial Treatment Plan has been approved.

3.4 STATE EXAMINATION AND AUTHORIZATION TO RESUME WORK

- A. Representatives of the State will from time to time examine the area as work proceeds.
- B. 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.
- C. The Contractor shall notify the State if the Contractor finds anything suspected to be of historic significance and shall discontinue further work in the vicinity of the find until the State can examine the area.

- D. In either case, further work in the vicinity of such historical or suspected historical values may proceed only upon approval by the State.
- E. Such approval can be normally expected within one week and shall in no case require more than one month.

3.5 MONITORING REPORTS

- A. A monitoring report shall be prepared by the Qualified Archaeologist and submitted to SHPD for all monitoring undertaken.
- B. The report shall include the following:
 - C. Management summary, including presence or absence of sites and general findings.
 - D. Location of the study area, including USGS quad map, island, district, ahupua‘a, TMK, and acreage.
 - E. Purpose of the monitoring.
 - F. Archaeological field methods, including personnel names and qualifications, dates of work, methods, and any deviations.
 - G. Detailed description of each site encountered, including state site number, formal type, size, horizontal extent, feature descriptions, presence or absence of surface remains, subsurface deposits, photographs, line drawings, and plan maps.
 - H. Subsurface analysis findings, including stratigraphic layers with USDA soil descriptions, profile drawings, feature descriptions, artifact listings, faunal and botanical remains, debris listings, and radiocarbon data.
 - I. Assessment of site function and age.
 - J. Any consultation process, listing consulted individuals and organizations, and summarizing their comments.
 - K. Recommendations for further action or preservation measures.

3.6 VIOLATIONS AND PENALTIES

- A. The Contractor is advised that violation of archaeological and burial site protections may result in civil penalties under HRS §6E-11.5, administrative penalties under HRS §6E-11.6, criminal penalties under HRS §6E-71 through §6E-75, injunctive relief under HRS §6E-13, and suspension or termination of the Contract.

3.7 FAILURE TO COMPLY

- A. If the Contractor fails to comply with any provision of this section, the State may order a stop-work order for all or part of the Project.
- B. The Contractor shall bear all costs associated with stop-work orders, corrective actions, archaeological documentation, SHPD review fees, and any resulting delays.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.1 SUBMITTALS

- A. Shop drawings shall be required for:
 - 1. Section 13201 – Bolted Steel Water Tank
 - 2. Any others as called for in the plans, specifications or by the Engineer.
- B. Other required submittals shall include:
 - 1. Piping Layout.
 - 2. Manufacturer's Data.
 - 3. Certificates of Warranty.
 - 4. Any others as called for in the plans, specifications, or by the Engineer.

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 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 Engineer 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 Engineer, prior to any ordering of materials and equipment.
- E. Unless otherwise noted, the Contractor shall submit to the Engineer 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 Engineer 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 Engineer, 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 Engineer to correct or finish will not be acceptable, and shop drawings which, in the opinion of the Engineer, 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 Engineer, 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 Engineer. No changes shall be made by the Contractor to the resubmitted shop drawings other than those changes indicated by the Engineer. The resubmittal shall be so indicated on the shop drawing.

- I. The review of such drawings and catalog cuts by the Engineer 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 Engineer approved the change or deviations, in writing, at the time of submission; nor shall review by the Engineer relieve the Contractor from the responsibility for errors in the shop drawings. When the Contractor does call such deviations to the attention of the Engineer, 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)

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.

A. 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 landowner.

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 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 Engineer. 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. Wastewater 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 Engineer, 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 Engineer 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

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

1.2 SUBMITTAL

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

1.3 LETTER STYLE

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 ARTWORK

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

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.

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 Engineer. The project sign shall be erected upon commencement of work.

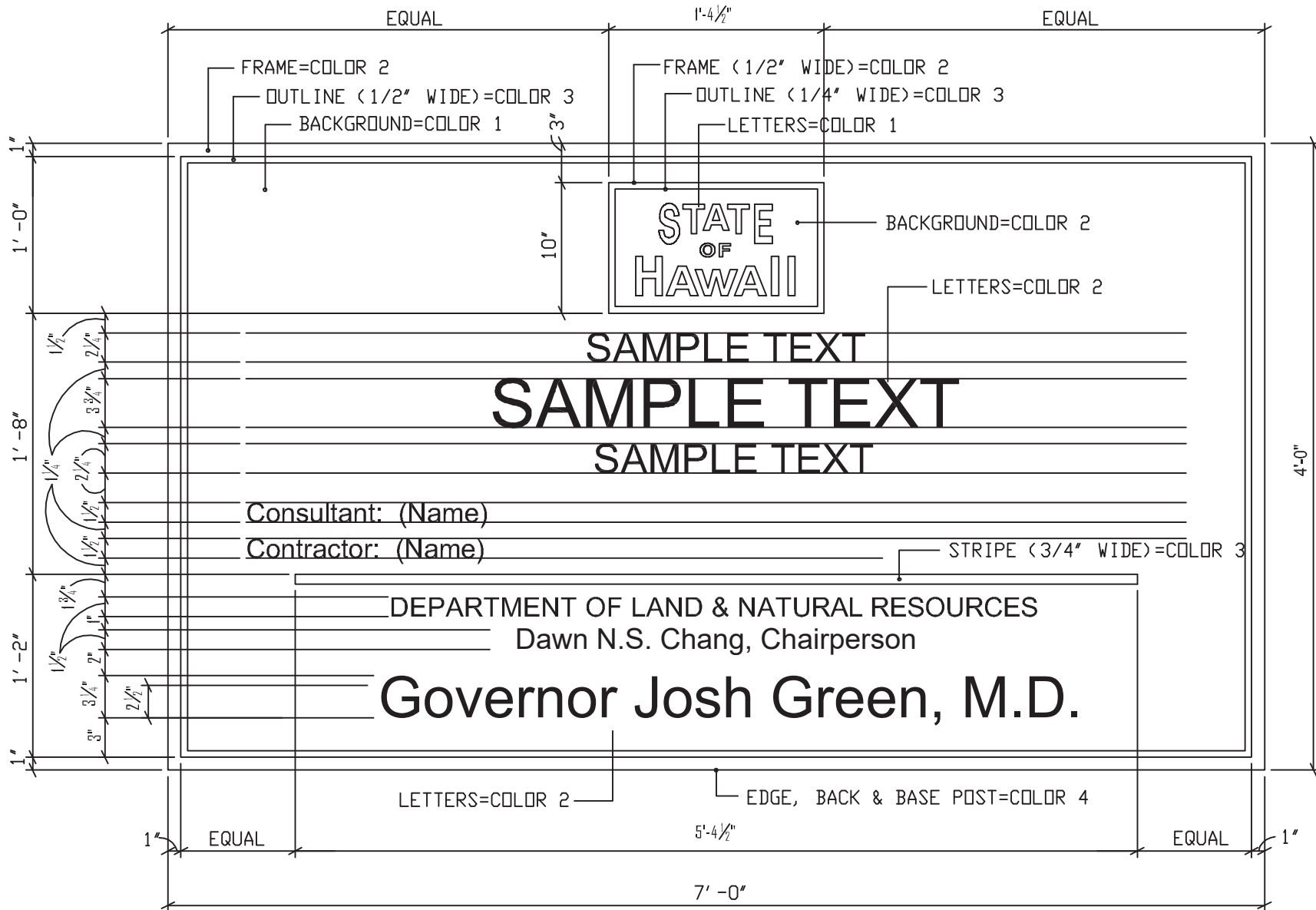
3.2 MEASUREMENTS AND PAYMENT

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

Project Sign
01581-3

Job No.



NOTE: Number of signs required 1

SECTION 02000

WATER POLLUTION, EROSION, SEDIMENT AND DUST CONTROL

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section is in regard to submitting detailed plans, diagrams, and written site-specific best management practice (BMP); the construction, maintenance and repair of temporary and permanent water pollution, erosion, sediment, and dust control measures at the project site, including work areas, material stockpiling areas, and haul roads; removal and disposal of potential hazardous wastes; and compliance with applicable State and Federal Permit conditions.
- B. The requirements of this section also apply to borrow pit operations, haul roads and/or Contractor's storage sites located outside the contract limits.
- C. The requirements of this section do not apply to dewatering or hydro-testing activities. If excavation/backfilling operations require dewatering or the installation of relocating water lines require hydro-testing, and the Contractor elects to discharge dewatering or hydro-testing effluents into State Waters or existing drainage systems, the State shall obtain a National Pollution Discharge Elimination System (NPDES_ Dewatering or Hydro-Testing Waters Permit from the Department of Health, Clean Water Branch.
- D. The Contractor shall conform to the requirements of the NPDES Notice of General Permit Coverage and shall follow the guidelines in the "Best Management Practices Manual for Construction Sites in Honolulu" dated May 1999 in developing, installing, and maintaining the BMP's for the project site and follow Honolulu's City and County "Rules for Soil Erosion Standards and Guidelines" and use respective soil erosion guidelines for County of Hawaii.
- E. The erosion and sediment control structures shall be maintained until temporary ground cover is established to stop all sediment, dust and erosion. All fines imposed for improper erosion, and sediment, and dust control shall be paid by the Contractor responsible for the work.
- F. Install temporary erosion and sediment controls which will ensure that the storm water and other drainage from job site areas which will be stripped or modified of its naturally existing or artificially established stabilization or protection against erosion shall pass through a filter system before being discharge and that these areas shall be kept sufficiently moist to control dust.
- G. Requirements under this section shall apply to all work directly related to the performance of work under this Contract. In the event that the Contractor elects to utilize excavated material as backfill material on private properties in areas outside of the project work limits or elects to perform additional grading and/or excavation work on properties outside of the work limits; such agreements shall be considered as private agreements between the Contractor and the private property owner. In such cases the Contractor shall be responsible for the costs of all required water pollution and erosion control measures for that work.

1.2 SILTATION FENCE, RE-VEGETATION, CRUSHED ROCK PAD

- A. Establish, construct, and maintain erosion and sediment control measures. Temporary siltation control devices and a crushed rock pad shall be installed before construction begins. All disturbed and graded areas shall be hydromulched at the end of the construction project. The installation of

these erosion and sediment control measures shall be in accordance with the approximate locations shown on the Plans. All erosion and sediment control measures shall be kept in good repair and maintained throughout construction.

1.3 DUST CONTROL

- A. The Contractor shall exercise precautionary measures to minimize dust emissions, which shall include, but not be limited to, periodic sprinkling or wetting of the site. The Contractor has the option of using a dust palliative. The Contractor must comply with all local requirements.

1.4 SUBMITTALS

The Contractor shall submit the following:

- A. A written site-specific BMP Plan approved by the Department of Health describes activities to minimize water pollution and soil erosion into State Waters and drainage systems. The BMP Plan shall include but is not limited to the following: an identification and source of potential pollutants, a list of all materials and heavy equipment to be used during construction; descriptions of methods and devices used to minimize the discharge of pollutants into State Waters and drainage systems; details for the installation and maintenance of any erosion or silt control devices; methods for removal and disposal of hazardous waste encountered during construction; and methods for storing and handling of oil, paint, and other products used for the project fueling and maintenance vehicles; material storage and handling areas, and other staging areas; concrete truck washouts; tracking of sediment off-site from entries and exits to the project site; litter management, dust control; and spill control. BMP plan and any revisions signed by the Contractor's authorized representative and maintained on site throughout the duration of the project.
- B. The Contractor shall provide plans clearly indicating the location of water pollution and erosion and sediment control devices; plans and details of BMP measures to be installed; areas of soil disturbance, storage and staging areas, and areas where vegetative practices are to be implemented. The plans shall indicate the intended drainage patterns.
- C. Construction Schedule.
- D. Name(s) of the individuals designated to be responsible for the water pollution and erosion controls on the project site along with home, business, and cellular telephone numbers. Individuals shall be available during off-hours, weekends and holidays.
- E. Description of fill material to be used on the project.
- F. An officer of the Contractor will be designated as an Authorized Representative in accordance with Section 6 of the Notice of General Permit Coverage and will be responsible for certification and submission of the site-specific BMP Plan to the State of Hawai'i Department of Health. A draft copy of the site-specific BMP Plan shall be submitted to the Engineer for general review prior to Contractor submission to the Department of Health. Contractor shall upon reward of contract prepare the site-specific BMP and submit to DOH for approval.
- G. Modify and resubmit the above items to correct unforeseen conditions that develop during pre-construction and construction phases.

PART 2 – PRODUCTS

2.1 SILT FENCE

- A. Silt fence shall be nylon reinforced polyester netting with fabric weight in excess of 4.0 ounces per yard and having a built-in cord running throughout the top edge of the fabric. Silt fence fabric shall be Mirafi 100X, or equal, inert to chemicals commonly found in soil and resistant to mildew, rot, insects, and rodent attack. Posts shall be either steel or two-inch square pressure treated fir, southern pine or hemlock and shall be spaced not more than six feet on center. The silt fence with a two-foot-height minimum shall be installed at the down slope boundaries of the project site.

2.2 GRAVEL DRIVEWAY

- A. Crushed rock shall be #3 Coarse in accordance with ASTM C33. See Section 02349 CRUSHED ROCK for more information.

2.3 DUST FENCE

- A. 60% density weathershade dust screen stapled to 4x4 post and tied down with 9 GA. Galvanized tension wire every 12" o.c. Contractor shall determine method of supporting dust screen. Contractor shall consult State Archeologist on options.

2.4 BIOSOCK

- A. Hawaii Biosock or approved equal filled with mulch supported with stakes or sandbag to prevent movement.

2.5 CONCRETE WASH BASIN

- A. 6 mil. PVC non-perforated liner in a hole or basin 1.5 times the total volume of wash water.

2.6 RAIN GAUGE

- A. Rain Gauge shall be Weather Wizard III with remote monitoring function or equal. The equipment shall become the property of the State upon completion of the project.

PART 3 – EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The Contractor shall conform the requirements of the NPDES Notice of General Permit Coverage
- B. The Contractor shall not begin work on the project until the submittal detailed in Section 1.4 above is completed, reviewed by the Engineer, and submitted/accepted by Department of Health in writing.
- C. The Contractor shall install and maintain a rain gauge at location determined by the State
- D. The Contractor shall install stabilized construction entrances and egresses (crushed rock pad) to minimize track of dirt, and mud onto the roadways.
- E. BMP measures shall be installed and accepted by the State before commencement of work activities that result in the disturbance of earth material. The Contractor shall coordinate and maintain BMP measures throughout the construction and post-construction period.
- F. The Contractor shall address any water pollution, erosion and sediment control concerns brought to attention by the State within 24 hours of notification.

- G. The Contractor shall apply accepted erosion control measures to all exposed surfaces subject to erosion. If after 7 days, the erosion control measures have not been applied, the Contractor shall apply an accepted erosion control measure at no cost to the State.
- H. Silt fences shall be installed by securely fastening silt fence fabric using wire ties. The silt fence fabric panels shall be installed loosely with adjacent panels overlapped a minimum of 12 inches. Silt fence material shall be embedded at least 6 inches beneath the ground surface and shall extend upward at least two feet above the disturbed area ground surface. The top edge of the fabric shall be reinforced or shall have a one-inch tuck.
- I. An eight-inch-thick gravel driveway shall be installed at the ingress/egress of the project site as shown on the Plans to aid in the removal of dirt/mud from the tires of trucks exiting the construction site areas.

3.2 MONITORING AND REPORTING REQUIREMENTS

- A. Accumulated silt and debris buildup behind the face of the silt fence and rock check dam shall be removed as needed whenever it reaches 1/3 of their heights to provide proper silt fence and rock dam operation. Clogged or damaged filter fabric for silt fence and rock check dam shall be immediately replaced and accumulated silt and debris shall be removed at no additional cost.
- B. The Contractor shall implement erosion control measures around all areas to be disturbed prior to disturbing ground in the area, to the satisfaction of the State. The State will periodically inspect erosion and sediment control structures to confirm that the Contractor is maintaining these features.
- C. The Contractor shall take sufficient precautions during construction to eliminate run-off polluting substances such as silt, clay, wastes, fuels, oils, and bitumen into the ocean, water supplies and surface waters. Special precautions shall be taken in the use of construction equipment to conduct operations in a manner that reduces erosion.
- D. The temporary erosion and sediment control features shall be maintained at locations identified in Contractor's site-specific BMPs submitted for the NPDES permit. Care shall be taken to prevent the discharge of unsuitable drainage to the ocean, a water supply, or surface water body.
- E. The contractor shall monitor and record daily (7 days/week) rainfall at the same or near same time of the day continuous for the duration of the project. The rainfall record shall be submitted to the State weekly.
- F. The Contractor and State shall jointly inspect, and Contractor shall make any necessary repairs to all erosion and sediment control measures continuously for the duration of the project at the following intervals:
 - 1. Weekly during dry periods
 - 2. Within 24-hours of any rainfall event of 0.5 inch or greater occurring in a 24-hour period
 - 3. Daily during periods of prolonged rainfall.
 - 4. When existing erosion control measures are damaged or not operating properly.
- G. The contractor shall maintain record of all inspections and repairs made. These records shall be continuously for the duration of the project and submitted weekly to the State. Payment shall be on approved Force Account Sheets.

- H. Failure to conform to the above requirements shall 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. The State further reserves the right to employ outside assistance to address the necessary corrective action and hold the Contractor responsible for associated costs.

PART 4 – MEASUREMENT AND PAYMENT

- A. The State shall measure and pay for acceptable installation of BMP structure in accordance with the Proposal Schedule.
- B. The State shall pay for acceptable maintenance, repair of water pollution and erosion, sediment, and other additional BMP measures required by the Engineer on Force Account basis in accordance with General Requirements and Covenants Section 9.4 as amended per Special Provisions SP-6 and as directed by the Engineer.
- C. The State shall consider the following as incidental costs to the project and will not be measured for payment.
 - 1. Work required for the development, submittal or any additional modification of the Contractor's site-specific water pollution and erosion, sediment, and dust control plan.
 - 2. Work required that is due to the Contractor's convenience, negligence, or carelessness:
 - 3. Erosion, sediment, and dust control measures that are not implemented within 7 days of exposure.
 - 4. Work required for preparation and obtaining of the NPDES dewatering/hydro-testing permits.
 - 5. Water and equipment required for dust control
 - 6. BMPs required by Contractor to secure hi staging areas, baseyard, borrow pits outside of the project limits.
 - 7. Installation, set up, maintenance and removal of rain gauge.
 - 8. Work under section 1.01, paragraph G.
- D. No progress payment shall be authorized until the State accepts the site-specific BMP or when the Contractor fails to properly maintain the project site according to the accepted BMP.
- E. For all citations or fines received by the State for non-compliance with the Notice of General Permit Coverage, the State will deduct the citations or fines amount from the progress payment due to the Contractor. If the progress payment due to the Contractor does not cover the cost of the citations or fines, the Contractor shall reimburse the State within 30 calendar days for the full amount of the outstanding cost the State incurred.

END OF SECTION

SECTION 02050

DEMOLITION REMOVAL AND RELOCATION

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

- A. As specified in Section 00700.

1.2 GENERAL

- A. Furnish all materials, labor and equipment necessary to demolish, remove or relocate all rock walls, structures, concrete slabs, pavement, concrete sidewalks and all other existing improvements as shown on the drawings and as specified herein.
- B. Condition at Site
 - 1. Visit the site, examine and note all existing conditions and extent of work involved for completion of this work.
 - 2. Accept obvious conditions of existing premises on date of bid opening as part of the work, even though they may not be indicated on the drawings or may vary there from.
 - 3. Exercise every precaution to preserve and protect from damage all existing structures, plants, trees, walls, private and public utilities above and below ground, etc., that are to remain. Repair any damage to the satisfaction of the Contracting Officer.
- C. Permits, Notices, Etc.
 - 1. Procure and pay for all necessary permits or certificates required in connection with this work.
 - 2. Serve proper notices and consult with the Contracting Officer regarding any temporary disconnections of electrical or other utility lines, which may interfere with this work. Properly disconnect all such lines where necessary before commencing with the work.
- D. Existing Utility Lines
 - 1. Existence of underground utility lines other than those shown is not definitely known. Should any be encountered or identified, immediately notify the Contracting Officer and follow his direction as to procedure at no additional cost to the Owner.
 - 2. The following areas must be surveyed for existing underground utilities. The underground utility survey must include both horizontal and vertical information.
 - a. Perimeter of proposed structures both above ground and underground (buildings, drywells, etc.).
 - b. Alignment of proposed underground utilities
 - 3. A map showing the results of the underground utility survey must be submitted at contract closeout.

1.3 SUBMITTALS

- A. Submit the following items for review. Work may not begin until these submittals have been reviewed and an adequate response has been provided per Section 01300 – Submittal Procedure.
 - 1. Submit a plan for demolition, removal, and relocation.
 - a. Indicate schedule of operations.
 - b. Indicate demolition procedures and equipment, highlighting operations which may be especially noisy or otherwise disruptive.
 - c. Indicate items and quantities to be removed.
 - d. Indicate items to be relocated.
 - e. Indicate items and quantities to be recycled or reused.
 - f. List all items and quantities that may be salvaged. The Contracting Officer will respond with direction as to which items should be salvaged including how and where they should be stored.
 - 2. Documentation of Existing Conditions
 - a. The Contractor may submit photo or video documentation of damage existing prior to construction work. Photos must be of an appropriate scale to identify the location and the condition of the subject.
- B. A map showing the results of the underground utility survey must be submitted at contract closeout.

1.4 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged.
- B. Remove and Salvage: Protect items, detach from existing construction, and store them as directed by the Contracting Officer.
- C. Relocate: Protect items, detach from existing construction, and reinstall as indicated per plan or as directed by the Contracting Officer.
- D. Protect in Place: Do not remove or damage this existing item.

1.5 WARRANTIES

- A. Should the work covered under this section result in the voiding of any warranties in place for existing materials, equipment, or otherwise, the Contractor shall be responsible for the replacement and reinstallation of those items, with full warranties, at no additional cost to the Owner.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. No asbestos containing materials or equipment shall be used under this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

PART 3 – EXECUTION

3.1 DEMOLITION, REMOVAL, AND RELOCATION

- A. Wherever possible, demolition waste should be recycled instead of being sent to the landfill. In addition to a standard waste disposal bin, the Contractor must provide recycling bins at the jobsite for the collection of recyclable waste.
- B. Execute all work in an orderly manner, with proper safety precautions observed at all times. Provide warning signs, lights, barricades, etc. as required or as directed by the Contracting Officer.
- C. Demolish all improvements indicated on the drawings completely. Do not remove from the site, portions of any structure or any improvements, either as a whole or substantially as a whole, for revise elsewhere. Break up and remove pavement in areas noted on the drawings.
- D. Cut portions of concrete curbs and gutter, sidewalks and pavements which are to remain to a depth of 1-1/2” with a power-driven abrasive saw. The saw cut shall be neat and true with no shattering or spalling of the portion of concrete to remain in place or to be joined with the new work.
- E. Relocate existing improvements as indicated on the drawings.
- F. Removed material having no salvage value, as determined by the Contracting Officer, shall become the property of the Contractor and shall be removed from the premises at no cost to the Owner. Removed materials with salvage value, as determined by the Contracting Officer, shall be stored where directed.
- G. Backfill all voids, trenches, holes, depressions and pits created by the removal of such miscellaneous improvements as required on the plans and in the pertinent sections of these specifications.
- H. Provide adequate shoring, coverings, barriers, etc. as necessary to protect existing construction not scheduled to be demolished.

3.2 MAINTAINING TRAFFIC

- A. Conduct operations and schedule work for minimum interference to streets, driveways, sidewalks, etc. Confine all work, equipment, materials and personnel, as much as possible, to the work area as indicated so as not to interfere with the normal function of adjacent streets.
- B. Schedule all work involving excessive noise, dust, dirt or any other detrimental aspect of this work in order that there will be a minimum disruption of the normal facility operations.
- C. The premises will remain occupied during the entire construction period for the conduct of normal operations. Coordinate with the Contracting Officer to minimize any conflict. Any interruptions or interference caused by the construction activities, which hampers normal operations, shall be halted and rescheduled to the satisfaction of the Contracting Officer at no additional cost to the Owner.

3.3 DUST CONTROL

- A. Keep the work area thoroughly wetted down to prevent dirt and dust from rising but not so much as to create runoff. Provide all waterlines required for this purpose. Grade to fill all depressions or pits and to remove high spots after grubbing and removing all debris.
- B. Erect dust fence as indicated on the plans prior to any construction operations that may cause excessive dust. Such operations include but are not limited to grubbing, grading, demolition, and excavation.

3.4 DEBRIS

- A. Remove all debris existing or accumulated from this work completely and promptly from the site to the satisfaction of the Contracting Officer. Burning of debris on the site is not permitted.

3.5 CLEANING

- A. Keep the premises clean, neat and orderly at all times. Promptly remove all excess soil, debris, materials, apparatus, temporary toilets, lights, barriers, etc. from the site upon completion of this work or prior to the completion of work when directed by the Contracting Officer.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

- A. Furnish materials, labor and equipment required to accomplish all excavation, filling, backfilling, grading, and compacting as indicated on the drawings.
- B. The Geotechnical engineer shall be present to observe site grading, proofrolling, fill and backfill placements and compaction and probing and grouting procedures on a full-time basis. All cost for their services shall be borne by the Contractor.
- C. It shall be the responsibility of the Contractor to examine the site and determine for himself, the existing conditions.
- D. 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 or may vary therefrom.
- E. All debris of any kind accumulated from clearing shall be disposed of from the site, and the whole area left clean. The Contractor shall be required to make all necessary arrangements relative to the proposed place of disposal.
- F. The contractor shall coordinate with the State regarding archaeological monitoring requirements. No work shall begin prior to this coordination and all work shall proceed in accordance with the State's archaeological monitoring requirements.
- G. The requirements of this section are applicable to all new construction areas and to future construction areas under this contract.

1.2 SUBMITTALS

- A. Submit the following items for review. Work may not begin until these submittals have been reviewed and an adequate response has been provided per Section 01300 – Submittal Procedure.
 - 1. Manufacturer's product data
 - a. When formulated by a Contractor-hired landscape professional, product data for top soil must be accompanied by a certifying cover letter.
 - 2. A plan for achieving all compaction requirements noted on the plans and these specifications.
 - 3. Sequence of work.
 - 4. Name and license number of land surveyor or civil engineer responsible for laying out baselines, establishing grades, and staking.
 - 5. Site Specific BMP Plan

- a. The Contractor must submit a BMP plan developed specifically for this project including but not limited to layout drawings and descriptions of work processes.
 - b. The site specific BMP plan must include any necessary phasing and shall refer to the overall project schedule.
 - B. Compaction test results must be submitted as soon as they are available.
- 1.3 CODES, STANDARDS, REGULATIONS
 - A. Materials for roads and parking areas shall be constructed in accordance with the below-listed sections of the State of Hawaii, Department of Transportation, 2005 Standard Specifications, except as amended in the plans and/or specifications herewith. (Paragraphs concerning Measurements and Payments in the sections are not applicable to this project.)
 - 1. Clearing and Grubbing Section 201
 - 2. Trench Excavation and Backfill Section 204
 - 3. Excavation and Backfill Section 203
 - 4. Rock for Fill Section 703
- 1.4 REMOVAL AND REPAIR WORK
 - A. The contractor shall exercise every precaution to preserve and protect all structures, walkways or utility improvements which are to remain or be relocated. Portions of walkway and pavement which are to remain shall be saw-cut neat and true to line. Restore all pavement and curbs upon completion of the work.
- 1.5 PROTECTION
 - A. Erect temporary barricade to prevent people from entering into project area, to the extent as required/approved by the Contracting Officer. The extent of barricades may be adjusted as necessary with the approval of the Contracting Officer. This work shall be accomplished at no extra cost to the Owner.
 - B. Take all precautions and safety measures as required to protect the Owner free and harmless from liability of any kind. Conduct operations with minimum interference to streets, driveways, sidewalks passages, etc.
 - C. Adequate precautions shall be taken before commencing and during the course of the work to ensure the protection of life, limb, and property.
 - D. The Contractor shall protect from damage all surrounding structures, trees, plants, grass, walks, pavements, etc. Any damage will be repaired or replaced by the Contractor to the satisfaction of the Engineer at no cost to the State.
 - E. The Contractor shall prevent dust from becoming airborne at all times including non-working hours, weekends and holidays in conformance with State of Hawai'i, Department of Health, Administrative Rules, Title 11, Chapter 60.1 – Air Pollution Control.

1. The method of dust control and costs shall be the responsibility of the Contractor. Methods of dust control shall include the use of water or chemicals approved for such use over surfaces that may create airborne dust.
 - a. Dust control water shall be kept to a minimum so that no runoff is generated.
2. A dust barrier shall be erected to confine any dust generated from the construction project from spreading beyond the immediate project area.

1.6 CRITERIA FOR BIDDING

- A. Base bids on the following criteria.
 1. That the surface elevations are as indicated.
 2. Blasting is not permitted.
 3. Crushing and screening of onsite rock material for general fill is permitted.
 4. Removal of all unsuitable materials as well as additional embankment materials required for lava tubes, and subterranean voids shall be incidental items to excavation and embankment. The Contractor shall adjust his unit price accordingly.
 5. Provisions shall be made for the collapsing and backfilling of lava tubes of up to 100 cubic yards.
 - a. Where the extent of the lava tubes is found to be less than 100 cubic yards, a credit must be provided to the Owner at the end of the earth work operations.
 - b. Where the extent of the lava tubes is found to be greater than 100 cubic yards, the Contractor may request a change order based on the originally proposed unit price for collapsing and backfilling lava tubes.

1.7 PERMITS

- A. The Contractor shall obtain and pay for necessary permits prior to the commencement of work.
- B. The Contractor must be familiar with any permits that have been obtained by the Owner or otherwise and construction operations must be in accordance with the requirements of those permits.
- C. The following permits/certifications have been filed and paid for by the Owner:
 1. Department of the Army Permit
 2. Department of Health NPDES Permit
 3. Department of Health Water Quality Certification

1.8 MAINTAINING TRAFFIC

- A. The Contractor shall conduct operations with minimum interference to streets, driveways, sidewalks, traffic activities, etc.

- B. When necessary, the Contractor shall provide, erect and maintain lights, barriers, etc., as required by traffic and safety regulations with special attention to protection of life.

1.9 CONSTRUCTION LINES, LEVELS, AND GRADES

- A. The Contractor shall verify all lines, levels and elevations indicated on the drawings before any clearing, excavation or construction begins. Any discrepancy shall be immediately brought to the attention of the Contracting Officer 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 laying out of base lines, establishment of grades and staking out the entire work shall be done by a qualified surveyor as determined by the Contractor. He shall be solely responsible for their accuracy. Erect and maintain substantial batter boards showing construction lines and levels.

PART 2 – PRODUCTS

2.a MATERIALS

- A. Asbestos Prohibition
 - 1. No asbestos containing materials or equipment shall be used under this section. The Contractor shall insure that all materials and equipment incorporated in the project are asbestos free.
- B. Unless otherwise noted, the materials covered by this section shall be composed of basalt rock or similar material having a specific gravity at or above 2.60.
- C. Structural Fill and Backfill
 - 1. Structural fill shall be well graded granular material, with particles less than 6 inches in maximum size and contain less than 30 percent particles passing the No. 200 sieve by weight. When placed in confined areas, such as utility trenches and footing excavations the maximum particle size shall be limited to 2 inches.
- D. General Fill
 - 1. General fill material shall be well-graded granular material, free from organic material and backfill, debris, other deleterious substances and majority of which are less than 12 inches in size with an absolute maximum dimension of 18 inches. Materials between 12 and 18 inches in particle size should be limited to about 15 percent or less of the total volume.
- E. Cushion Fill
 - 1. Under exterior and interior concrete slabs-on-grade shall be sized as indicated on the plans. Where no size requirement is provided on the plan, cushion fill shall be ASTM C33 Standard Size Aggregate No. 67.
 - a. Under building slabs, the cushion fill shall be overlaid with a moisture barrier and two (2) inches of clean sand.
- F. Drain Rock

1. Drain rock shall be sized as indicated on the plans. Where no size requirement is provided on the plan, drain rock shall be ASTM C33 Standard Size Aggregate No. 67.
- G. Subbase Course
1. Subbase course shall meet the requirements of the 2005 Standard Specifications for Road and Bridge Construction, Sections 305 and 703.
- H. Aggregate Base Course
1. Aggregate base course shall meet the requirements of the 2005 Standard Specifications for Road and Bridge Construction, Sections 304 and 703.
- I. Boulders
1. Boulders for grouted boulder fill shall be sized as noted per plans and shall be composed of basalt "blue rock" or similar material, having specific gravity at or above 2.60.
 2. The Contracting Officer must be given the opportunity to observe and select boulders that will be left permanently visible, as barricades or otherwise.
- J. Top Soil
1. Requirements for top soil are as indicated on the plans or elsewhere in these specifications. Where no specific requirements are provided, the contractor is required to consult a landscaping professional to determine the appropriate mix components and ratios for the project site and planting requirements. Product information must be submitted for review along with a certifying cover letter from the landscaping professional.
- K. Suitable Native Materials
1. Excavated onsite basalt materials may be used as fill and backfill, provided that the materials are well graded and maximum size of the individual fragments are limited to the applicable sizes for general fill and backfill and structural fill and backfill.
 2. Ash soil (e.g. volcanic Pahala ash) shall not be used as structural fill or backfill.
 3. Ash/rock mix, containing less than 5% ash by volume may be used as structural fill provided that particle size meets the standards described herein and the mix is compactable.
- L. Insufficient Earth Material
1. The Contractor shall import all necessary material to complete the grading work at no additional cost to the Owner. Imported material shall be well-graded from coarse to fine with no particles greater than 6 inches in largest dimension. The material shall have a laboratory California Bearing Ratio (CBR) value of 20 or higher, and a swell potential of 1 percent or less when tested in accordance with ASTM Test Designation D1883. The imported material shall be tested prior to being transported to the site and subject to review by the Contracting Officer and shall meet the requirements as specified for each category of the materials.

PART 3 – EXECUTION

3.1 PROTECTIVE MEASURES

- A. All excavation shall be protected and guarded against danger to life, limb and property in accordance with applicable regulations.
- B. Shoring, cribbing and logging, as required to safely preserve the excavations, earth banks, and existing structures free from damages resulting from the work shall be designed, provided and installed by the Contractor.
- C. All excavations shall be kept free from standing water. The Contractor shall do all pumping and draining that may be necessary to remove water to the extent required in carrying on the work. Grading shall be controlled so that the ground surface is properly sloped to prevent water run-off from entering structural foundations and open trenching excavations.
- D. The Contractor shall conduct operations with minimum interference to streets, driveways, sidewalks, passageways, traffic, etc. The Contractor shall confine all work, equipment, materials and personnel as much as possible to the work area as indicated. The Contractor shall schedule all work that involves excessive noise, dust, dirt, or any other detrimental aspect of this work in order that there will be minimum disruptions to neighbors. When necessary and when directed, the Contractor shall provide and erect barriers, etc. with special attention to the protection of personnel.
- E. The underground utility lines crossing the construction area known to exist by the designer are shown on the plans. Should any be encountered during excavation, whether shown on the plans or not, the Contractor shall not disconnect same without authorization from the Contracting Officer but shall inform the latter immediately of each discovery. The Contracting Officer shall investigate and issue proper authorization for procedure.

3.2 LAYING OUT

- A. The laying out of base lines, establishment of grades and staking out the entire work shall be done by a qualified surveyor as determined by the Contractor. He shall be solely responsible for their accuracy. Erect and maintain substantial batter boards showing construction lines and levels.
- B. Should any discrepancies be discovered in the dimensions given in the plans, the Contractor shall immediately notify the Contracting Officer before proceeding any further with the work; otherwise, he will be held responsible for any costs involved in corrections of construction placed due to such discrepancies.

3.3 SITE GRADING

- A. All grading work shall be performed in conformance with County of Hawaii Ordinance 168, the applicable provisions of Chapter 54, Water Quality Control Standards, and Chapter 55, Water Pollution Control, of Title 11, Administrative Rules of the State Department of Health. In addition, the work shall be in conformance with the Air Pollution Control Standards and Regulations of the State Department of Health.
- B. The area to be graded shall be cleared of vegetation, debris, rubbish, old pavements, abandoned pipelines and other deleterious materials. Trees and large masses of roots shall be grubbed. All of these materials shall be removed and disposed of properly off-site at no cost to the Owner.

- C. No blasting will be permitted.
- D. The areas not covered by concrete slab or pavement up to the Contract Zone Limits shall be graded to conform to finish contours. The top layer shall be 6" thick top soil unless otherwise indicated in the drawings or these specifications. Rough grading shall prevent the drainage of water into construction areas.

3.4 SITE PREPARATION

- A. Prior to commencement of earthwork operations, all vegetation, debris, and other deleterious materials shall be removed from the site.
- B. Any underground structures such as cesspools, cisterns, septic tanks, well, pipelines, fuel tanks, etc. discovered in the site preparation work shall be removed and backfilled in accordance with these specifications and any applicable regulations.
- C. Soils testing, as required elsewhere in these specifications, must be completed prior to removing any soils from the site.
- D. The underground utility survey required elsewhere in these specifications must be completed prior to commencing with any operations covered under this section.
- E. All pertinent BMPs including but not limited to dust fence, silt fence, sediment waddles, construction entrance, etc. must be in place prior to the commencement of earthwork operations.
- F. Where compaction must occur to ensure soil stability, that compaction must be completed prior to starting any excavation.
- G. Basalt rock under slab-on-grade pavements, excavated subgrades and areas to receive fill shall be ripped and proofrolled as specified herein.
- H. All subgrades of fill areas shall be ripped to a depth of about 3 feet below the existing ground surface to detect and collapse near-surface cavities and/or voids. As a minimum, ripping of the subgrades should extend at least three (3) feet laterally beyond the limits of the fill areas.
- I. After the fill surfaces have been ripped to a depth of about 3 feet below the ground surface, the ground should be proof-rolled with a Caterpillar D-10 bulldozer or similar size bulldozer a minimum of four passes to provide a relatively level surface. After leveling with the bulldozer, the fill subgrades should be proof-rolled with a large vibratory drum roller (minimum 20 tons static weight) for a minimum of eight passes travelling no faster than 100 feet per minute. Yielding areas, loose areas, or cavities disclosed during clearing and proof-rolling operations should be over-excavated and backfilled with compacted fill materials.

3.5 STRUCTURAL EXCAVATION

- A. The bottom of all footings shall be embedded a minimum of 18 inches below the lowest adjacent finish grade. Deeper excavation is required at localized areas to provide a competent bearing surface. Footings located adjacent to a slope shall be embedded deep enough to provide a minimum 6-foot setback distance measured from the outside edge of the footing horizontally to the slope face.
- B. When foundations are located next to utility lines, they shall be embedded below a 1 horizontal to 1 vertical (1H:1V) imaginary plane extending upward from the bottom edge of the utility trench or as deep as the inverts of the utility lines.

- C. The bottom of all footing excavations shall be on basalt rock. The footing shall extend through the fill materials and bear on the underlying basalt rock. This requirement is applicable to areas where rock is anticipated. For Hamakua and similar areas, those requirements outlined in the filling and backfilling sections will apply.
- D. Excavation for wall footings shall have level beds of firm bearing, with stepped levels where necessary.
- E. Excavated material approved for general fill and backfill and structural fill and backfill shall be transported to fill area as specified herein. Excavated materials declared unusable shall be removed from the site at the Contractor's expense. Excess excavated materials shall be removed from the site at no additional cost to the Owner.
- F. Should any existing utility lines other than those shown on the drawings be encountered during excavation, the Contractor shall immediately notify the Contracting Officer and follow his direction as to procedure at no additional cost to the Owner.
- G. The bottoms of all footing excavations shall be level, free of sharp points that may cause a concentration of loading and cleared of loose rock fragments prior to the placement of reinforcing steel and concrete. Footing bottoms shall be protected from disturbance by workers' activities.

3.6 PROBING AND GROUTING

- A. One probe hole shall be made at each spread footing location. Probe holes shall be spaced not more than 10 feet on centers for wall footings supporting continuous structural walls. Submit probe locations to the Contracting Officer at least one week prior to the start of probing. If cavities and/or voids are encountered or suspected during the probing operation, additional probes shall be drilled at closer spacing to aid in delineating the vertical and lateral extent of the cavity and/or void.
- B. Probe holes shall have a diameter of at least three (3) inches.
- C. Depth of probing below the bottom of footings shall be 10 feet.
- D. Probe holes should be grouted with cement grout having a compressive strength of at least 1,500 pounds per square inch. A grout pipe shall be utilized and fully inserted to the bottom of the probe hole prior to pumping any grout. A maximum of 1 cubic yard of grout shall be pumped into a probe hole at any time. After that volume has been pumped, the grout shall be allowed to set, and then grouting in the same zone shall be attempted again. Grouting should continue 1 cubic yard at a time.
- E. In areas of excessive grout take, it may be preferable to excavate the roof of the cavity and fill it with structural backfill, concrete, or some combination.
- F. All costs for probing shall be borne by the Contractor up to 10 cubic yards of grout material. Grouting costs beyond this in cubic yards shall be considered a Change Order.
- G. The probe drill shall be available on-site until the probing and grouting operations are completed. The Contractor must account for lag time between probing/grouting operations and foundation construction in the construction schedule.

3.7 FILLING AND BACKFILLING

- A. In the absence of a soils report and/or other direction within the project plans, bids for filling and backfilling should be based on the procedures and materials described below. If a

different pavement or structural subgrade section is detailed in the plans, bids should be based on the procedures described below. Materials, thicknesses, and procedures are subject to change based on actual field conditions.

- B. Fill areas of the project shall be capped with a minimum two (2) foot thick layer of structural fill material.
- C. Fill and backfill materials below the minimum two (2) foot thick structural fill layer may consist of general fill material.
- D. General fill and backfill shall be compacted to a firm, unyielding surface. Conventional compaction testing is generally not practicable in fills which are composed of rocks, boulders and/or cobbles. A testing program to evaluate the number of passes of a compactor needed to achieve the desired level of compaction shall be conducted at the start of the grading phase of the project.
- E. General fill areas shall be compacted to not less than 90% maximum dry density.
- F. General fill slopes shall not be steeper than 2 horizontal to 1 vertical.
- G. Filling operations shall start at the lowest point and continue up in level horizontal compacted layers in accordance with the fill placement recommendations noted herein before. Fill slopes should be constructed by overfilling and cutting back to the design slope ratio to obtain a well-compacted slope face.
- H. Fills placed on slopes steeper than 5 horizontal to 1 vertical should be keyed and benched into the existing slope instead of backfilling the slope to the design grade with sliver fills.
- I. Structural fill materials shall be used under buildings and to backfill any voids detected during proof-rolling.
- J. Structural fill shall be laid in lifts not exceeding 12 inches in loose thickness moisture-conditioned and compacted to at least 95% maximum dry density (ASTM D4914). For structural fill and backfill in confined areas, the material shall be placed in smooth, loose lifts less than 6 inches thick, moisture conditioned, and compacted to at least 95 % maximum dry density.
- K. Structural fill slopes shall not be steeper than 1.5 horizontal to 1 vertical.

3.8 FILL TESTING

- A. Fills shall be tested for appropriate compaction as noted below. All tests shall be conducted by a geotechnical engineer or an independent testing agency. Test results must be provided to the Contracting Officer for review. Should any test results indicate insufficient compaction, additional testing to the satisfaction of the Contracting Officer may be required.
 - 1. Below Building: Compaction testing of the subgrade and cushion fill is required at two locations, one on either side of the building, below the foundation of all buildings.
 - 2. Parking Lot: Compaction testing of the subgrade, subbase, and aggregate base course is required at two locations, one on either side of the parking lot.

- B. Additional testing of fills for appropriate compaction may be requested by the Contracting Officer at any point during the project. Fill shall be tested by a geotechnical engineer or an independent testing agency. Except in the case where insufficient compaction is discovered, costs for additional fill testing shall be borne by the Owner. Where insufficient compaction is discovered, the Contractor shall be responsible for the cost of that test and any subsequent tests performed until compaction is determined to be sufficient.

3.9 FINISH GRADING

- A. Where finish grades and contours are not given, Contractor shall grade to provide drainage away from new and existing structures and shall provide smooth transitions into existing grades outside the grading limits.

END OF SECTION

SECTION 02361

TERMITE CONTROL

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section covers the following systems for termite control; unless it is required elsewhere in the plans or these specifications, the Contractor is required to select and implement ONE of these systems.
 - 1. Stainless steel mesh termite barrier
 - 2. Chemical soil treatment

1.2 DEFINITIONS

- A. EPA: Environmental Protection Agency
- B. PCO: Pest Control Operator

1.3 SYSTEM DESCRIPTIONS

- A. The stainless steel mesh termite barrier system consists of a fine stainless steel mesh is placed across all termite entry points to the building, principally penetrations to concrete slab and cavities of walls. The mesh is too fine for the termites to squeeze through, too hard to chew through, and resistant to corrosive resistant to chemical attack.
- B. The chemical soil treatment system consists of application of termiticide chemicals to exposed soil before the building slab and foundations are placed and to voids in construction where insects may gain entry to the building.

1.4 SUBMITTALS

- A. Submit the following items for review. Work may not begin until these submittals have been reviewed and an adequate response has been provided per Section 01300 – Submittal Procedure.
 - 1. Manufacturer's product data, including installation/application instructions, MSDS, and EPA registered labels as applicable.
 - 2. Qualification data for firms and persons specified in the "Quality Assurance" article herein.
 - a. If stainless steel mesh termite barrier (mesh) is selected, provide installers resume including certificates of training completion, at least five (5) previous projects where mesh was successfully installed and contact information for each.
 - b. If chemical soil treatment is selected, provide installers resume including a copy of their current PCO license and at least five (5) previous projects where chemical soil treatment was successfully installed and contact information for each.

3. If mesh is selected, provide shop drawings showing layout and details for all installations.
 - a. Shop drawings must be legibly drawn to scale and show all installation locations and details for all installation types.
 4. Sample of Guarantee.
- B. The following items may be submitted at contract closeout.
1. Certification from manufacturers of termite control products that the treatments/products furnished comply with the requirements of this project.
 - a. Certification must be specific to this project.
 2. If chemical soil treatment is selected, submit a soil treatment application report after termiticide application is completed. Report should include the following, as applicable:
 - a. Date and time of application.
 - b. Moisture content of soil before application.
 - c. Brand name and manufacturer of termiticide.
 - d. Quantity of undiluted termiticide used.
 - e. Dilutions, methods, volumes, and rates of application used.
 - f. Areas of application.
 - g. Water source for application.
 3. Guarantee.

1.5 QUALITY ASSURANCE

- A. The stainless steel termite barrier mesh installer must be an experienced installer with a history of successful installations and who employs workers who have been trained and certified by the manufacturer.
- B. Chemical soil treatment shall be done by a PCO who is licensed by the Hawaii State Pest Control Board in Branch #3 and certified as a commercial applicator under the Hawaii Pesticide Law by the Hawaii State Department of Agriculture in category 7b and who is an experienced installer having completed treatments similar to that indicated for this project and whose work has a record of successful in-service performance.

1.6 GUARANTEE

- A. The Contractor must provide a written guarantee certifying that termite control work performed under this section will prevent infestation by subterranean termites. If subterranean termite activity or damage is discovered during the guarantee period, the Contractor is required to retreat soil and repair and/or replace items damaged by termites at no additional cost to the Owner.
 1. The guarantee period will extend for two (2) years from the date of project acceptance.

2. All necessary repairs of damages resulting from subterranean termite infestation shall be made by the Contractor at no additional cost to the Owner and to the satisfaction of the Contracting Officer.
3. If subterranean termite infestation should occur through the treated area within the two (2) year guarantee period, the corrective treatment shall be as described below. Where the initial treatment system was stainless steel mesh, corrective treatment shall be with an approved repellent termiticide. Where chemical soil treatment was initially used, corrective treatment shall be with the same chemical unless otherwise directed by the Contracting Officer.
4. Corrective Treatment
 - a. All corrective treatments shall be performed to at least 10 feet around each visible subterranean termite activity.
 - b. Remove carpets or other floor finishes, as necessary, from areas being treated.
 - c. Drill and treat through all interior concrete floors, along both sides of all partitions and walls, and all cracks and expansion joints according to label directions. Drill holes through concrete slab shall be ½ inch or 9/16 inch diameter and spaced not more than 18 inches apart.
 - d. Drill one hole at each plumbing or utility penetration through ground floor slab and treat according to label instructions.
 - e. Patch drill holes with cement/concrete to full depth of slab thickness and refinish walls/floors as necessary to prevent any backflow and to restore original appearance.
 - f. Reinstall carpets or other floor finishes as applicable / necessary. Installation shall be done by a competent commercial installer.
 - g. Replace any finish materials which are contaminated by spilled chemicals.
5. The above ground areas infested with subterranean termites shall be treated as appropriate with a proven, effective insecticide to eliminate those termites.

PART 2 – PRODUCTS

2.1 STAINLESS STEEL MESH TERMITE BARRIER SYSTEM

- A. Barrier mesh shall be marine grade 316 stainless steel mesh of 0.18 mm diameter wire with mesh openings of 0.66mm x 0.45 mm.
- B. All accessories, including but not limited to parping adhesives, clamps, and ties shall be as recommended or required by the system supplier.

2.2 CHEMICAL SOIL TREATMENT

- A. Provide an EPA registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatments solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA registered label.

- B. Chemicals shall be aqueous solutions of non-repellent termiticides such as Termidor, Altriset, premise 75, or Phantom. The chemicals shall be used in accordance with the labels and provisions related to the use of those pesticides as adopted by the Hawaii Pesticide Law, Chapter 149A, HRS, and the Federal Insecticide, Fungicide and Rodenticide Act.

PART 3 – EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove 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 and around foundations.
- B. Chemical Soil Treatment Preparation
 - 1. 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 by termiticide manufacturer.
 - 2. Fit filling hose connected to the water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 STAINLESS STEEL MESH TERMITE BARRIER SYSTEM

- A. Strictly follow the manufacturer's installation instructions.
 - 1. Install mesh as required, fit and clamp mesh around all pipe penetrations, and terminate at perimeters as appropriate for the building construction.
 - 2. Install special fittings appropriate to construction.
- B. After the mesh installation; the vapor retarder, reinforcing steel, and concrete are installed as specified under other sections.
- C. Where required, mesh is integrated into subsequent construction.

3.4 CHEMICAL SOIL TREATMENT

- A. 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 the treatment evenly.

1. A totalizing meter shall be provided to determine application rates and to indicate the total volume of pesticide applied in U.S. gallons. The meter shall be no more than five feet from the applicator at all times.
 2. Apply treatment under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - a. Whenever possible, the solution shall be applied not more than 24 hours before the pouring of concrete over the affected area.
 - b. Where a treated area that is not scheduled to be covered with a vapor retarder moisture barrier in the finished construction (e.g., lanai area) cannot be covered with a poured concrete slab the same day, the area shall be protected with a waterproofing covering such as polyethylene sheeting.
 3. At foundations, apply treatment to adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 - a. Treatment shall include the provision of vertical barriers as stated on the product label.
 4. At crawlspaces, apply treatment to soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
 5. Apply treatment 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 CONDITIONS

- A. As specified in Section 00700.

1.2 GENERAL REQUIREMENTS

- A. This work shall consist of the application of weed killer on the prepared parking area, driveway, roadway and shoulder subgrade prior to the installation of the base course and where called for on the plans and on existing growth prior to application of asphalt in the case of resurfacing jobs.

1.3 SUBMITTALS

- A. Submit the following items for review. Work may not begin until these submittals have been reviewed and an adequate response has been provided per Section 01300 – Submittal Procedure.
 - 1. Manufacturer’s product data, including installation/application instructions, MSDS, and EPA registered label.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. No asbestos containing materials or equipment shall be used under this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

<u>Weed Killer Trade Name</u>	<u>Application</u>
Casoron 4G or Norosac 4G	Under new or rebuilt asphalt pavement
Hyvar X or Roundup	Existing weeds for resurfacing work

PART 3 – EXECUTION

3.1 APPLICATION

- A. Spread the under asphalt weed killer uniformly using calibrated application equipment at the maximum rates permitted for under asphalt use. Install base course material as soon as possible to preclude loss of germination inhibiting action.
- B. In treatment of existing growth on resurfacing jobs, mix the weed killer and uniformly spray in strict accordance with the manufacturer’s label.

- C. Retreat nut grass and weeds two (2) days after initial application and again if growth still exists.
- D. Notify the Contracting Officer 72 hours before the application of weed killer.

END OF SECTION

- C. Mix shall be State Mix No. V for all work.

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS

- 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.
- B. Weed killer shall be applied as indicated elsewhere in these specifications, for the treatment of existing growth or to prevent new growth.

3.2 SUBGRADE, SUBBASE, AND BASE COURSE INSTALLATION

- A. Subbase and base course shall be installed to the thicknesses indicated on the plans.
 - 1. Where these thicknesses are not indicated on the plans, the minimum compacted thickness shall be 6” for subbase and 4” for base course.
- B. Subbase and base course shall be placed at a consistent thickness and such that the finished surface does not vary more than 0.10 feet vertically from theoretical grade.
- C. Compaction of the subgrade, subbase, and base course shall be as required on the plans and/or as indicated elsewhere in these specifications.
- D. Compaction testing shall be performed as required prior to the installation of each successive layer.
- E. Subbase and base course shall be placed in lifts having a maximum compacted thickness of 6”.

3.3 ASPHALTIC CONCRETE INSTALLATION

- A. Asphaltic concrete may not be placed on wet surfaces.
- B. Asphaltic concrete may not be placed when ambient temperatures are at or below 50 degrees F.

3.4 COMPACTION TESTING

- A. After compaction of each pavement component, including but not limited to subgrade, subbase, base course, and asphaltic concrete, in-place density testing must be performed by nuclear methods (ASTM D6938, ASTM D2950).
 - 1. Baseline testing for asphaltic concrete shall be done according to the requirements of ASTM D2041 (rice test).
- B. Testing must be performed at a rate of one test per component, per 200 linear feet of roadway or 4,000 square feet of pavement or per day, whichever is greater.
- C. Testing, as described above will be the responsibility of the Contractor at no additional cost to the Owner. Additional testing may be required at the request of the Contracting Officer.
- D. Except in the case where the in-place density is found to be less than what is specified (failed test), additional testing will be paid for by the Owner. In the case of failed tests, those

additional tests, including follow up testing after remediation is complete, must be provided by the Contractor at no cost to the Owner.

END OF SECTION

SECTION 02600

PIPED UTILITY MATERIALS AND METHODS

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

- A. As specified in Section 00700.

1.2 GENERAL REQUIREMENTS

- A. This specification covers the requirements for furnishing and installation of piped utilities, including but not limited to; water (potable and non-potable), sanitary sewer, storm sewer, Liquefied Petroleum Gas (LPG), and Natural Gas as indicated in the plans or elsewhere in these specifications.
 - 1. The following utility piping is not covered by this section but is covered by other sections of these specifications:
 - a. Electrical conduit
 - b. Building plumbing
- B. Whenever the Contractor is required by State or local laws or regulations to make a deposit and/or pay for a permit before proceeding with any work called for under this part of the specifications, the Contractor shall make the necessary deposits and/or pay for obtaining the required permit for the work.
- C. The Contractor must be familiar with any permits that have been obtained by the Owner or otherwise and construction operations must be in accordance with the requirements of those permits.
- D. The following construction standards, with certain modifications as hereinafter specified, are hereby incorporated into and made a part of these specifications by reference and shall be applicable to all work performed by the Contractor under this section.
 - 1. The Counties' STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION dated September 1986 and STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION dated September 1984 as revised, except as amended in the plans and/or specifications herewith. (Paragraph concerning Measurements and Payments in the Sections are not applicable to this project.
 - 2. The Hawaii County Code.
 - 3. WATER SYSTEM STANDARDS, and APPROVED MATERIAL LIST AND STANDARD DETAILS FOR WATER SYSTEM CONSTRUCTION, County of Hawaii, State of Hawaii, 2002.
 - 4. 2005 STANDARD SPECIFICATIONS & SPECIAL PROVISIONS, Department of Transportation, State of Hawaii, latest edition, as amended with deletion of sub-sections related to measurement and payment and as specified herein.

1.3 SUBMITTALS

- A. Submit the following items for review. Work may not begin until these submittals have been reviewed and an adequate response has been provided per Section 01300 – Submittal Procedure.
 - 1. Manufacturer’s product data
 - 2. Material Safety Data Sheets (MSDS)
 - 3. Shop Drawings
 - a. Where shoring is required, submit shop drawings showing shoring locations and details of shoring to be provided.
 - 4. If shoring is not required, submit a letter signed by the Contractor providing justification for not using shoring.
- B. Prior to any installation work, the Contractor must furnish affidavits from the manufacturers of all materials furnished and installed under this section verifying that such materials delivered to the project conform to the requirements of this specification. Materials include but are not limited to pipe, fittings, valves, and appurtenances.
 - 1. These affidavits must be specific to this project.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Asbestos Prohibition
 - 1. No asbestos containing materials or equipment shall be used under this section. The Contractor shall insure that all materials and equipment incorporated in the project are asbestos free.
- B. Materials for sanitary sewer system shall be in accordance with the PLUMBING CODE of the County of Hawaii and the applicable sections of the Counties’ STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION dated September 1986 and STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION dated September 1984 as revised, except as amended in the plans and/or specifications herewith.
 - 1. Gravity flow sanitary sewer piping and fittings must be PVC SDR-26 or SDR-35 as indicated on the plans and must conform to ASTM D3034 or ASTM F679 as applicable.
 - 2. Gravity flow sanitary sewer piping shall be green in color.
 - 3. Pressurized flow sanitary sewer piping must be HDPE (PE3408 or PE4710 resins) DR 11 or heavier, rated for pressures of 160psi.
 - 4. Pressurized flow sanitary sewer piping shall have green markings at intervals not less than five (5) feet indicating that it is a sanitary sewer pipe.
- C. Material for storm drain system shall be in accordance with the PLUMBING CODE of the County of Hawaii and the applicable sections of the Counties’ STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION dated September 1986 and STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION dated September 1984 as revised, except as amended in the plans and/or specifications herewith.

1. Storm drain piping and fittings must be PVC SDR-26 or SDR-35 as indicated on the plans and must conform to ASTM D3034 or ASTM F679 as applicable.
 2. Storm drain piping shall be green in color.
- D. Materials for water distribution system shall be in accordance with the current Department of Water Supply's WATER SYSTEM STANDARDS, except as amended in the plans or specifications herewith.
- E. Warning tape must be installed for all underground piped utilities. Warning tape must be a minimum 6" wide and run continuously along the length of buried pipe. The warning tape must clearly identify the type of utility for which it is applied (e.g. "Caution Sanitary Sewer Below").
1. Warning tape must be manufactured specifically for underground use, be resistant to destructive elements typically found in soil, and have a minimum thickness of 4.5 mils.
 2. Where metallic piping has been installed, the warning tape shall be non-metallic.
 3. Where non-metallic piping has been installed, the warning tape shall be metallic and detectable by standard, non-destructive, pipe detection methods.
 4. Warning tape and lettering shall have the following color schemes:
 - a. Sanitary and Storm Sewer: Green
 - b. Potable Water: Blue

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Location and Adjustment of Existing Utility Lines
1. The Contractor shall be responsible for precisely laying out the various exterior utility lines shown on the contract drawings as provided elsewhere in these specifications. The locations shown on the contract 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.
 2. 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 Contracting Officer at the Contractor's expense.
 3. If a Ground Penetrating Radar (GPR) survey is required by the plans or elsewhere in these specifications, that survey must be completed prior to any excavation work.
- B. Joining and Laying Pipe
1. Pipes must be joined and placed according to the manufacturer's requirements and recommendations. For gravity flow pipes and other piping requiring a specific slope,

ensure the trench bedding is well compacted prior to placing. Any solvents or lubricants used must conform to the pipe manufacturer's requirements.

2. All HDPE piping must be joined by heat fusion unless specifically noted to be joined by solvent welding.

C. Excavation and Backfill

1. Trench excavation and backfill for the laying and installation of water and sewer pipes, to the required line and grade and structure excavation for the construction of the appurtenant structures, shall be governed by the following provisions of the DPW STANDARD SPECIFICATIONS as hereinbefore amended with respect to measurement and payment and with certain additional modifications noted below:

- | | | |
|----|---|------------|
| a. | Trench Excavation and Backfill | Section 11 |
| b. | Structure Excavation and Backfill | Section 13 |
| c. | PVC Sewer Pipe and Appurtenances | Section 21 |
| d. | Restoring Pavement and Other Improvements | Section 38 |

2. Surplus material resulting from trench and structure excavation shall be used by the Contractor for backfilling, filling and grading to the extent required as specified elsewhere in these specifications. The Contractor, in performing any work within the Contract Zone Limits shown on the contract drawings, shall exercise due care to keep to an absolute minimum any damages to existing improvements, including plants and shrubs. The Contractor shall be responsible for repairing, replacing and/or restoring all damages to existing improvement to the satisfaction of the Contracting Officer

a. Sanitary Sewer System

- 1) In accordance with the PLUMBING CODE of the County of Hawaii and applicable Sections of the Counties' STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION dated September 1986.

b. Water Distribution System

- 1) In accordance with the PLUMBING CODE of the County of Hawaii and applicable sections of the current Department of Water Supply's WATER SYSTEM STANDARDS , 2002
- 2) Connecting, Testing, Flushing and Disinfecting: The new lines shall be installed but not connected until pressure testing is completed. Connecting shall be done at the discretion of the Contracting Officer. Pressure testing, flushing of valves and mains, disinfection of the system shall be carried out in accordance with the Department of Water Supply's WATER SYSTEM STANDARDS. The Contractor shall submit the results of such tests to the Contracting Officer for approval. Any additional fittings of a temporary nature required for the purpose of working such tests shall be supplied and installed at the Contractor's expense. All charges for service by the Department of Water Supply shall be paid for by the Contractor.

3.2 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. All surplus materials of every character resulting from the work of this section shall have been removed. Sanitary sewers shall be free from sand, silt or other obstructions. Any defects discovered in the utilities subsequent to this inspection shall be corrected prior to final acceptance.

END OF SECTION

SECTION 02880

IRRIGATION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Materials, equipment and services required to install the complete landscape irrigation system as indicated on Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02300 – Earthwork
- B. Section 02324 - Trenching
- C. Section 02900 – Planting
- D. Section 16000 – Electrical

1.3 REFERENCES

- A. ASTM A 126 - Standard Specification for Gray Iron Castings For valves, Flanges and Fittings
- B. ASTM A 536 - Standard Specification for Ductile Iron Castings
- C. ASTM B 32 - Standard Specification for Solder Metal
- D. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings
- E. ASTM B88 - Standard Specification for Seamless Copper Water Tube
- F. ASTM B 302 - Standard Specification for Threadless Copper Pipe, Standard Sizes
- G. ASTM B 828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings
- H. ASTM D 1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
- I. ASTM D 1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- J. ASTM D 2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
- K. ASTM D 2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

- L. ASTM D 2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
- M. ASTM D 3350 – Standard Specification for Polyethylene Plastic Pipe and Fittings Materials
- N. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- O. ASTM F 714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
- P. NEMA 250 - Enclosures For Electrical Equipment

1.4 QUALITY ASSURANCE

- A. In accord with Section 01440 – Quality Assurance and Quality Control.
- B. Workman Qualifications:
 - 1. Contractor with no less than five (5) years experience installing irrigation systems, similar to the scope and complexity of this project, with documented completion of at least (5) successful installations of commercial, computer controlled irrigation systems.
 - 2. Installing personnel shall have completed central control system manufacturer's 'Installation Certification Program for Computer Controlled Irrigation Systems'.
 - 3. On-site field superintendent shall have no less than (5) years of continuous experience in the installation of commercial computer controlled irrigation systems. Supervisor shall remain on site during all specified work in progress.
- C. Tests and Inspections:
 - 1. Do not conceal any work until all required tests and inspections have been completed.
 - 2. Conduct the following tests, inspections and conference with Owner. Provide advanced notification of each according to the times indicated:
 - a. Pre-installation conference: 7 days
 - b. System layout: 24 hours
 - c. Hydrostatic testing of pressure main line and non-pressure lateral lines installed under paving: 24 hours
 - d. Coverage tests: 24 hours

- e. Final inspection: 48 hours
 - 3. During final inspection, provide two-way radios and sufficient personnel to provide constant communication between inspection areas and the controller.
 - 4. Hydrostatic tests:
 - a. Furnish force pump and all equipment required to perform hydrostatic testing.
 - b. Center load backfill over pipes, leaving all joints exposed until the installation has been inspected, tested, and approved by Owner.
 - c. Except for ball valves installed upstream of control valves, all testing shall be completed prior to the installation of all other valves and valve assemblies.
 - d. Perform hydrostatic tests in presence of Owner. Maintain 150 psi pressure in the lines for a period of not less than 4 hours. If leaks develop, remake joints and repeat tests until the entire system has proven watertight.
 - 5. Coverage test:
 - a. Upon completion of the sprinkler system and prior to planting of shrubs, ground cover or turf, perform a coverage test in presence of Owner to determine that irrigation coverage for all planting areas is complete and adequate.
 - b. Furnish materials and perform work required to correct any inadequacies of coverage. Re-schedule and perform additional coverage test with Owner for approval.
 - 6. Final Inspection:
 - a. Upon completion of the entire system, schedule and conduct a final inspection of all equipment and perform a coverage test of each valve station with the Project Manager as part of the Final Approval process.
 - b. During final inspection, provide two-way radio communication and sufficient personnel to provide constant communication between inspection areas and the controller.
- D. Final Acceptance:
- 1. Prior to final approval of work, all of the following requirements shall be met:

- a. Landscape irrigation system completed and approved by Owner.
 - b. Coverage tests completed and approved by Owner.
 - c. Punch list items completed and approved by Owner.
 - d. As-built drawings completed and approved by Owner.
2. Maintain irrigation system and sufficient watering schedule until all conditions of approval have been completed.
 3. Contracted irrigation maintenance period shall begin upon Owner's Final Acceptance.

1.5 PROJECT CONDITIONS

- A. Coordinate work with underground utilities and trades responsible for other underground improvements including the location and planting of specimen trees, and other planting as applicable. Verify locations with Owner of all planting requiring excavations 48 inches in diameter and larger prior to layout of main lines.
- B. Provide temporary irrigation at all times to properly maintain existing planting where required.

1.6 PRE-INSTALLATION CONFERENCE

- A. At least two (2) weeks prior to the commencement of work, conduct a pre-installation conference with the Owner. This meeting shall include all parties responsible for installation, scheduling and testing of the finish work under this section.
- B. Review methods and procedures related to the work of this Section, including, but not necessarily limited to the following:
 1. Products and system requirements
 2. Review of required submittals
 3. Review of required details
 4. Schedule and sequencing of work
 5. Coordination with other trades and existing site conditions
 6. Forecasted weather and procedures for coping with unfavorable conditions
 7. Required inspections, reviews and procedures for approvals
- C. Record discussions of conference including all decisions, directions and agreements reached. Furnish copies of record to all parties in attendance.

1.7 SUBMITTALS

- A. In accord with Section 01300 – Submittal Procedures
- B. Documentation to substantiate required experience and workman qualifications.
 - 1. Provide copy of certificates for professional memberships, certifications and training.
 - 2. List project names, location, address, and telephone number of contact persons for information regarding completed work.

C. List of materials:

- 1. Submit a complete list of materials prior to commencing work. List of materials shall include the name of manufacturer, model number, and description of each item intended for use in the installation
- 2. Irrigation submittal shall be specific and complete. All items shall be listed, including solvent, primer, wire, wire connectors, valve boxes, and all other items needed to complete work.
- 3. Although manufacturer and other information may differ, the following is a guide to the proper format for submittal:

Item	Description	Manufacturer	Model No.
1.	Pop-up Sprinkler Bodies	Hunter	MP Rotary
2.	Field Satellite	Hunter	ACC99
3.	Manual Gate Valves	Nibco	T-113

- 4. Submit operating manuals and maintenance data of equipment.
 - a. No substitutions of materials or equipment will be allowed without prior written approval by Owner. Refer to Section 01630 - Substitution Procedures.
 - b. Any equipment or materials furnished without the prior approval of Owner may be rejected and required to be removed at Contractor's expense.

D. Project Record Documents:

1. Provide and keep up-to-date, a complete red-lined record set of drawings (blue-line Ozalid type prints) which shall be corrected daily. Prints for this purpose may be obtained from Owner at cost. Document every change from the original Drawings and the exact installed locations, sizes, and types of equipment. Final deliverable to client shall be reproducible hardcopy.
2. Red-lined drawings shall be kept on job site and shall be used only as a record set. The record drawings shall be available at all times for review by Owner. Formally submit copies of the red-lined record drawings for Owner's review on the first of each month.
3. Red-lined drawings shall serve as record for the progress of work completed and shall be used by the Owner as a basis for measurement and payment. Should record drawings not be available for review or not be up-to-date at the time of review, it will be assumed no work has been completed.
4. As-built locations shall be dimensioned from two permanent points of reference, such as building corners, curbs, hardscape edges, roadways, or similar elements. Offsets should be taken at 90 degree angles from reference points whenever possible.

Provide the GPS coordinate location of the following items and include on As-Built:

- a. Pressure main line routing. Include all changes in direction
- b. Point of connection to the existing water supply lines
- c. Sprinkler control valves
- d. Quick coupling valves and washdown valves
- e. Gate valves (manual and automatic)
- f. Communication and flow sensor cable routing
- g. Flow sensors
- h. Point of connection to electrical power service
- i. Diagrammatic routing of irrigation control wire
- j. Field satellite location
- k. Irrigation electrical pull box locations
- l. Other related equipment, as directed by Owner

E. Controller charts:

1. Provide two controller charts for each field satellite supplied.
2. Submit As-built drawings for review and approval by Owner prior to preparation of controller charts.
3. Controller charts shall be prepared in AutoCAD. Provide (2) hard copy prints of controller charts and AutoCAD electronic files on disk.
4. Controller chart to be a reduced scale drawing of the actual installed system depicting all valve stations from one field satellite. Each valve's area of coverage shall be uniquely identified by a contrasting color to the other adjacent valve stations.
5. The controller charts are to be completed and approved prior to final acceptance of the system.

1.8 PRODUCT HANDLING

- A. In accord with Section 01660 - Product Storage and Handling Requirements.
- B. Deliver and store products and equipment in manufacture's unopened packaging until ready for installation.

1.9 ADDITIONAL MATERIALS

- A. Furnish the following extra components prior to Final Approval.
 1. Two wrenches for each rotor type sprinkler head installed on project.
 2. One long-handled valve key each for square nut and hand wheel equipped gate valves.
 3. Two quick coupler key assemblies, for every five (5) washdown valves installed (or fraction there-of). Key assembly shall include; one Rainbird #44K key, one Nibco T-580 1 inch ball valve, one 1 inch x 2 inch brass nipple, and one Rain Bird SH-1 hose swivel.

1.10 WARRANTY

- A. Submit warranty documents in accord with Section 01770 – Contract Closeout.
- B. Warranty the entire landscape irrigation system to give satisfactory service, including all equipment and materials for a period of one (1) year from the date of Final Acceptance.
- C. Warranty the supplemental landscape irrigation system to give satisfactory service for a period of (6) months from the date of its acceptance by Owner.

- D. Should any problems develop within the warranty period due to inferior materials or faulty workmanship, correct problems to Owner's satisfaction at no additional cost.
- E. Any damages or re-work required of the landscape or hardscape due to repairs of the irrigation system shall be completed to Owner's satisfaction at no additional cost.
- F. Owner reserves the right to make temporary repairs, as necessary, to keep the landscape irrigation system in an operating condition. Exercising this right does not in any way relieve the contractor of any responsibilities under the terms of the warranty.
- G. Manufacturer's product warranties shall supplement but not relieve the Contractor of any liability from his contacted installation Warranty.

PART 2 - PRODUCTS

2.1 PLASTIC PIPE AND FITTINGS

- A. Non-potable pipe shall be lavender colored with "Do Not Drink" warning, marked with Manufacturer's name, nominal pipe size, schedule or class, pressure rating in PSI, and date of extrusion.
 - 1. Non-pressure 'lateral line' pipe: Class 200, PVC plastic, ASTM D1785, Type I, Grade I with solvent welded joints. Use Schedule 40, PVC for all pipe installed under paving.
 - 2. Pressure main line pipe, sizes 2½ inches and smaller: Schedule 40, PVC plastic, ASTM D 1785, Type I, Grade I, with solvent welded joints, with Christy's detectable marking tape, green color with irrigation line below warning.
 - 3. Pressure main line pipe, sizes 3 inches and larger: Class 200, PVC plastic, ASTM D 1785, Type I, Grade I with rubber gasketed bell and spigot connections, with Christy's detectable marking tape, green color with irrigation line below warning. Insertion marks shall be visible to show proper depth into spigot.
- B. Potable Pipe shall be marked with Manufacturer's name, nominal pipe size, schedule or class, pressure rating in PSI, and date of extrusion.
 - 1. Non-pressure 'lateral line' pipe: Class 200, PVC plastic, ASTM D1785, Type I, Grade I with solvent welded joints. Use Schedule 40, PVC for all pipe installed under paving.
 - 2. Pressure main line pipe, sizes 2½ inches and smaller: Schedule 40, PVC plastic, ASTM D 1785, Type I, Grade I, with solvent welded joints, and Christy's detectable marking tape, green color with irrigation line below warning.

3. Pressure main line pipe, sizes 3 inches and larger: Class 200, PVC plastic, ASTM D 1785, Type I, Grade I with rubber gasketed bell and spigot connections, with Christy's detectable marking tape, green color with irrigation line below warning. Insertion marks shall be visible to show proper depth into spigot.
- C. Fittings shall bear manufacturer's name or trademark, material designation, size, and applicable I.P.S. schedule.
1. Glued socket type, for pipe sizes 2½ inches and smaller; Schedule 40, PVC plastic; Grade I, ASTM D 2466, Type I.
 - a. Solvent cement: ASTM D2546, for PVC pipe and fittings.
 2. Threaded type, for pipe sizes 2½ inches and smaller; Schedule 80, PVC plastic; Grade I, ASTM D 2464, and ASTM F 437.
 3. Bell-end, sizes 3 inches and larger; Ductile iron, grade 70-55-05 in accord with ASTM A 536, having deep bell push-on joints with gaskets meeting ASTM F477.
 - a. Harco 'Deep Bell' by the Harrington Corp. of Lynchburg, VA., (804) 845-7094; or Owner-approved equivalent.

2.2 COPPER PIPE AND FITTINGS

- A. Type K, hard tempered pipe, ASTM B 88.
- B. Solder joint type wrought copper fittings, ASTM B 828.
- C. 95/5 solder, ASTM B 32.

2.3 HDPE PIPE AND FITTINGS

- A. Pipe shall be manufactured from a pipe resin which meets ASTM D 3350-05 with a minimum cell classification of 445474C. Pipe shall be manufactured to the dimensions of ASTM F-714. The service factor to determine the pressure rating shall be 0.63. Pipe shall be have a minimum pressure ratings of:

DR 9	240 psi
DR 11	200 psi
DR 13.5	160 psi
DR 15.5	138 psi
DR 17	125 psi
DR 21	100 psi
DR 26	80 psi

The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.

- B. Butt Fusion Fittings - Fittings shall be made from HDPE pipe resin meeting ASTM D 3350-05 with a minimum cell classification of 445474C. Molded Butt Fusion Fittings shall have a manufacturing standard of ASTM D-3261. Molded & fabricated fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans. Fabricated fittings must have the same pressure rating as the pipe; a DR less than the pipe shall be used. Fabricated fittings are to be manufactured using a Data Logger to record temperature, fusion pressure, and a graphic representation of the fusion cycle shall be part of the Quality Control records.
- C. Electrofusion Fittings - Fittings shall be made from resin or pipe meeting ASTM D 3350-05 with a minimum cell classification of 445474C. Electrofusion Fittings shall meet the manufacturing standard of ASTM F-1055. Fittings shall have the same pressure rating as the pipe or higher unless otherwise specified on the plans.
- D. Flanged and Mechanical Joint Adapters - Flanged and Mechanical Joint Adapters shall be made from materials containing resin that meets ASTM D 3350-05 with a minimum cell classification of 445474C.

2.4 FLEXIBLE TUBING

- A. Rain Bird Swing Pipe, Toro 850-01, or equal thick wall flexible pipe.

2.5 CONDUIT

- A. Gray PVC Schedule 80 conduit with solvent weld fittings.
- B. Use separate conduits for each type of wire or cable run.
- C. Size conduits as indicated on Drawings or as required to accommodate anticipated number of wires without binding or damaging wire insulation.

2.6 SLEEVES

- A. Schedule 40 PVC for applications requiring 3 inches and smaller diameter.
- B. Class 200 PVC for applications 4 inches and larger.
- C. All sleeves shall be 2 pipe sizes larger than the diameter of the protected pipe run for pipes under 6 inches diameter and 2 pipe sizes larger for runs 6 inches and larger.

2.7 CONTROL WIRE

A. Control Wire:

1. UL-approved direct burial copper wire AWG-U.F. 600V.
2. No. 14 for control wires and No. 12 for common wires.
 - a. Provide separate control wires and a single common wire for operation of each automatic gate valve.
 - b. Color of all common wire shall be white. Multiple common wires in the same trench shall be white with a different colored stripe on each. Provide separate common wire for each field satellite or controller installed.

B. Color code all control wires as follows:

Common (1) – White	Common (3) – White with Black stripe
Common (2) – White with Red stripe	Common (4) – White with Blue stripe
Spare – Red	
Station No. 1 – Black	Station No. 2 – Orange
Station No. 3 – Brown	Station No. 4 – Blue
Station No. 5 – Lt. Blue	Station No. 6 – Tan
Station No. 7 – Purple	Station No. 8 – Blue with White stripe
Station No. 9 – Pink	Station No. 10 – Gray
Station No. 11 – Yellow	Station No. 12 – Red
Station No. 13 – Black with Red stripe	Station No. 14 – Orange with Red stripe
Station No. 15 – Brown with Red stripe	Station No. 16 – Blue with Red stripe
Station No. 17 – Lt. Blue with Red stripe	Station No. 18 – Tan with Red stripe
Station No. 19 – Purple with White stripe	Station No. 20 – Blue with Yellow stripe
Station No. 21 – Pink with White stripe	Station No. 22 – Gray with Red stripe
Station No. 23 – Yellow with Red stripe	Station No. 24 – Red with White stripe

C. Wire Connectors: DBY-6 and DBR-6 direct bury splice kits by 3M with 'Scotchlok'™ connectors.

D. Communication Cable and Sensor Wire:

1. Central System Communications Cable:
 - a. PE-89, rodent resistant, six pair, 19 gauge telephone cable, Model No.P-7073D as manufactured by the Paige Electric Co

- b. All communication cable runs are to be installed in 2 inch PVC Schedule 40 conduit and are direct pulls without buried splices. For interior installations, conduit is not required.
 - c. All connections are to be made at a terminal strip inside controller enclosure. The maximum length of one communications chain is 5,000 feet.
2. Unavoidable wire splices below grade are to be made with Re-enterable Splice Kit No. 8006039 by Ranger Serviseal. All below grade splices shall be installed in a PVC valve box unless within 3 feet of a traffic area which shall require a concrete box with road rated cast iron lid.

2.8 BACKFLOW DEVICE

- A. Backflow Device: As indicated on Drawings.

2.9 FLOW SENSOR AND FLOW METER

- A. Flow sensor as manufactured by Hunter Industries.
 - 1. Model No. FCT-150; brass, tee mounted flow sensor for 1 inch, 1-1/4 inch, & 1-1/2 inch sizes.
 - 2. Model No. FCT-150; brass, tee mounted flow sensor for 2 inches size.
 - 3. Model No. IR-220-SS; insert style, stainless steel flow sensor for sizes 2-1/2 inches and larger.

2.10 VALVES

- A. Gate Valves:
 - 1. Manual Gate Valves 2-1/2 inches and smaller:
 - a. Nibco T-113 or Owner-approved equivalent that includes the following options; 200 lb. saturated steam rated brass body, ASTM B62, with threaded joints, non-rising stem, screwed bonnet and bronze hand wheel.
 - 2. Manual Gate Valves 3 inches and larger:
 - a. Nibco F-619 or Owner-approved equivalent that shall include the following options; 200 lb. W.O.G. epoxy coated iron body, ASTM A126 Class B, with flanged joints, non-rising stem and double disk, and bolted bonnet with 2 inch square operating nut.
- B. Ball Valves:

1. Spears No. 2121 series industrial grade PVC ball valve with threaded ends or Owner-approved equivalent that includes the following options;
 - a. Heavy bodied PVC construction with 236 psi min. pressure rating.
 - b. PTFE ball seats.
 - c. EPDM high grade abrasion resistant O-rings.
 - d. NSF listed for potable water.
- C. Electric Control Valves: Type and size as indicated on Drawings.
- D. Quick Coupler Valves: Type and size as indicated on Drawings.

2.11 CONTROLLERS

- A. Central Computer Control system:
 1. Hunter IMMD-ET-CD computerized landscape irrigation central control system.
 2. Incidental parts which may not be specified or indicated on Drawings, but are required to complete or modify the existing system shall be furnished and installed without additional cost.
 3. Coordinate with Owner for connections to the existing service and/or installation of conduit, cable, telephone service, jacks or modems.
- B. Field Satellite Controllers:
 1. Hunter ACC99 with ACC-HWMM, as manufactured by Hunter Corporation.
 2. Satellite shall be provided pre-assembled with a (5) year limited warranty that includes service at location of equipment.
- C. Controller Cabinet:
 1. Strong Box SB-18SS, as manufactured by V.I.T. Products, Inc., PH: (800) 729-1314, or approved equal.
 2. NEMA Type 3R rating with thermostatically controlled fan and louvered-vent filters.
 3. Include a minimum of two (2) GFCI receptacles within controller enclosure.

2.12 SPRINKLER HEADS

- A. Sprinkler Heads: As specified on Drawings.
- B. Rotor Heads: As specified on Drawings.

2.13 JOINT RESTRAINT FITTINGS

- A. Lateral Isolation Valve Specifications: Lateral Isolation Valves shall be 200 psi rated angle globe valves with integrally restrained ends. Ends shall be male swivel or integrally restrained push on gasketed joint as required. Components shall be Ductile Iron, 316 Stainless Steel, and Low Zinc Bronze complying with ASTM A536, ASTM A276, ASTM B62-C83600 respectively or equivalent. Ductile Iron shall be fusion bond epoxy coated. Gasketed joints shall be SBR Rubber and comply with ASTM F477. Internal seals shall be EPDM rubber. Lateral Isolation Valves shall be as manufactured by HARCO (Harrington Corporation) of Lynchburg, VA.
- B. Fittings: Fittings shall be manufactured of ductile iron, Grade 65-45-12 in accordance with ASTM A-536. Fittings shall have deep bell push-on joints with gaskets meeting ASTM F-477. Fittings shall be DEEP BELL as manufactured by HARCO (Harrington Corporation) of Lynchburg, VA. Transition gaskets are not allowed.
- C. Fitting to Pipe Joint Restraint: Joint Restraint shall be knuckle type as manufactured by HARCO (Harrington Corporation) of Lynchburg, Virginia. The grip ring shall be one piece residing within a ductile iron housing having machined serrations and shall be activated by one bolt. Housing and grip ring shall be of ductile iron to ASTM A536. Bolt and nut shall be Type 304 stainless steel.
- D. Fitting to Pipe Joint Restraint: Fitting to Pipe Restraints shall meet the requirements of UNI-B-13-94. Grip ring serrations shall be machined. As cast serrations are not permitted. Restraint rods, bolts and nuts shall be of ductile iron to ASTM A563 or low alloy steel to AWWA/ANSI C111/A21.11. Fitting to Pipe Restraint shall be supplied by HARCO (Harrington Corporation), Lynchburg, VA.
- E. Pipe to Pipe Restraints: Pipe to Pipe Restraints shall meet the requirements of UNI-B-13-94. Grip ring serrations shall be machined. As cast serrations are not permitted. Restraint rods, bolts and nuts shall be of low alloy steel to AWWA/ANSI C111/A21.11. Pipe to Pipe Restraints shall be supplied by HARCO (Harrington Corporation) of Lynchburg, VA.
- F. Gate Valve to Pipe Restraint: Valve to Pipe Restraint shall consist of ductile iron (ASTM A536) grip rings with machined serrations and ductile iron restraint rods. The ring that grips the pipe shall meet the requirements of Uni-B-13-94. The restraint rod nuts shall be made from low alloy steel to AWWA/ANSI C111/A21.1 or ductile iron to ASTM A536. All valve restraint is to be supplied by HARCO (Harrington Corporation) of Lynchburg, Virginia.

2.14 VALVE BOXES

- A. All subgrade valves and valve assemblies located within planting areas are to be installed in green plastic boxes with matching green lids. Armor™ brand (formerly Amatek) as manufactured by Underhill International.

1. For manual gate valves; 10 inch x 10-1/4 inch round box with bolt-down cover. Extension sleeve shall be PVC with minimum depth of 6 inches.
 2. For Electric Control Valves; 11-3/4 inch x 17 inch x 12 inch rectangular box with bolt-down cover.
 3. For Control Valves with wye strainer assembly; 16 inch x 25-1/2 inch x 12 inch jumbo rectangular box with bolt-down cover.
 4. Communication cable and flow sensor wire pull boxes; 12 inch x 18 inch rectangular box, with green bolt-down cover.
 5. For quick coupler valves; 10 inch x 10-1/4 inch round box with bolt-down cover.
- B. Gate Valves located in hardscape and traffic areas;
1. Rectangle shape concrete boxes with cast iron lids, Brooks brand concrete body with cast iron frame and cast iron non-locking cover, or Owner-approved equivalent.

2.15 VALVE IDENTIFICATION TAGS

- A. Christy brand, Maxi Tag™, manufactured from Behr polyurethane Desopan 2, hot-stamped with black letters on yellow background. Attach one tag to each electric control valve providing ACC, field satellite and station numbers.
- B. All valves, regardless of type, shall have 'Reclaimed Water' ID tags attached. Tags shall be Christy brand Maxi Tag™, hot-stamped with black letters on purple background. Tags shall read "Warning - Reclaimed Water - Do Not Drink." Tag shall be printed in English and Spanish.
- C. Special order tags from T. Christy Enterprises, 403 West Brenna Lane, Orange, CA 92667. Ph: (714) 771-4142, Fax: (714) 771-3029.

2.16 LIGHTING PROTECTION

- A. Grounding Rods to be 5/8 inch diameter x 10 foot copper clad; No. 182007 by Paige Electric, (800) 327-2443, or approved equal.
- B. Grounding plates to be 4 inch x 96 inch x 0.064 inch solid copper with integral wire connection of 25 feet long #6 AWG bare, solid copper wire, UL Listed and conforming to the minimum requirements of Section 250 of the National Electric code; No. 182199L by Paige Electric, (800) 327-2443.
- C. Grounding connections to utilize exothermic welding process; UL Listed Cadweld connectors.
- D. Grounding wire shall be #6 AWG, solid, bare copper wire.

- E. Ground enhancement material shall be Powerset as manufactured by Loresco in 50 pound bags.

2.17 MISCELLANEOUS EQUIPMENT

- A. Surge Arresters:
 - 1. For 120V power wiring: Surge-arresting duplex outlet by Leviton, Model No. 528-I.
- B. Flex Risers: King Brothers, Global Water System, or Excaliber
- C. Stakes: #4 rebar – length as noted.
- D. Clamps: Stainless steel screw clamps
- E. Swing Joints: Dura, Spears, Rain Bird maximum, or Lasco

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Layout of irrigation pipe and equipment indicated on Drawings is diagrammatic. Actual locations are contingent upon actual site conditions and integration with other underground utilities.
- B. Verify dimensions, grades and points of connection in field prior to commencement of work.
- C. Do not proceed with installation when it is apparent that obstructions, grade differences or conflicts in the Drawings exist. Bring all such conflicts or discrepancies to the immediate attention of Owner for clarification.
- D. Obtain and pay all plumbing permits and inspections required by governing agencies.

3.2 SUPPLEMENTAL IRRIGATION

- A. Provide a supplemental drip irrigation system for all palm trees and all boxed trees 24 inches and larger installed under this contract. This system is to ensure that installed trees will be automatically irrigated during the plant establishment period.
- B. The supplemental system shall be designed by a qualified irrigation design professional that is experienced with drip and low flow irrigation systems.
 - 1. Submit for Owner approval, prior to commencing with work, schematic drawings showing intended drip irrigation design with all pertinent information for temporary water connections, equipment and installation.

- C. System to be installed and operational prior to tree planting, regardless of the availability of a permanent water connection. If permanent irrigation water is not available at the time the system is installed, provide a temporary water connection until a permanent connection can be made.
- D. Pipe and/or tubing, not in a hazardous area, to be installed on-grade. Pipe installed as a part of temporary irrigation shall not be re-used as any part of the permanent landscape irrigation system.
- E. All pipe and/or tubing shall be buried and sleeved under construction or access roads at a proper depth to prevent damage.
- F. Protect temporary system during entire planting process. Repair any damage to landscape caused by leaking or broken lines.
- G. The system should be designed at 90% capacity to allow for additional plant material or emitters as required. Ten percent (10%) additional emitters to be included in contract and installed at Owners discretion.
- H. Use the following table to determine the required quantity of emitters or spray stakes;
 - 1. 1 spray stake/emitter for all rootballs up to 2 feet measured in the largest dimension.
 - 2. 2 spray stakes/emitters for all rootballs up to 4 feet measured in the largest dimension.
 - 3. 3 spray stakes/emitters for all rootballs up to 6 feet measured in the largest dimension.
 - 4. 4 spray stakes/emitters for all rootballs up to 8 feet measured in the largest dimension.
- I. Flow rates should be calculated using 0.25 GPM per emitter.
- J. Upon completion of the permanent irrigation system, remove the supplemental system without damaging landscape. Battery operated controllers and valves to be turned over to Owner. Remainder of supplemental materials to be salvaged or properly disposed of off-site.

3.3 POINT OF CONNECTION

- A. Connections to water source shall be at approximate location indicated on Drawings. Make any minor changes caused by actual site conditions without additional cost to Owner.

3.4 FLOW METER AND FLOW SENSOR

- A. Install in accord with manufacturer's instructions and as indicated on Drawings.

- B. Provide separate flow sensor cable from each flow sensor to its respective pulse decoder. Run all cables in PVC Schedule 40 conduit.
 - 1. Maximum of two (2) cables from the same point of connection may be installed within the same conduit. Cables from different points of connection are not permitted within the same conduit.
 - 2. Control and common wires for automatic gate valve, upstream of flow sensor, shall be installed within flow sensor cable conduit.

3.5 TRENCHING

- A. Lay-out system using an approved staking method.
- B. Coordinate routing of mainline piping and trenching with underground utilities and specimen tree locations.
 - 1. Planting locations shall take precedence over sprinkler and piping locations where possible
 - 2. Maintain minimum clearance between pipes as required by code.
 - 3. Notify and coordinate with Owner of any major deviations from original layout.
- C. Excavate trenches with straight and vertical sides. Provide continuous support for pipe on bottom of trenches. Lay pipe to uniform grade.
 - 1. Maintain 1 inch minimum clearance between lines which cross at 45 degree to 90 degree angles.
 - 2. Maintain 6 inches minimum clearance between sprinkler lines and between lines of other trades. Do not install sprinkler lines directly above any other pipes or utilities.
- D. Where irrigation lines occur within landscaping, trench depths shall be:
 - 1. Provide minimum cover of 24 inches over all pressure main lines 6 inches and larger. Maximum cover shall be 48 inches unless otherwise approved by Owner.
 - 2. Provide minimum cover of 18 inches over all pressure supply main lines 4 inches and larger. Maximum cover shall be 48 inches unless otherwise approved by Owner.
 - 3. Provide minimum cover of 10 inches over non-pressure lateral lines. Maximum cover shall be 18 inches unless otherwise approved by Owner.
- E. Where irrigation lines occur under paving, depth of coverage shall be measured from the bottom of paving material. Trench depths shall be:

1. Provide minimum cover of 36 inches over all sleeves or direct-bury pressure main lines 6 inches and larger. Maximum cover shall be 48 inches unless otherwise approved by Owner.
 2. Provide minimum cover of 24 inches over all sleeves or direct-bury pressure supply main lines 4 inches and larger. Maximum cover shall be 48 inches unless otherwise approved by Owner.
 3. Provide minimum cover of 12 inches over all sleeves or direct-bury non-pressure lateral lines. Maximum cover shall be 18 inches unless otherwise approved by Owner.
- F. Install, under mainline, one continuous No. 14 AWG UF tracer wire in all locations where control wires are not installed in same trench as mainline. Tracer wire shall be black with a white stripe.

3.6 BACKFILLING

- A. Backfill and compaction: In accord with Section 02320, Excavation & Backfilling for Utilities.
- B. Initial backfill over all pipe shall be clean, fine granular material.
- C. Backfill only when pipe is cool. During hot weather, pipe can be cooled by operating the system for a short time prior to backfilling.
- D. Provide marking tape, as specified in Section 02505 – Underground Utility Marking, over all pressure supply main lines.
- E. Properly compact backfill in trenches to dry density equal to the adjacent undisturbed soil, and conform to adjacent grades without dips, sunken areas, humps, or other irregularities.
- F. Restore grades and repair any damage where settlement may occur.

3.7 PLASTIC PIPE AND FITTINGS

- A. Install and connect plastic pipe in accord with manufacturer's recommendations.
- B. Prepare all welded joints with approved cleaner prior to applying primer and solvent.
 1. Allow welded joints at least 15 minutes set-up and curing time before moving or handling.
 2. Partially center load pipe in trenches to prevent movement or shifting when water pressure is applied.
 3. Do not permit water in pipe for a minimum of 4 hours after applying solvent welds.

4. When the temperature is above 80°F, allow solvent weld joints at least 24 hours curing time before water is introduced under pressure.
- C. Installing pipe under existing pavement:
1. Piping under existing pavement may be installed by jacking, boring, or hydraulic driving. Hydraulic driving will not be permitted under asphalt paving.
 2. Secure permission from Owner prior to cutting or breaking any existing pavement. Repairs or replacement to existing paving shall be approved and completed to the satisfaction of the Owner and shall be installed at no additional cost.
- D. Marking Tape: Install continuous identifying warning tape 12 inches above all pressure and washdown mainline piping.
- E. Flushing System:
1. After all sprinkler pipe and risers are in place, open control valve and thoroughly flush system clean prior to installing sprinkler heads.
 2. Contractor shall be responsible for repair of clogged nozzles for a period of thirty days after notice of substantial completion.

3.8 HDPE PIPE

- A. During loading, transportation and unloading, every precaution shall be taken to prevent injury to the pipe. No pipe shall be dropped from cars or trucks, or allowed to roll down slides without proper retaining ropes. During transportation each pipe shall rest on suitable pads, strips, skids or blocks securely wedged or tied in place. Any pipe damaged shall be replaced.
- B. Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe supplier's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe supplier. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself. All field welds shall be made with fusion equipment equipped with a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the Quality Control records.
- C. Mechanical joining will be used where the butt fusion method can not be used. Mechanical joining will be accomplished by either using a HDPE flange adapter with a Ductile Iron back-up ring.
- D. Hot gas fusion, threading, solvents, and epoxies will not be used to join HDPE pipe.

3.9 CONDUITS

- A. Install conduit where control wires pass through or under walks, walls and paving. Conduits shall be of adequate size to accommodate retrieval of wires for repair and shall extend 18 inches beyond edges of walls and pavement.
- B. Install continuous conduit for all flow sensor and communication cables.

3.10 SLEEVES

- A. Install sleeves for all pipes and conduits passing through or under walks, walls and paving as indicated on Drawings. Sleeving shall be of adequate size to accommodate retrieval of wiring or piping for repair and shall extend 18 inches beyond edges of paving or other construction.
- B. Field verify location, size and depth of existing sleeves where noted on the Drawings. Notify owner of any discrepancies prior to the start of installation.

3.11 CONTROL WIRE

- A. Control wire shall be run in same trench adjacent to mainline pipe whenever possible. Multiple wires in run to be bundled and taped together at 12 foot intervals.
- B. Install control wire in PVC Schedule 40 gray conduit when not run with mainline.
- C. Use only continuous wire between controller and remote control valves. Do not use wire splices without prior approval by Owner.
- D. Make underground wire connections to electric remote control valves with UL-listed 3M DBR/Y6 connectors (depending on wire size).
- E. An expansion curl shall be provided at each wire connection. Expansion curl shall be of sufficient length at each control valve, so that the valve bonnet may be brought to the surface for maintenance without disconnecting the wires.

3.12 VALVE ASSEMBLIES

- A. Install and connect all assemblies in accord with Drawings.
- B. Do not install multiple assemblies on individual service tees. Provide each assembly with its own outlet. When used, the pressure relief valve shall be the last assembly.
- C. All threaded fittings shall be assembled using Teflon tape applied to the male threads.
- D. When specified, install backflow assemblies in shrub areas at the minimum height required by local codes.

- E. Locations for all equipment, as indicated on Drawings, such as point of connection, ACC's, field satellites and valves are approximate.
 - 1. Minor modifications to layout and location of equipment shall be provided at no additional costs to Owner.
 - 2. Stake out all equipment locations for Owner's review and obtain approval prior to installation. Failure to obtain Owner's approval prior to installation may require Contractor to relocate or re-work installation at no additional costs to Owner.

3.13 GATE VALVES

- A. Install in accord with Drawings.
- B. Check and tighten valve bonnet packing before backfill.

3.14 ELECTRIC CONTROL VALVES

- A. Install in accord with Drawings.
- B. Install at sufficient depth to provide not more than 6 inches and not less than 4 inches cover from top of valve to finish grade.
- C. Install valves in a plumb position with 24 inches minimum maintenance clearance from other equipment.
- D. Electric control valves shall be connected to field satellites in numerical sequence as indicated on Drawings.

3.15 QUICK COUPLER VALVES

- A. Install in accord with Drawings.

3.16 CONTROLLERS

- A. Field Controller Assemblies:
 - 1. Coordinate with Owner for connections to central computer control system.
 - 2. Secure the following services from the approved equipment supplier:
 - a. On-site meeting to review system operation and ensure that all personnel understand system installation techniques.
 - b. On-site technical assistance during installation period when requested by Contractor or Owner.
 - c. Testing of grounding system.
 - d. Hook-up of communication and sensor wires within assemblies.

- e. Continuity and resistance tests on communication wires.
 - f. Address satellites and decoders.
 - g. Verify system flow range and calibrate pulse transmitter.
 - h. Test system components for proper operation.
 - i. Certification that equipment conforms to and is installed in accord with Drawings, Specifications, and manufacturers' recommendations.
- B. High voltage wiring for field satellite:
- 1. 120V power connection to field satellites to be provided under Division 16 of Specifications.
 - 2. All electrical work shall conform to local codes, ordinances, and authorities having jurisdiction.
- C. Central Computer Control Interconnect Circuitry:
- 1. Warranty tests shall be performed by the approved supplier on all electrical circuits. Provide Owner with written approval from the equipment supplier prior to start of maintenance period.
 - a. Wire loop resistance (continuity): Test each circuit for maximum loop resistance of 200 ohms.
 - b. Ground fault: Test each circuit with an ohm meter, after each interconnect circuit has been installed and connections have been made. Minimum ground resistance to be 700,000 ohms. After test has been completed, remove splices and leave exposed in pull box for future access.
 - c. Record results of circuitry tests and submit to Owner prior to acceptance of work.
 - d. Functional test: Perform test to demonstrate each and every part of the system functions as specified and intended.
 - (1) The functional test for each new or modified electrical system shall consist of not less than (5) days of continuous, satisfactory operation. If unsatisfactory performance of the system develops, correct the condition and repeat test until (5) days of continuous satisfactory operation has been obtained.

- (2) Functional tests and turn-on shall not be started on a Friday, or on a day preceding a legal holiday. Shutdown caused by factors beyond Contractor's control shall not constitute discontinuance of the functional test.

D. Interconnect Conductors:

1. Irrigation interconnect conductors shall be pulled by hand, leave 2 feet of coiled slack at each field controller and at each pull box.
2. Irrigation interconnect wire shall be continuous from satellite to satellite. Splices shall occur within satellite enclosure, unless specifically authorized otherwise by Owner.

Make splices by approved connectors only. Splices shall be capable of satisfactory operation under continuous submersion in water.

3.17 GROUNDING

- A. Multiple controller locations shall have separate grounding for each controller or group of controllers. Lightning protection grids shall be installed in an irrigated area.
- B. Install ground rods a minimum of 12 feet from the controller and connect via a Cadwell connection to #6 solid, bare copper wire. Additional rods shall be spaced at 20 foot intervals. The copper wire is to be installed in as straight a line as possible, and where necessary to make a turn or bend, it shall be done in a sweeping curve with a minimum radius of 9 inches and a minimum included angle of 90 degrees. There shall be no splices in the bare copper wire.
- C. Top of each grounding rod shall be driven into the ground to below finish grade and covered with a standard 10 inch round plastic valve box with lid.
- D. Grounding plates to be installed horizontally at 36 inches below grade with 100 lbs of 'Powerset'™ ground enhancement material spread evenly above and below each plate in accordance with manufacturer's directions.
- E. Install a minimum of 6 inches of 4 inch perforated polyethylene pipe over each plate and cap with a flat PVC drain grate for periodic inspection. Plates shall also be covered with a 4 inch grated cover as specified, set a minimum of 1 inch below grade, to facilitate drainage onto the plate. Cover shall be installed on a minimum of 36 inches of 4 inch ADS corrugated polyethylene, perforated drainage pipe.

3.18 SPRINKLER HEADS

- A. Install in a plumb position, perpendicular to finish grade, at intervals not to exceed maximum spacing indicated on drawings.
- B. Install heads 1/2 inch above finish grade along curbs, walks, paving, and similar areas.

- C. Lay out sprinkler heads and make all minor adjustments required due to differences between site conditions and Drawings. All such deviations in layout shall be within the intent of the original Drawings, and without additional cost to Owner. Routing and layout of all piping shall be approved by Owner prior to installation.
- D. After all permanent sprinkler pipe lines and risers are in place and prior to installation of sprinkler nozzles, open control valves and flush out the system with a full head of water.
- E. Install nozzles of the required size and pattern for the area of coverage. Install pressure compensating screens per manufacturer's recommendations.

3.19 FINAL ADJUSTMENTS

- A. Adjust sprinkler heights and vertical alignment as required to maintain proper relationship to established grades and planting. Re-grade and replant around sprinkler heads as necessary.
- B. Fill-in all depressions that may arise from possible settlement over trenching or other excavations, with proper soil mix. Compact lightly, and replant as needed to maintain planting design.
- C. Adjust nozzles to provide optimum coverage with no overspray to hardscape or building walls.
- D. Replace nozzles where required to provide full and complete coverage.
- E. Adjust or relocate moisture sensing equipment, as required, for proper operation.
- F. Adjust irrigation schedule and run times to provide adequate water to maintain landscaping.

END OF SECTION

SECTION 02920

LAWNS AND GRASSES

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. Hydrosprigging.
- B. Related Sections:
 - 1. Section 02300 - Earthwork
 - 2. Section 02880 – Irrigation Systems
 - 3. Section 02930 – Exterior Plants

1.3 DEFINITIONS

- A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

- F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 ACTION SUBMITTALS

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

Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified landscape Installer.
- B. Product Certificates: For soil amendments and fertilizers, from manufacturer.
- C. Material Test Reports: For existing native surface topsoil and imported or manufactured topsoil.
- D. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf and meadows during a calendar year. Submit before expiration of required initial maintenance periods.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf and meadow establishment.
 - 1. Experience: Five years' experience in turf installation in addition to requirements in Division 01 Section "Quality Requirements."
 - 2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

3. Personnel Certifications: Installer's field supervisor and/ or personnel assigned to the Work shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Certified Landscape Technician – Exterior, with installation and irrigation specialty area(s), designated CLT-Exterior.
 - b. Certified Turfgrass Professional, designated CTP.
 4. Maintenance Proximity: Not more than one hour normal travel time from Installer's place of business to Project site.
 5. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Landscape Architect. A minimum of ten representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for turf growth.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. Yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- D. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Bulk Materials:

1. Warranty Period: Five (5) years from date of project acceptance. The surety shall not be held liable beyond two years from the Project Acceptance Date.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.8 PROJECT CONDITIONS

- A. Planting Restrictions: Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.9 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:
 - 1) Sprigged Turf: 90 days from date of Substantial Completion.

1.10 WARRANTY

A. Plant Material:

1. Plant materials furnished or relocated under this section shall be warranted in writing, for a period of one (1) 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 Owner of the death of any warranted plant materials shall be promptly replaced with 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 requirements of the specifications.

3. When plants are replaced, advise the Owner, in writing, of the necessary establishment maintenance which must be performed. If this information is not provided, the Contractor will be liable for total cost of replacement should the replaced plant die.
4. The expense of replacement shall be borne by the Contractor if replacement is necessary during the maintenance period, or shall be evenly shared by the Owner and the Contractor if replacement is necessary after the maintenance period but during the remainder of the warranty period.
5. Contractor shall not be held liable for loss of plant materials after final acceptance due to lack of care, vandalism, acts of God, or accident. The Owner must show that the plants have been maintained properly.

PART 2 PRODUCTS

1.11 SPRIGS

- A. Sod Sprigs: Healthy living stems, rhizomes, or stolons with a minimum of two nodes and attached roots free of soil, of the following turfgrass species:
 1. Turfgrass Species: 'El Toro' Zoysia (*Zoysia japonica* 'El Toro')

1.12 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 1. Class: O, with minimum of 96 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
 2. Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.

- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

1.13 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through ½ inch sieve; soluble salt content of 5 to 10decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
- B. Peat Moss: Partially decomposed stems and leaves of moss, free from dirt, salt, coarse roots and other deleterious materials.
- C. Humus: Organic nutrient soil conditioners shall be Gro-Power Plus (5-3-1), Ferto (6-4-2) or approved equal, with an ash content of not less than 8% and not more than 50%.
- D. Burnt Bagasse Mix: Shall be a mixture of sugar cane ash, aged sugar cane trash and milled forest waste products.
- E. Macadamia Nut Husks: Air-classified fine husk, sifted through a ¼ inch screen, free of shells.

1.14 FERTILIZERS

- A. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- C. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
- E. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

1.15 PLANTING SOILS

- A. Planting Soil: ASTM D 5268 topsoil, with pH range of 6.0 to 7.2, a minimum of 2 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth. Mix ASTM D 5268 topsoil with soil amendments and fertilizers as required to produce planting soils with the following characteristics:
 - 1. Salinity: Saturation Extract Conductivity (ECe), less than 10 mmhos/ cm at 25 degrees Celsius.
 - 2. Boron content of saturated extract: Less than 1.0 ppm.
 - 3. Silicon content (acid-insoluble ash) shall be less than 20%.
 - 4. Carbon to nitrogen ratio shall be less than 20:1.
 - 5. Sufficient quantities of nitrogen, phosphorus, potassium, calcium and magnesium to support normal plant growth in accordance to the soil analysis recommendations.
- B. Planting Soil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and stockpiled on-site. Verify suitability of native surface topsoil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
- C. Based on soil analysis recommendations, mix existing, native surface topsoil with soil amendments and fertilizers to produce acceptable planting soil.

1.16 MULCHES

- A. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
- B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

1.17 PESTICIDES

- A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

1.18 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
- B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

PART 3 EXECUTION

1.19 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

1.20 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydrosprigging overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

1.21 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply superphosphate fertilizer directly to subgrade before loosening.
 - 2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planning will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 - 3. Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately $\frac{1}{2}$ the thickness of planting soil over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.
 - b. Apply superphosphate fertilizer directly to surface soil before loosening.

4. Remove stones larger than 1 inch in any dimension and sticks, roots, trash and other extraneous matter.
 5. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
 - D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
 - E. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

1.22 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in "Turf Area Preparation" Article.
- B. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- C. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

1.23 PREPARATION FOR GRAVEL-PAVING MATERIALS

- A. Reduce subgrade elevation soil to allow for thickness of gravel-paving system. Grade gravel paving areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade so that installed paving is within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions.
- B. Install base course and sand course as recommended by paving-material manufacturer for site conditions; comply with details shown on Drawings. Compact according to paving-material manufacturer's written instructions.
- C. Install paving mat and fasten according to paving-material manufacturer's written instructions.
- D. Fill cells of paving mat to no more than 1/4 inch above the top of cells with approved aggregate and compact according to manufacturer's written instructions.
 1. Finish gravel with stiff bristled broom.

1.24 HYDROSPRIGGING

- A. Broadcast sprigs uniformly over prepared surface at a rate of 10 cu. ft./1000 sq. ft. and mechanically force sprigs into lightly moistened soil
 - 1. Spread a 1/4 inch thick layer of planting soil on sprigs.
 - 2. Lightly roll and firm soil around sprigs after planting.
 - 3. Water sprigs immediately after planting and keep moist by frequent watering until well rooted.

1.25 TURF MAINTENANCE

- A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain turf irrigation system to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowing to maintain the following grass height:
 - 1. Mow St. Augustine grass to a height of 2 to 3 inches.
- D. Turf Post-fertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

1.26 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Landscape Architect:
 1. Satisfactory Plugged Turf: At end of maintenance period, the required number of plugs has been established as well-rooted, viable patches of grass, and areas between plugs are free of weeds and other undesirable vegetation.
 2. Satisfactory Sprigged Turf: At end of maintenance period, the required number of sprigs has been established as well-rooted, viable plants, and areas between sprigs are free of weeds and other undesirable vegetation.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

1.27 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

1.28 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Remove non-degradable erosion-control measures after grass establishment period.

END OF SECTION

SECTION 02930

EXTERIOR PLANTS

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. Plants.
- 2. Planting soils.
- 3. Tree stabilization.
- 4. Landscape headers.

- B. Related Sections:

- 1. Section 02300 - Earthwork.
- 2. Section 02880 – Irrigation Systems
- 3. Section 02920 – Lawns and Grasses

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Division 01 Section "Unit Prices."

- 1. Unit prices apply to authorized work covered by quantity allowances.
- 2. Unit prices apply to additions and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped

with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than sizes indicated.
- D. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- E. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
- G. Finish Grade: Elevation of finished surface of planting soil.
- H. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- I. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- J. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- K. Planting Area: Areas to be planted.
- L. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- M. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

- N. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- O. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- P. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- Q. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- R. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, including soils.
 - 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 - 2. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
 - 3. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
- B. Samples for Verification: For each of the following:
 - 1. Organic Mulch: 1-quart volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
 - 2. Mineral Mulch: 2 lb. of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot

of material to be delivered and installed on the site; provide an accurate indication of color, texture, and makeup of the material.

3. Weed Control Barrier: 12 by 12 inches.
4. Edging Materials and Accessories: Manufacturer's standard size delivered to the site for review, to verify color selected.
5. Tree Grates, Frames, and Accessories: Manufacturer's standard size delivered to the site for review, to verify design and color selected.
6. Root Barrier: Width of panel by 12 inches.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 1. Manufacturer's certified analysis of standard products.
 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Material Test Reports: For existing native surface topsoil, imported screened topsoil, light weight soil mix, and Coconut Palm planting mix.
 1. The Landscape Contractor shall be responsible for screening, amending, hauling, and installing.
 2. The Landscape Contractor shall be responsible for submitting a soils analysis at the beginning of the project for review and approval by the Landscape Architect.
- D. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.
- E. Warranty: Sample of standard and special warranty.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 2. Experience: Five years of experience in landscape installation in addition to requirements in Division 01 Section "Quality Requirements."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's field supervisor and/or personnel assigned to the Work shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Certified Landscape Technician - Exterior, with installation and irrigation specialty area(s), designated CLT-Exterior.
 - b. Certified Ornamental Landscape Professional, designated COLP.
 5. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Landscape Architect. A minimum of ten representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for plant growth.
 - a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil

amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.

- b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- 1. Submit a request for inspection and documentation to Landscape Architect at least one month prior to start of work that all plant material has been ordered.
 - 2. Any plant identified as specimen, field grown, field stock, and all palms with a trunk greater than 4 feet will be inspected at place of growth by the Landscape Architect.
- E. Substitutions:
- 1. If any plant specified is not obtainable, submit a written substitution request to the Landscape Architect.
 - 2. Substitutions of plant materials will not be permitted unless authorized in writing by the Landscape Architect.
- F. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
- 1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
 - 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- G. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site at the Landscape Contractor's expense.

1. Notify Landscape Architect of sources of planting materials seven days in advance of delivery to site.
- H. Plant Allowance List: Plant materials and other landscape related materials identified on this list shall be provided and installed by the Landscape Contractor under the direction of the Landscape Architect and Owner.
- I. Preinstallation Conference: Conduct conference at Project site. Provide a written projected planting schedule noting the estimated completion date, number of working days required and any special condition requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Bulk Materials:
 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.
- C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- D. Handle planting stock by root ball.
- E. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 2. Do not remove container-grown stock from containers before time of planting.

3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work. By proceeding with work under this Section, the Contractor indicates his acceptance of all previous related work.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements
- C. Underground Utilities and Obstructions:
 1. Verify the location of all underground utilities and other obstructions that may affect the work with the General Contractor prior to commencing work
 2. Any obstructions encountered shall be reported to the Landscape Architect.
 3. Repair all damage to any known utility line or other underground obstructions at Landscape Contractor's expense.
 4. Report damage to any unknown utilities to the Landscape Architect and Owner.
- 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. 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 any damage resulting from landscape planting operations. Repair all damage to return the area to the previous conditions at Landscape Contractor's expense.
- E. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.
- F. Clean Up: Keep all areas of work clean, neat, and orderly at all times during the period of Contract. Clean all construction areas at the end of each day.
- G. Pre-Maintenance Inspection and Final Inspection: At the completion of all landscape operations and prior to the beginning of the formal maintenance period, the Pre-Maintenance Inspection shall be held. At the completion of the formal maintenance period, the Final Inspection shall be held.
1. Request these inspections of the Landscape Architect five (5) working days prior to the completion of work in order that a mutually agreeable time for inspection may be arranged.
 2. The Landscape Architect, Landscape Contractor, General Contractor, and Owner or Owner's Representatives shall be present at the inspection.
 3. At the time of inspection, the Landscape Contractor shall have all the areas under the Contract free of weeds, dead leaves, and trash. All the areas under the Contract shall be neatly cultivated and raked, and all stakes, guys, and plant basins shall be in good order.
 4. If, after the Pre-Maintenance Inspection, the Landscape Architect and the Owner are 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 that must be corrected, and state the date of commencement and completion of the formal maintenance period.
 5. If, after the Final Inspection, the Landscape Architect and the Owner are 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. The final payment and the formal maintenance period for the unaccepted work and any related items shall be extended at no cost to the Owner until the defects in the work have been corrected and the work is accepted by the Landscape Architect and the Owner.

1.10 WARRANTY

- A. Terms: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
1. Failures include, but are not limited to, the following:

- a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization, landscape headers and tree grates.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
2. Warranty Periods from Date of Substantial Completion:
- a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
3. Include the following remedial actions as a minimum:
- a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25% dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.
- B. Liability: The liability under the warranty shall include the repair of damage to the work of other Contractors, or damage to the Owner'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 this warranty.

1.11 MAINTENANCE SERVICE

- A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
1. Maintenance Period: Three months from date of Substantial Completion.

- B. Initial Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
 - 1. Maintenance Period: Three months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 - 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.
 - 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.
- E. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

- F. Container-Grown Stock: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
 - 2. Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
- B. Peat Moss: Partially decomposed stems and leaves of moss, free from dirt, salt, coarse roots and other deleterious materials.
- C. Humus: Organic nutrient soil conditioners shall be Gro-Power Plus (5-3-1), Ferto (6-4-2) or approved equal, with an ash content of not less than 8% and not more than 50%.

2.4 FERTILIZERS

- A. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb./1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- C. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- D. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
 - 1. Size: 21-gram tablets.
 - 2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.
- E. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

2.5 PLANTING SOILS

- A. Imported screened soil material: ASTM D 5268 topsoil, with pH range of 6.0 to 7.2, a minimum of 2 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth; free of refuse, noxious seeds, and weeds. Red Humic latasol soils or types known as "Palolo Clay" or "Lualualei Clay" or similar materials will not be accepted. Mix ASTM D 5268 topsoil with soil amendments and fertilizers as required to produce planting soils with the following characteristics:
 - 1. Salinity: Saturation Extract Conductivity (ECe), less than 3.0 mmhos/ cm at 25 degrees Celsius

2. Sodium: Sodium Absorption Rate (SAR), less than 1.0ppm.
 3. Boron content of saturated extract: Less than 1.0 ppm.
 4. Silicon content (acid-insoluble ash) shall be less than 20%.
 5. Carbon to nitrogen ratio shall be less than 20:1.
 6. Sufficient quantities of nitrogen, phosphorus, potassium, calcium and magnesium to support normal plant growth in accordance to the soil analysis recommendations.
- B. Planting Soil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and stockpiled on-site. Verify suitability of native surface topsoil to produce viable planting soil. Clean soil of roots, plants, noxious seeds, weeds, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
1. Based on soil analysis recommendations, mix existing native surface topsoil with soil amendments and fertilizers to produce acceptable planting soil.
- C. Light weight Soil Mix: For all modular planters in the interior mall and any planters with closed bottoms.
1. Mix thoroughly prior to placing. Mix shall be:
 - 1 part shredded hapuu fibers
 - 1 part ½ minus black cinders
 - 1 part “Hawaiian Menehune Magic” organic soil amendment
 - 20 lbs. Gro-Power per cubic yard of mix

Sixty (60) days prior to placement, Landscape Contractor shall submit one (1) cubic foot of the specified pre-mixed light weight soil mix to the Landscape Architect and a certified soil testing laboratory for soil weight testing. Contractor shall not place any light weight soil mix on the project site until the Landscape Architect, General Contractor, and Owner has reviewed test results and given the Contractor written notification to proceed.
- D. Coconut Palm Planting Mix: For all Coconut Palms in the interior mall. Planting mix shall conform to the following:
1. Mix thoroughly prior to placing Coconut Palms: 85% screened silica sand, 15% organic soil amendment.

2.6 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood or Ground or shredded bark.
 2. Size Range: 3 inches maximum, 1/2 inch minimum.
 3. Color: Natural.
- B. Cinder Mulch (for Topdressing): Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:
1. Type: Crushed and chipped black cinder.
 2. Size Range: 1/2 inch maximum, 1/4 inch minimum.
 3. Color: Readily available natural black color range acceptable to Landscape Architect.

2.7 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids.

2.8 PESTICIDES

- A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.9 TREE STABILIZATION MATERIALS

- A. Stakes and Guys:
1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood or softwood with specified wood pressure-preservative treatment, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
 2. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.

3. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
 4. Guy Cables: Five-strand, 3/16-inch- diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.
 5. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.
- B. Root-Ball Stabilization Materials:
1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated; stakes pointed at one end.
 2. Wood Screws: ASME B18.6.1.
- C. Palm Bracing: Battens or blocks, struts, straps, and protective padding as indicated.
1. Battens or Blocks and Struts: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-4-inch nominal by lengths indicated.
 2. Straps: Adjustable steel or plastic package banding straps.
 3. Padding: Burlap.

2.10 LANDSCAPE HEADERS (EDGINGS)

- A. Plastic Headers: Standard black polyethylene or vinyl edging, V-lipped bottom, extruded in standard lengths, with steel angle stakes.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Epic Plastics.
 - b. Valley View Industries.
 2. Edging Size: 1.0 inch wide by 6 inches deep
 3. Top profile: Round top, 1 inch in diameter.
 4. Accessories: Manufacturer's standard stakes and pins.
 5. Color: Black.

- B. Recycled Composite Headers: 100% recycled plastic and wood composite blend, straight shaped, extruded in standard lengths, with Manufacturer's plastic straight and "J" shaped stakes.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. TREX.
 - b. Epic Plastics (Bend-a-Board).
 - 2. Edging Size: 1.0 inch wide by 6 inches deep.
 - 3. Accessories: Manufacturer's standard stakes and pins.
 - 4. Color: Brown or Gray.

2.11 MISCELLANEOUS PRODUCTS

- A. Shredded Hapuu Fibers: for Light Weight Soil Mix, as distributed by Exacta Sales, Honolulu, Hawaii or approved equal.
- B. Root Barrier: Black, molded, modular panels manufactured with 50 percent recycled polyethylene plastic with ultraviolet inhibitors, 85 mils thick, with vertical root deflecting ribs protruding 3/4 inch out from panel, and each panel 24 inches deep.
 - 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. Deep Root Partners, L.P.
 - b. VesPro, Inc.
 - c. Villa Root Barrier
- C. Burlap: Non-synthetic, biodegradable
- D. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with Size No. 8.
- E. Planter Filter Fabric: Non-woven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.
- F. Maintenance Strip Gravel: Washed, sound crushed stone or gravel:
 - 1. Size: Minimum 3/4", maximum 3" size.

3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in wet or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 PLANTING AREA ESTABLISHMENT

- A. Loosen subgrade of planting areas to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots,

rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply superphosphate fertilizer directly to subgrade before loosening.
 2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 3. Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
1. Excavate approximately two times as wide as ball diameter for balled and burlapped, balled and potted, and container-grown stock.
 2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.

4. Maintain required angles of repose of adjacent materials. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 5. Maintain supervision of excavations during working hours.
 6. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
- B. Subsoil and topsoil removed from excavations may not be used as planting soil.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
1. Hardpan Layer: Drill 6-inch diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
1. Use planting soil for backfill.
 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 5. Continue backfilling process. Water again after placing final layer. Do not tamp final layer of soil.
- D. Set balled and potted and container-grown stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
1. Use planting soil for backfill.
 2. Carefully remove root ball from container without damaging root ball or plant.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 5. Continue backfilling process. Water again after placing final layer. Do not tamp final layer of soil.
- E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Then, prune, thin, and shape trees, shrubs, and vines as directed by Landscape Architect.
- B. Do not apply pruning paint to wounds.

3.7 TREE STABILIZATION

- A. Install trunk stabilization as follows unless otherwise indicated:
 1. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation

and to extend at least 72 inches above grade. Set vertical stakes and space to avoid planting pits.

2. Use two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.
 3. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
 4. Attach flags to each tie wire with two flags per wire.
- B. Staking and Guying: Stake and guy trees more than 14 feet in height and more than 3 inches in caliper unless otherwise indicated. Securely attach no fewer than three guys to stakes 36 inches long, driven to grade.
1. Site-Fabricated Staking-and-Guying Method:
 - a. Support trees with strands of cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - b. Attach flags to each guy wire, 30 inches above finish grade.
- C. Palm Bracing: Install bracing system at three or more places equally spaced around perimeter of trunk to secure each palm until established unless otherwise indicated.
1. Site-Fabricated Palm-Bracing Method:
 - a. Place battens over padding and secure battens in place around trunk perimeter with at least two straps, tightened to prevent displacement. Ensure that straps do not contact trunk.

3.8 ROOT-BARRIER INSTALLATION

- A. Install root barrier where trees are planted within 60 inches of underground utility lines and paving or other hardscape elements, such as walls, curbs, and walkways unless otherwise shown on Drawings.
- B. Align root barrier vertically and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.
- C. Install root barrier continuously for a distance of 60 inches in each direction from the tree trunk, for a total distance of 10 feet per tree. If trees are spaced closer, use a single continuous piece of root barrier.

1. Position top of root barrier per manufacturer's recommendations.
2. Overlap root barrier a minimum of 12 inches at joints.
3. Do not distort or bend root barrier during construction activities.
4. Do not install root barrier surrounding the root ball of tree.

3.9 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated in even rows with triangular spacing.
- B. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
- C. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- E. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.10 PLANTING AREA MULCHING

- A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches and secure seams with galvanized pins.
- B. Mulch backfilled surfaces of planting areas and other areas indicated.
 1. Trees in Turf Areas: Apply organic mulch ring of 3 inch average thickness, with 36-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
 2. Mineral Mulch in Planting Areas: Apply 3 inch average thickness of black cinder mulch extending 12 inches beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems. Do not place mulch in planting areas designated for ground cover planting only.

3.11 HEADER INSTALLATION

- A. Recycled Composite Headers: Install recycled composite headers where indicated according to manufacturer's written instructions. Anchor with manufacturer's stakes spaced approximately 36 inches apart.

- B. Plastic Headers: Install plastic headers where indicated according to manufacturer's written instructions.

3.12 TREE GRATE INSTALLATION:

- A. Tree Grates: Set grate segments flush with adjoining surfaces. Shim from supporting substrate with soil-resistant plastic. Maintain a 3 inch minimum growth radius around base of tree; break away units of casting, if necessary, according to manufacturer's written instructions.
 - 1. Tree Grate Frames: Install Manufacturer's tree grate frames with concrete nelson studs in 6 inch wide reinforced concrete header, or into adjacent reinforced concrete paving.
 - a. Coordinate installation with paving Contractor.

3.13 PLANT MAINTENANCE

- A. The Landscape Contractor, at his option, may set up barricades to keep traffic out of newly planted areas, as needed and where safety allows.
- B. Protect all walkways and paved areas from being stained during placement of screened soil. Remove and/or clean soil from all walkways and paved surfaces immediately.
- C. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- D. Keep planting areas a minimum of 90% free of weeds and undesirable grasses through daily weeding as necessary. Remove the entire root system of weeds. Dispose of all weeds in appropriate trash containers.
- E. Remove damaged or diseased growth from trees, palms, and shrubs.
- F. Immediately remove any dead or dying plants not in a vigorous thriving condition. Replacement shall be the same species and size as originally planted.
- G. Restake, tighten, repair guys, and reset to proper grades or upright position any plants that are not in their proper growing position.
- H. As it becomes evident that certain groundcovers have not uniformly or properly established, replant the areas immediately with the same plants and quantity as specified for the initial planting and maintained as specified for 90% coverage of healthy, actively growing groundcovers for approval during the final inspection.

- I. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- J. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.14 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.15 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.16 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION

SECTION 03300

CAST IN PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. 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 07920: Joint Sealants.

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. 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. Provide chemical composition for rebars that are to be welded.
- B. 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.
- C. 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.
- D. 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. Curing materials.
4. Bonding agents.
5. Adhesives.
6. Vapor retarders.
8. Epoxy joint filler.
9. Joint-filler strips.
10. Repair materials.

1.4 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. 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.
- D. 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.
- E. 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.

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 two edges and one side for tight fit.
- C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, 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 1 inch to the plane of the exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes not larger than 1 1/2 inches in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed, unless otherwise noted on the drawings.
- B. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

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 C595M.
 - 3. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- C. Blended Hydraulic Cement: ASTM C 595M; Type IS - portland blast-furnace slag cement, Type IP - portland/pozzolan cement, Type I (PM) - pozzolan-modified portland cement, or Type I (SM) - slag-modified portland cement.
- D. Silica Fume: ASTM C 1240, amorphous silica.
- E. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:

1. Class: Moderate weathering region, but not less than 3M.
 2. Aggregate Size: 1-1/2 inches (38 mm).
 3. Aggregate Size: No. 57 (1 inch to No. 4).
 4. Aggregate Size: No. 67 (3/4 inch to No. 4).
- F. 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.
- G. 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 percent 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. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.6 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.
1. Permeance Rating: ASTM E96, ASTM E154 not exceeding 0.03 grains/ft²/hr.

2.7 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 percent 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.

2.8 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- B. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Cementitious Coatings: Cement based polymer modified concrete finishing materials. Available Products subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. ProFinish by Bonded Materials
 - 2. Polycoat by Tremcrete Systems Incorporated
 - 3. Durus by Durus High Tech Cement
 - 4. MBT RS-1150 by Master Builders Technologies.

- F. Sleeves:
 - 1. Schedule 40 pipe, galvanized per ASTM A53.
 - 2. Schedule 40 PVC Pipe.
- G. Reglets: Fabricate reglets of not less than (0.0217-inch) thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- H. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than (0.0336 inch) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.9 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. Slab-on-Grade and Spread Footings: Proportion normal-weight concrete mix as follows:
 - 1. Compressive Strength (28 Days): 3000 psi.
- C. All Other Concrete: Proportion normal-weight concrete mix as follows:
 - 1. Compressive Strength (28 Days): 3000 psi.
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
 - 5. Silica Fume: 10 percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent portland cement minimum, with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- F. Maximum Water-Cementitious Materials Ratio: 0.40 to 0.45 for concrete required to have low permeability.
 - G. Do not add air entrainment to concrete of trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.
 - H. Limit water-soluble, chloride-ion content in hardened concrete per ACI 318 Chapter 4 for corrosion protection of reinforcing steel.
 - I. 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.

2.10 FABRICATING REINFORCEMENT

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

2.11 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 jobsite, 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.

- B. Project-Site Mixing: Measure, batch, and mix concrete materials according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd.0.76 cu. m or less, continue mixing at least one and one-half minutes, but not more than five minutes after all ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd.0.76 cu. m, increase mixing time by 15 seconds for each additional 1 cu. yd.0.76 cu. m.
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of concrete placement in structure.
 4. Hand mixed concrete will not be allowed, except to make up shortages for fence post footing, thresholds, curbs and gutters, thrust block and utility trench encasements.

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 inch.
 2. Class B, 1/4 inch.
 3. Class C, 1/2 inch1.
 4. Class D, 1 inch.
- 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 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, but not within the thickness of the basaltic termite barrier.
- C. Obtain contracting officer'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 deg F(10 deg 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 Contracting Officer.
- B. Leave formwork, for slabs and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 1. At least 70 percent of 28-day design compressive strength (minimum requirement).
- 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 Contracting Officer.

3.4 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.

3.5 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.
- C. 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 15" E.W.	4'-6" o.c. each way
WIRE FABRIC SHEETS	MAXIMUM DISTANCE BETWEEN SUPPORTS
6 x 6 - W2.9/w2.9	2'-0" o.c. each way
6 x 6 - W6/W6	3'-0" o.c. each way

- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

- E. 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.

3.6 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 Contracting Officer.
 - 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.
- 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 inch. 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 inch 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 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "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.

3.7 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 contracting officer for each scheduled pour.
- B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301. Up to two gallons of water per cubic yard of concrete may be added at the jobsite provided the approved design mix accommodates the additional water.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.
- 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.
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 contracting officer. 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.

3.8 CONCRETE SLABS ON GRADE

- A. For exterior areas, unless specified elsewhere, place concrete floor slabs directly over compacted layer of approved 1-1/2 inch minus and over compacted well-graded 6 inch minus on-site materials or approved import and reinforce slabs with grade 60, #5 steel bars at 16" on center top and bottom each way. 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.

3.9 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.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, 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.
- 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 spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, 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 Contracting Officer before application.
- E. Swirled Finish: Apply a swirl finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated. Immediately after second troweling, and when concrete is still plastic, work the surface with a float in semi-circular or fan-like motion.

3.11 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.

3.12 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 3.14.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 seven 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.

3.13 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.
- C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas. Remove and replace concrete that cannot be repaired and patched to Contracting officer'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 inch] in any dimension in solid concrete but not less than [1 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 Contracting officer.
- 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 inch 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.
 6. Repair defective areas, except random cracks and single holes [1-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-inch] 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 [1-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 Contracting officer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Contracting officer's approval.

3.15 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., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. 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 deg F and below and when 80 deg F 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 two laboratory-cured specimens at 7 days and two at 28 days.
 - a. Test two field-cured specimens at 7 days and two at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
- C. When strength of field-cured cylinders is less than 85 percent 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 three 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.
- E. Test results shall be reported in writing to Contracting officer, 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 Contracting officer 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. 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 Contracting officer. 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 Contracting officer.

3.16 CLEAN UP

- A. Installer shall clean up all concrete and cement materials, equipment and debris upon completion of any portion of the concrete work and upon completion of the entire concrete and related work.

END OF SECTION

SECTION 05720

RAILING CABLE SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

- A. Furnish and install stainless steel cable railing infill systems, including cables, fittings, and accessories, as indicated on the Drawings and as specified herein.
- B. This Section includes horizontal cable infill only.

1.2 REFERENCES

- A. International Building Code (IBC), latest adopted edition.
- B. ASTM A276 – Stainless Steel Bars and Shapes.
- C. ASTM A580/A580M – Stainless Steel Wire Rope.
- D. ASTM A967/A967M – Chemical Passivation of Stainless Steel.
- E. ASCE 7 – Minimum Design Loads for Buildings and Other Structures.

1.3 PERFORMANCE REQUIREMENTS

- A. Cable railing infill shall comply with code requirements for guards, including load resistance and opening limitations.
- B. Cable spacing and tension shall be maintained to prevent passage of a 4-inch diameter sphere.

1.4 SUBMITTALS

- A. Product data for cables, fittings, and accessories.
- B. Shop drawings: Indicate materials, sizes, fabrication, anchorage and installation details, and lengths for cable system on shop drawings prepared by fabricator of cable supporting structure.
- C. Samples : Minimum 12 inch (300 mm) length of cable and each fitting and accessory proposed for the project. Submit items in specified finish.
- D. Quality Assurance/Control Submittals:
 - 1. Qualifications: Proof of Manufacturer's qualifications.
 - 2. Manufacturer's Installation Instructions

E. Closeout Submittals: Reference 01300 – SUBMITTALS, submit following items:

1. Maintenance Instructions:

- a. Manufacturer's recommendation for periodic checking and adjustment of cables to maintain uniform cable tension.
- b. manufacturer's recommendation for periodic cleaning to remove accumulated dirt, debris, and stains.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Minimum five years of experience in producing cable assemblies of the type specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Reference manufacture's instructions.

PART 2 – PRODUCTS

2.1 CABLES

- A. Cables: Type 316 stainless steel, commercial, dry grade
- B. Construction: 1x19 strand.
- C. Diameter: 1/8 inch (3.2 mm)
- D. Finish: Uniform mill or polished finish.

2.2 FITTINGS

- A. Type 316 stainless steel.
- B. Swaged or swageless fittings suitable for field installation.
- C. Provide means for field adjustment and future re-tensioning.

2.3 ACCESSORIES

A. Sleeves, grommets, washers, and end caps as required.

2.4 ACCEPTABLE MANUFACTURERS

- A. Feeney, Inc.
- B. Atlantis Rail Systems.

- C. Stainless Cable & Railing Inc.
- D. Jakob Rope Systems.
- E. Ultra-Tec Cable Railing Systems.
- F. Ronstan Tensile Architecture.
- G. Or approved equal.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine work to which cables will be anchored or will penetrate. Coordinate with responsible entity to perform corrective work as necessary.
 - 1. Verify post size and cable spacing are in accordance with manufacturer's recommendations.
- B. Take field measurements and compare installation conditions to shop drawings. Notify manufacturer if field measurements vary from shop drawings.

3.2 INSTALLATION

- A. Install cable infill in accordance with approved submittals and manufacturer instructions.
- B. Provide straight cable runs only; terminate and restart at changes in direction.
- C. Install cables level, uniformly spaced, and evenly tensioned.
- D. Isolate dissimilar metals with grommets or bushings.

3.2 FIELD QUALITY CONTROL

- A. Verify uniform tension and secure fittings.
- B. Replace damaged or improperly installed components.

3.3 CLEANING AND PROTECTION

- A. Clean stainless steel surfaces following installation.
- B. Protect completed work until final acceptance.

END OF SECTION

DIVISION 06 – WOOD, PLASTICS & COMPOSITES

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

Section includes all rough carpentry, complete, including framing, blocking, plates, nailers, strips, rough hardware, preservative-treated wood, miscellaneous framing, related fasteners and framing anchors.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01300 - SUBMITTALS.
- B. Provide manufacturer's data for each type of rough carpentry product, including lumber, plywood, Ipe hardwood members, preservative-treated lumber, metal connectors, framing anchors, fasteners, and adhesives.
- C. Provide truss shop drawings and calculations sealed by a professional engineer licensed in the State of Hawaii when shop-fabricated trusses are used.
- D. Provide manufacturer literature and current evaluation reports for proprietary connectors where required for code compliance.
- E. Provide copies of treatment warranties and written guarantees required by Section 06310 for rough carpentry items requiring preservative treatment.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Storage: Keep materials dry at all times. Protect against exposure to weather and contact with dry or wet surfaces.
- B. Stack lumber and plywood and provide air circulation within stacks.
- C. Do not deliver preservative-treated wood to the Project until moisture content has been reduced to the specified level after treatment.
- D. Reject warped, split, or otherwise damaged materials.

1.4 QUALITY ASSURANCE

- A. All rough carpentry work shall conform to the 2018 International Building Code,

as amended by the County of Hawaii, and to the structural Drawings.

- B. Grading Marks: Factory mark each piece of lumber and plywood with type, grade, mill, and grading agency identification; except omit marking from surfaces to be exposed with transparent finish or without finish.
- C. Lumber grading rules shall conform to WCLIB Standard No. 17 for Coastal Douglas Fir or WWPA Western Lumber Grading Rules, as applicable.
- D. Preservative treatment shall comply with the separate requirements of Section 06310 - Preservative Treated Lumber. Where requirements of this Section and Section 06310 both apply, the more stringent requirement shall govern.

1.5 COORDINATION

- A. Coordinate rough carpentry with architectural, structural, roofing, waterproofing, and finish requirements.
- B. Coordinate locations of anchor rods, holdowns, straps, bolts, framing anchors, proprietary hardware, and truss reactions prior to fabrication and installation.
- C. Coordinate all rough carpentry items requiring preservative treatment with Section 06310.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Lumber, General: All lumber, timber and boards shall be Douglas Fir Larch dressed seasoned lumber, S4S, pressure-preservative-treated where required by this Section or Section 06310, unless otherwise indicated. Ipe hardwood members indicated on the Drawings for decking and railing components shall comply with requirements specified herein and shall not be preservative-treated.
 - 1. The lumber shall be graded in accordance with the West Coast Lumber Inspection Bureau (WCLIB), "Standard No. 17, Grading Rules for Coastal Douglas Fir," or Western Wood Products Association (WWPA), "Western Lumber Grading Rules." Use the following grades or better:
 - a. 2-inches to 4-inches thick, 2-inches to 4-inches wide - Structural light framing - No. 2 minimum.
 - b. Structural Joists - No. 1 minimum.
 - c. Beams and Stringers - Select Structural.

- d. Truss members - No. 2 minimum.
 - e. Posts - No. 1 minimum.
 - f. Studs - No. 2 minimum.
- B. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
- C. Plywood: Comply with U.S. Product Standard PS 1 for plywood, Group 1, Douglas Fir unless otherwise specified or noted. Use exterior grade only without visible patches or repairs on exposed sides. For roof sheathing use Structural II, C-D EXT-APA. Where plywood is preservative-treated, treatment shall comply with Section 06310.
- 1. Exterior siding plywood shall be APA #303-6 wood patch, T1-11, 5/8-inch thick exterior grade, Douglas Fir with rough sawn face, 3/8-inch by 1/4-inch deep grooves spaced at 4 inches o.c., conforming to U.S. Product Standard PS 1.
 - 2. Interior plywood, where indicated, shall be 1/2-inch thick A/C panel, interior/exterior glue, treated as specified in Section 06310.
- D. Glulam members shall have the following minimum allowable unit stresses:
- Extreme Fiber in Bending
 - GLB - 2400 psi
 - Rosboro Big Beam - 3000 psi
 - Horizontal Shear
 - GLB - 165 psi
 - Rosboro Big Beam - 300 psi
 - Compression Perpendicular to Grain
 - GLB - 450 psi
 - Rosboro Big Beam - 650 psi
 - Modulus of Elasticity
 - GLB - 1,800,000 psi
 - Rosboro Big Beam - 2,100,000 psi
- E. Wood-Preservative Treatment:
- 1. Comply with Section 06310 - Preservative Treated Lumber for preservative chemicals, treatment process, certificates, guarantees, and field treatment of cuts and penetrations.

2. Treat lumber and plywood by pressure process, unless otherwise permitted by Section 06310.
3. Ipe members shall not be preservative-treated unless specifically indicated otherwise.
4. Lumber shall be milled to finish size and shape prior to treatment and shall be treated before assembly. Plywood may be treated in regular panel sizes.
5. Treated lumber shall bear the quality mark of an approved inspection agency.
6. Apply preservative treatment to wood blocking, nailers, curbs, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing; wood in contact with masonry or concrete; wood framing attached directly to the interior of below-grade masonry or concrete walls; wood framing members less than 18 inches above ground in crawlspaces or unexcavated areas; and wood floor plates installed over concrete slabs-on-grade.
7. Application of treatment shall be coordinated so that this Section does not duplicate treatment requirements for items covered by Section 06310. This Section governs rough carpentry product requirements; Section 06310 governs preservative-treatment process and warranty requirements.

F. Ipe Members:

1. Ipe shall be dense tropical hardwood suitable for exterior and marine exposure applications.
2. Members shall be free of defects that impair structural performance, durability, or fastening.
3. Ipe shall not be preservative-treated.
4. All cuts, drilling, and fastening shall follow manufacturer recommendations to prevent splitting

2.2 FASTENERS, CONNECTORS, ROUGH HARDWARE

- A. Fasteners and Anchors: Provide size, type, material and finish as indicated and as necessary for the project requirements; and as recommended by applicable standards complying with ASTM, ANSI, or Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices.
- B. Metal Hangers and Framing Anchors: Provide metal hangers and framing anchors of the size and type recommended by the manufacturer or as shown on the Drawings for each use including recommended nails or screw fasteners. Provide

all fasteners and anchorages with hot-dip zinc coating, unless stainless steel finish is indicated.

1. Use matching manufacturer-recommended fasteners for all proprietary connectors.
2. Connector hardware not available in galvanized or Type 316 stainless steel finish may be galvanized if available, or have Simpson ZMAX finish, unless noted otherwise on the Drawings.
3. The use of galvanized plates, shims, hardware, fasteners, etc. is prohibited in contact with oil-borne preservative treated wood members.
4. All connectors, fasteners, and hardware used in boardwalk construction, exterior framing, and railing systems shall be Type 316 stainless steel.
5. Mixing stainless steel and galvanized components is not permitted.
6. Fasteners used in Ipe hardwood shall be stainless steel and installed in predrilled holes to prevent splitting.
7. Provide matching manufacturer-recommended fasteners for all proprietary connectors.

C. General: All connector references and framing hardware shall be Simpson "Strong Tie" connectors or approved structural equivalent. Unless otherwise indicated or specified, rough hardware exposed to weather, embedded in or in contact with exterior masonry or concrete, or installed in high-humidity or marine-influenced locations, shall be hot-dipped galvanized complying with ASTM A153 and ASTM F2329, or stainless steel where indicated.

1. Bolts, Nuts, Studs - ANSI B18.2.1, ANSI B18.5.2.1M, ANSI B18.5.2.2M, ANSI B18.2.2, ASTM A 687, hot-dip galvanized, and stainless steel Type 316 for exterior applications.
2. Expansion Shields - CID A-A-1924. Except as shown otherwise, maximum size of devices in Groups IV, V, VI and VII shall be 3/8 inch.
3. Lag Screws and Lag Bolts - ANSI B18.2.1, hot-dip galvanized.
4. Wood Screws - ANSI B18.6.1, hot-dip galvanized.
5. Wire Nails - ASTM F1667, galvanized.
6. All nails shall be hot-dipped galvanized or Type 316 stainless steel common nails where indicated on the Drawings. Type 316 stainless steel nails shall be ring shank.

7. All bolts shall be galvanized or Type 316 stainless steel where indicated. Bolt holes shall be a maximum of 1/16 inch larger than the nominal diameter of the bolt used.
8. Provide standard cut washers under bolt heads and nuts against wood, galvanized or stainless steel to match bolt material.
9. All wood framing screws shall be hot-dipped galvanized or better rated for exterior exposure, with minimum 2-inch embedment into the main member unless otherwise indicated.
10. Where nail holes and bolt holes are provided in proprietary connectors, use nails unless otherwise noted.
11. Hardware and fasteners in contact with Ipe wood members shall be stainless steel.

2.3 MISCELLANEOUS MATERIALS

- A. Moisture Barrier: ASTM D226, 40-pound felt. Keep wood surfaces from direct contact with cementitious and metal surfaces with a layer of felt.
- B. Wood Glue: APA AFG-01 Waterproof, waterbase, and air cure type.
- C. ¼" thick HDPE shims shall be provided where indicated on the Drawings to fully separate wood members from concrete bearing surfaces.
- D. Self-adhering butyl rubber flashing tape designed for protection of horizontal wood framing members exposed to weather. Tape shall be compatible with pressure-preservative-treated lumber (including oil-borne systems) and shall not degrade, slip, or react with treatment chemicals or paint.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Discard units of materials with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.
 1. Members shall meet the tolerance requirements of IBC Section 2303.
 2. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.

3. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.
 4. Use common wire nails, except as otherwise indicated. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.
 5. Minimum nailing shall comply with IBC Table 2304.10.2 unless more stringent requirements are indicated on the Drawings.
 6. Do not cut, notch, drill, or otherwise penetrate structural framing except as shown on the Drawings or approved in writing by the Structural Engineer. Penetrations and openings with any dimension greater than 2 inches not shown on the structural drawings are prohibited unless approved in writing by the Structural Engineer.
 7. Do not splice structural members between supports unless specifically detailed or approved.
 8. Re-tighten all nuts prior to closing in the work.
 9. Use stainless steel hardware and fasteners for boardwalk construction.
 10. Provide non-corrosive plastic or composite shims at all wood-to-concrete bearing locations for boardwalk construction.
 11. Apply joist protection tape to tops of all joists, beams, and blocking supporting decking, beams and joists. Tape shall be installed prior to placement of decking or other members. Surfaces shall be clean and free of debris prior to installation. Install tape centered along member length, fully adhered with no wrinkles or voids. Lap joints at a minimum of 2 inches.
- B. Wood Grounds, Nailers and Blocking: Provide whenever shown and where required for attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown. Select and cut blocking and nailers to eliminate knots and other defects that would interfere with attachment of other work. Provide miscellaneous lumber used for blocking, nailers, and furring of the same species group as specified for general framing, unless otherwise indicated.
- C. Wood Furring: Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

- D. Wood Framing, General: Provide framing members of sizes and on spacing shown, and frame openings as shown, or if not shown, comply with applicable structural details.
 - 1. Install framing anchors, straps, holdowns, and related hardware complete to provide continuous load path as indicated on the structural drawings.
 - 2. For joists under 12 feet long, no blocking is required.
 - 3. For joists between 12 feet and 16 feet long, provide one row of blocking at the midpoint.
 - 4. For joists over 16 feet long, provide two rows of blocking at third points.
- E. Anchor and nail as shown, and comply with recommended nailing schedules and applicable structural details.
- F. Installation of Plywood: Comply with applicable APA recommendations for types of plywood products and applications indicated. Install structural sheathing in accordance with fastening schedules and shear wall requirements shown on the Drawings.
- G. Where treated wood is field cut, drilled, notched, or otherwise penetrated, treat all cuts and penetrations in accordance with AWWA M4 using two heavy brush coats of field-applied preservative solution compatible with the original treatment, or use the solution used in the initial treatment of the wood.
- H. Coordinate all rough carpentry with structural drawing requirements, including holdowns, straps, clips, truss reactions, glulam supports, shearwall boundary members, anchor bolt locations, and all hardware shown on the structural details.
- I. Shop-fabricated wood trusses, if used, shall not be fabricated until the Engineer has reviewed required shop drawings. Install temporary and permanent bracing in accordance with truss manufacturer's recommendations and approved submittals.
- J. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities where indicated and where required by code. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and in accordance with code requirements.

3.2 PROTECTION

- A. Protect installed rough carpentry from damage, dampness, staining, and corrosion during construction.
- B. Replace damaged or deteriorated rough carpentry work at no additional cost to the Owner.

END OF SECTION

Rough Carpentry
06100-9

SECTION 06200
FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide all finish carpentry work, complete, including, but not limited to, the following items.
 - 1. All finish carpentry work, blocking, etc.
 - 2. Wood trim.
 - 3. Millwork.
 - 4. Custom casework.
 - 5. Rough hardware.
 - 6. Install wood doors, finish hardware, built-in equipment, white-boards, tackboards and any other items specified to be installed under this section but furnished under other sections of these specifications.

- B. Related Work Specified Elsewhere:
 - 1. Preservative treatment is specified under SECTION 06310 – PRESERVATIVE TREATED LUMBER
 - 2. Back priming of wood work is provided under SECTION 09900 - PAINTING.

1.2 QUALITY ASSURANCE

- A. Grading Marks: Factory mark each piece of lumber and plywood with type, grade, mill, and grading agency identification. Certificate of inspection and grading by a recognized agency may be submitted with each shipment in lieu of factory marking, at Contractor's option.

- B. Qualifications of Manufacturer: Cabinets used in work of this section shall be produced by manufacturers or custom cabinet shops regularly engaged in manufacturing of similar items and with a minimum 5 year history of successful production acceptable to the Director.

- C. Qualifications of Installers: Use adequate number of skilled workmen who are thoroughly trained and experienced in necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work of this section.
- D. VOC content of adhesives shall be less than the current VOC content limits of the South Coast Air Quality Management District Rule 1168, "Adhesive and Sealant Application".

1.3 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Certificates: Provide a certificate of treatment showing compliance with the specifications, and a certificate of dryness for all wood specified to be dried after treatment.
- C. Material Safety Data Sheet (MSDS): Submit MSDS for each material.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.
- C. Store materials away from threat of termite or other insect infestation.

PART 2 – PRODUCTS

2.1 WOOD PRODUCT QUALITY STANDARDS

- A. Softwood Lumber Standards: Comply with U.S. Department of Commerce PS 20 and with applicable grading rules of the respective grading and inspection agency for the species and product indicated.
- B. Hardwood Lumber Standard: Comply with National Hardwood Lumber Association (NHLA) rules.
- C. Plywood Standards: Comply with U.S. Department of Commerce PS 1 for softwood plywood and PS 51 for hardwood plywood.

- D. Architectural Woodwork Quality Standards: Comply with AWI Quality Standards, Guide Specifications and Quality Certification Program, latest edition or WIC Manual of Woodwork, latest edition.

2.2 MATERIALS

A. General:

1. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and pattern as shown, unless otherwise indicated.
2. Moisture Content of Softwood Lumber: Provide kiln-dried lumber having a moisture content from time of manufacture until time of installation not greater than values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
3. Moisture Content of Hardwood Lumber: Provide kiln-dried lumber having moisture content from time of manufacture until time of installation within a range of 8% to 13% for individual pieces, and an average of 11% for the entire lot.

- B. Finish Carpentry: Solid lumber shall be milled to profiles indicated of clear Douglas Fir for paint finish.

- C. Boardwalk Decking: Use only dense tropical hardwood with proven resistance to moisture, decay, insects, and fungal growth without chemical treatment. Ipe shall be naturally decay-resistant and suitable for intermittent wetting and drying cycles.

D. Miscellaneous Materials:

1. Moisture Barrier: Air infiltration barrier and weather resistive membrane, ASTM E 96/E 63M when applied on exterior walls. "Tyvek" as manufactured by DuPont Co., Rufco-Wrap by Raven Industries, Type-65 Standard Grade by Griffolyn Reinforced Vapor Barrier, Jumbo Tex by Fortifiber Corp., MOLD Blocker Housewrap by PRO Installer, or approved equal. Material shall be Class A tested in accordance with the procedures of ASTM E 84.
2. Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the proper type, size, material and finish for application indicated to provide secure attachment, concealed where possible, and complying with ASTM F 547 and applicable ANSI standards. Provide all fasteners and anchorages with a hot-dipped zinc coating ASTM A 153/A 153M, Class C or D as applicable except that fasteners used with ACQ-C and ACQ-D, CBA-A, CA-B, and borate non-DOT type treated wood shall be G185 or stainless steel. Fasteners at wet areas shall be 316 stainless steel.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Discard units of material which are unsound, warped, bowed, twisted, im-properly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.
- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8-inch in 8-feet for plumb and level countertops; and with 1/16-inch maximum offset in flush adjoining 1/8-inch maximum offsets in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or re-pair damaged finish at cuts.
- D. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum lengths of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end-to-end joints. Sand smooth for imperceptible joints.
- E. Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and where prefinished matching fasteners heads are required, use fine finishing nail for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where transparent finish is indicated.
- F. Moisture Barrier: Install as recommended by the manufacturer.
- G. Re-treat cut and penetrated lumber in accordance with SECTION 06310 – PRESERVATIVE TREATED LUMBER.
- H. Boardwalk decking boards shall be end-sealed with manufacturer-recommended wax or sealer immediately after cutting.

3.2 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

- A. Repair damaged and defective work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, re-place casework. Adjust joinery for uniform appearance.

- B. Use penetrating oil finish formulated specifically for tropical hardwoods in coastal environments for boardwalk decking boards.
- C. Protection: Installer shall advise Contractor of procedures required to protect architectural work during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION

SECTION 06311

PRESERVATIVE TREATED LUMBER

PART I - GENERAL

1.1 GENERAL REQUIREMENTS

This section covers the requirements for furnishing and installing of preservative treatment.

1.2 SUBMITTALS

A Certificate of Treatment shall be issued to the Engineer showing compliance with these specifications, both as to kiln drying and type of treatment performed, including dip treatment.

1.3 GUARANTEE

The Contractor shall submit to the Engineer a written guarantee that he will replace all treated wood which is attacked by subterranean termites during the first two (2) years or is attacked by dry rot during the first two (2) years after project acceptance.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All wood treated with oil-borne preservatives shall be kiln-dried before treatment to an average of 12% to 15% moisture content.
- B. All wood shall be treated as specified in this Section except all-heart redwood and tropical hardwood decking specifically indicated to be used without preservative treatment..
- C. Lumber shall be milled to finish size and shape prior to treating, and it shall be treated before assembly. Plywood may be treated in regular panel sizes.
- D. Preservative treatment shall provide protection against fungal decay and termite attack, including Formosan termites, for the intended Use Category exposure in a tropical coastal environment.

2.2 MATERIALS

- A. Asbestos Prohibition: No asbestos containing materials shall be used under this

section. The Contractor shall insure that all materials incorporated in the project are asbestos-free unless specifically approved in writing by the Engineer.

- B. Water-Borne Preservatives: When water-borne treatment is permitted by the Drawings or Notes, preservatives shall be Wolmanized CCA, Osmose CCA, or Chemonite ACZA, or equal, in accordance with American Wood Protection Association (AWPA) Standard P5 and applicable Use Category requirements.
- C. Oil-Borne Preservatives:
 - 1. Preservatives shall be AWPA-listed oil-type preservatives suitable for Douglas-fir and other specified species in the indicated Use Category (UC3B or UC4A/UC4B, as applicable), and shall provide resistance to fungal decay and termites. Acceptable systems include:
 - a. DCOI-based oil-type preservatives standardized by AWPA for Coastal Douglas-fir in UC4A, UC4B, or UC4C.
 - b. Copper naphthenate in oil meeting AWPA standards for the required Use Category.
 - c. Other non-arsenical, oil-borne preservative systems meeting AWPA standards and approved by the Engineer.
 - 2. Preservatives shall be formulated in hydrocarbon solvent meeting the requirements of AWPA hydrocarbon solvent Type C, Standard P9, Paragraph 3.1, or as otherwise recommended by the preservative manufacturer for structural lumber.
 - 3. Organo-tin (TBTO) and chlorpyrifos-based formulations shall not be used.

PART 3 - EXECUTION

3.1 WOOD PRESERVATION WITH WATER-BORNE PRESERVATIVES

All lumber and plywood designated to receive water-borne preservatives shall be pressure treated with CCA or ACZA in accordance with AWPA and American Wood Protection Association standards for the specified Use Category (UC3B or UC4A/UC4B, as indicated on the Drawings) and American Wood Preservers Bureau "AWPB Approved" (Hawaii use only) or equivalent certification. All 1-inch and 2-inch lumber and all plywood shall be dried to a moisture content of 19 percent or less after treatment.

3.2 WOOD PRESERVATION BY PRESSURE TREATMENT WITH OIL-BORNE PRESERVATIVES

Exposed lumber 2-inch nominal thickness and over that will be unpainted or will receive a clear or semi-transparent stain shall be unincised and pressure treated with an approved oil-borne preservative system meeting the following:

- 1. Species: Douglas-fir or other species indicated.

2. Use Category: Treated to not less than UC4A for exterior above-ground members subject to frequent wetting, and UC4B where indicated for higher decay risk (e.g., near splash or in contact with concrete in damp soil).
3. Retention: Net retention shall meet or exceed AWPAs minimums for the selected preservative system and Use Category for Coastal Douglas-fir, as documented on the treating plant certification.
4. Moisture content after treatment: As recommended by the preservative manufacturer and treating plant to allow proper finishing; provide kiln-drying after treatment where required to achieve 19 percent or less moisture content before installation of finish.
5. Color: Preservative system shall produce a brown or neutral tone compatible with clear and pigmented stains; green-tinted treatments are not permitted for exposed surfaces.

3.3 WOOD PRESERVATION OF DIP TREATMENT

All finish lumber under 2" nominal thickness; finish plywood; and millwork items that will be exposed to view in the finished work shall be immersion treated for a minimum period of 15 minutes in any preservatives listed in Section 2.2 above in accordance with the requirements of the National Wood, Window and Door Association (NWWDA) Industry Standard I.S. 4-81 and the preservative manufacturer's recommendations.

3.4 INSTALLATION

Wherever it is necessary to end cut or penetrate into (such as by drilling or notching) treated wood on the job, all such cuts and penetrations shall be treated in accordance with AWPAs Standard M-4-84 using two heavy brush coats of a compatible field-applied preservative solution recommended by the preservative manufacturer for decay and termite protection.

END OF SECTION

SECTION 06605

FIBERGLASS REINFORCED PLASTIC PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide fiberglass reinforced polyester panel system for adhesive mounting with integral moldings, adhesive, and joint sealants for complete installation.

1.2 REFERENCES

- A. ASTM D 256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 1997.
- B. ASTM D 523 - Standard Test Method for Specular Gloss; 1989 (Reapproved 1994).
- C. ASTM D 570 - Standard Test Method for Water Absorption of Plastics; 1998.
- D. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics; 1997.
- E. ASTM D 696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer; 1998.
- F. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 1997.
- G. ASTM D 792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement; 1998.
- H. ASTM D 968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive; 1993.
- I. ASTM D 1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes; 1987 (Reapproved 1998).
- J. ASTM D 2197 - Standard Test Methods for Adhesion of Organic Coatings by Scrape Adhesion; 1998.
- K. ASTM D 2486 - Standard Test Method for Scrub Resistance of Wall Paints; 1996.
- L. ASTM D 2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor; 1995.
- M. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1998.

1.3 SUBMITTALS

- A. Submit in accordance with SECTION 01330 – SUBMITTAL PROCEDURES.
 - 1. Product Data: Manufacturer's data sheets on each product to be used, including:

- a. Preparation instructions and recommendations.
- b. Storage and handling requirements and recommendation
- c. Installation methods.
- d. Selection Samples: For each finished specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns
- e. Maintenance Instructions

1.4 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.

1.5 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Marlite
 - 2. Kemlite
 - 3. Crane Composites
 - 4. Approved equal.
- B. Panels, components, fasteners and adhesives shall be from one manufacturer's system or as approved for use by panel manufacturer.

2.2 PANEL SYSTEM

- A. Plastic Panel System: Factory finished panels, trim, sealant, and accessories. Manufacturer and system named in these specifications for design purposes to establish acceptable level of quality only.
- B. FRP Panels; fiberglass reinforced polyester
- C. Thickness: 3/32 inch (2.4 mm), nominal.
- D. Width: 48 inches (1220 mm).
- E. Height: (as required)
- F. Surface Burning Characteristics: Flame spread index of 200 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E 84 (Class C/III).

- G. Flexural Strength: 17,000 psi (117 MPa), when tested in accordance with ASTM D 790.
- H. Flexural Modulus: 600,000 psi (4137 MPa), when tested in accordance with ASTM D 790.
- I. Tensile Strength: 8,000 psi (55 MPa), when tested in accordance with ASTM D 638.
- J. Tensile Modulus: 9,430 psi (65 MPa), when tested in accordance with ASTM D 638.
- K. Barcol Hardness: 40, when tested in accordance with ASTM D 2583.
- L. Impact Resistance: 7 ft-lb/in (1225 N/m), when tested in accordance with ASTM D 256, Izod method.
- M. Coefficient of Thermal Expansion: 0.0000157 in/in/degree F (0.0000283 mm/mm/degree C), measured in accordance with ASTM D 696.
- N. Water Absorption: 0.17 percent, when tested in accordance with ASTM D 570.
- O. Specific Gravity: 1.53, when tested in accordance with ASTM D 792.
- P. Surface Texture: Gently pebbled, high-gloss.
- Q. Surface Texture: High-gloss, smooth.
- R. Color: As selected by the Architect from manufacturer's standard selection.
- S. Panel Trim: Extruded PVC, in manufacturer's standard colors.
- T. Outside corners, inside corners, edge trim, and division molding.
- U. Base Molding: Integral, coved, molding to provide seal at base of wall panel system. Provide factory made corners and splices.
- V. Borders: 4 inch (100 mm) wide decorative strips made of same material as panels.
- W. Sealant: Silicone Sealant; gunnable silicone rubber as recommended by panel manufacturer.
- X. Color: As selected to match panels and accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Take panels out of cartons and allow to acclimatize to room conditions for at least 48 hours 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. Clean surfaces thoroughly prior to installation.
- D. Protect existing surfaces from damage due to installation.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use the adhesives recommended by the panel manufacturer unless prohibited by local regulations; obtain manufacturer's approval of alternative adhesives.
- C. Install panels to align simulated grout joints.
- D. Install continuous bead of silicone sealant in each joint and trim groove and between trim and adjacent construction, maintaining 1/8 inch (3 mm) expansion space.
- E. Avoid contamination of panel faces with adhesives, solvents, or cleaners; clean as necessary and replace if not possible to repair to original condition.
- F. Protect installed products until completion of project.
- G. Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION

SECTION 07210
BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. The extent of building insulation work is shown on the drawings, by the generic name.
- B. The types of building insulation specified in this section include, but are not limited to, the following:
 - 1. Thermal and acoustical batt insulation for walls and partitions.
 - 2. Thermal rigid insulation for roof at supported (deck) framing.
 - 3. Reflective bubble foil insulation.
 - 4. Thermal rigid insulation for exterior insulation finish system.
- C. Related Work Specified in Other Sections:
 - 1. SECTION 07620 – FLASHING AND SHEETMETAL
 - 2. SECTION 07700 – ROOF ACCESSORIES.

1.2 QUALITY ASSURANCE

- A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by "R"-values they represent the rate of heat flow through a homogenous material exactly 1-inch thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.
- B. 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.
 - 3. ANSI/SPRI and FM rating for wind uplift as required to meet structural design criteria as indicated on drawings.

1.3 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.

- 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.

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. Open Flame: Do not use open flame around insulation materials.
- C. Do not use unfaced insulation in exposed applications where there is potential for skin contact and irritation.

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 MATERIALS

- A. Thermal Rigid Insulation at Supported (Concrete or Wood Deck) Roof Below Single Ply TPO Membrane Roofing with Polyisocyanurate Board: ASTM C 1289 Type II, felt faced, or Type I, foil-faced, except minimum compressive strength shall be 20 pounds per square inch, R = 20 minimum.
- B. Thermal Rigid Insulation for roof slope: Nominal 2.0 lb/ft³ (16 kg/m³) Expanded Polystyrene (EPS) insulation board in compliance with ASTM E 2430 and ASTM C 578 Type I requirements (Note: minimum required thickness is 1 inch and maximum allowable thickness is 12 inches when installed in accordance with ICC-ES ESR 1720).

2.2 ACCESSORIES

- A. Accessories shall be approved by manufacturer and shall comply with ANSI/SPRI and FM requirements for wind uplift, as determined by structural design criteria indicated on drawings.

- B. Adhesive: As recommended by the insulation manufacturer.
- C. 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 roof and 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 or 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. For thermal insulation the actual installed thickness shall provide the R-values shown or specified.
 - 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.

3.2 PROTECTION

- A. Protect installed insulation and facing from harmful weather exposures and from possible physical abuses, where possible by nondelayed installation of concealing work or, where that is not possible, by temporary covering or enclosure.

END OF SECTION

SECTION 07410

PREFORMED METAL ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Extent of preformed metal roofing is indicated on the drawings and by provisions of this section. Provide all materials, including all flashings for a complete system.
- B. Type of panels required include the following: Formed sheet panels, intended for exposed fastener installation.
- C. Work includes associated structural secondary framing.
- D. Related Work Described Elsewhere:
 - 1. Furnish matching prefinished sheet metal matching roof material for indicated prefinished related flashings specified in SECTION 07600 - SHEET METAL FLASHING AND TRIM.

1.2 QUALITY CONTROL

- A. Installer: The roofing system installer shall be factory-trained, approved by the metal roofing system manufacturer to install the system, and shall have a minimum of 3 years experience as an approved applicator with that manufacturer. The applicator shall have applied five installations of similar size and scope as this project within the previous 3 years.
- B. Installation Crew: Provide and maintain same foreman and crew from start to finish of work unless change is approved by the Director and manufacturer's representative. Workmen who will be walking on roof panels shall wear soft-soled shoes that will not damage the panels.
- C. Manufacturer's Technical Representative: The representative shall have authorization from manufacturer to approve field changes and shall be thoroughly familiar with the products and with installations in the geographical area where construction will take place. The manufacturer's representative shall be an employee of the manufacturer or their local representative.

1.3 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Manufacturer's Data: Submit manufacturer's product specifications, standard details, installation instructions and general recommendations, as applicable to materials and finishes for each component and for total system of preformed panels.
- C. Shop Drawings: Submit shop drawings of all roofing, flashing, fastenings, supports, anchors, and clearances, and connection details to the Director for acceptance.
- D. Samples: Furnish selection chart of available colors to be used to Director for approval.

- E. Test Reports: Provide test data demonstrating structural capacity, wind uplift and resistance to water infiltration performance as specified.
- F. Manufacturer's Technical Representative's Reports: Submit copies of all reports to the Director.
- G. Warranty: Submit warranty as noted under item entitled "WARRANTY" herein below.
- H. Information Card: For each roof project, furnish a typewritten information card for facility records and a card laminated in plastic, attached as directed by the Director. 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 roofing, underlayment, 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; roofing manufacturer's material warranty expiration date; warranty reference number, and warranty contact information. See Roofing Information Card at end of this section.

1.4 WARRANTY

- A. The warranty provisions and number of years for the warranties required by this article shall take precedence over the standard provisions in the GENERAL CONDITIONS.
- B. Project Warranty: Submit Contractor's warranty, signed jointly by Roofing Installer covering the work of this section, including all components of roof system without monetary limitation, in which roof installer and manufacturer(s) agree to repair or replace components of roofing system that fail in materials or workmanship for the warranty period specified below.
 - 1. Failures include, but are not limited to, the following: Structural failures, loose parts, wrinkling or buckling, failure to remain weathertight, including uncontrolled water leakage, deterioration of metals, metal finishes, and other materials beyond normal weathering, including nonuniformity of color or finish, galvanic action between sheet metal roofing, and dissimilar materials.
 - 2. A structural failure is defined as a failure to withstand, without damage, basic wind speeds up to 105 mph, Exposure C, and Importance Factor as indicated, as defined by the current edition of the ICC IBC Building Code adopted by the County of Hawaii for the applicable building heights.
 - 3. Warranty Period: Two years from the Project Acceptance Date.
 - 4. Warranty shall cover repairs or replacement of damages to the building and its finishes due to leaks.
 - 5. Warranty shall state the Manufacturer's acceptance that the roof was installed in accordance with the contract requirements and that the Contracting Officer's personnel were properly instructed in the maintenance procedures.
 - 6. In the event of a failure, Contracting Officer Roofing Installer, and Manufacturer shall mutually agree and determine roof system failures and remedies.

- C. Special Warranty on Finishes: On manufacturer's standard form which manufacturer agrees to repair finish or replace sheet metal roofing that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer 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: Twenty years from the Project Acceptance Date.
 - 3. The Surety will not be held liable beyond 2 years of the Project Acceptance Date.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle preformed panels, bulk roofing products and other manufactured items in a manner to prevent damage or deformation.
- B. Delivery: Provide adequate packaging to protect materials during shipment. Do not uncrate materials until ready for use except for inspection. Immediately upon arrival of materials at jobsite, inspect materials for damage, dampness, and staining. Replace damaged or permanently stained materials that cannot be restored to like-new condition with new material. If materials are wet, remove moisture, restack and protect panels until used.
- C. Storage: Stack materials stored on the site on platforms or pallets and cover with tarpaulins or other suitable weathertight coverings which prevent water trapping or condensation. Store panels so that water which might have accumulated during transit or storage will drain off. Do not store the panels in contact with materials that might cause staining, such as mud, lime, cement, fresh concrete or chemicals. Protect stored panels from wind damage.
- D. Handling: Handle material carefully to avoid damage to surfaces, edges and ends.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Roof Panels: Formed from minimum 24 gauge "Zincalume" or "Galvalume" coated steel conforming to ASTM A 792/A 792M, Grade 33 with a minimum AZ50 coating. Panel configuration shall be corrugated roofing with exposed fasteners. Panel shall be corrugated, 7/8-inch high. Panels shall have 32-inch coverage and continuous lengths. Roofing shall be as manufactured by HPM Building Supply Custom Metal Roofing "Commercial-Rib (Pattern 7)" or equal products as manufactured by Macsteel Service Centers USA, Custom-Bilt Metals, Architectural Metal Products, Tomen Building Components, Inc., Centria, MBCI Metal Roof and Wall Systems, Knudson, or approved equal. Panels shall be prefinished as specified.
- B. Flashing: Formed of prefinished material to match roof panels of manufacturer's standard flashings for the panels specified. Configuration of flashings shown on the drawings are intended to indicate basic intent. Other flashings which accomplish the basic intent will be acceptable if standard with the panel manufacturer. Provide metal flashings for locations indicated. Furnish

sheet metal flashing items in 8- to 10-foot lengths and in widths to provide profiles shown. Single pieces less than 8-feet long may be used at corners, and at ends of runs. Provide accessories and other items essential to complete the sheet metal installation of the same materials as the items to which they are applied. Connect all pieces of linear flashing by a slip joint to permit thermal movement. Exposed flashings and metal closure strips shall match finish of roof panel.

2.2 METAL FINISH

- A. General: Apply coatings either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability. Provide low-gloss/low sheen Ultra-Cool color indicated or, if not otherwise indicated, as selected by the Director.
- B. For exposed exterior surfaces, provide thick finish of Kynar 500 conforming to AAMA 605.2 with a primer and Kynar topcoat of 1 mils.
- C. Interior/underside finish shall be off white polyester washcoat of 0.5 mil or better.
- D. Provide a finish touch up kit for coating system at field cut edges and touch up of abraded areas.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners: Fasteners shall be stainless steel with composite metal and neoprene composition washers. Lengths shall be as required for roofing system to meet the indicated wind resistance criteria. Where required, exposed fasteners shall be gasketed on the exterior side of the covering to waterproof the covering and finished to match roof finish.
- B. Accessories: Except as indicated as work of another specification section, provide components required for a complete roofing system, including stainless steel clips, standoff clips, sidelap clips, and uplift clips; trim, flashings and expansion joint flashing; single component polyurethane sealants, gaskets, fillers, closure strips and similar items. All clips shall be stainless steel. Match materials/finish of preformed roof panels where exposed.
- C. Closure Strips: Formed specifically for this purpose of laminated cross-linked polyethylene closed cell-foam or neoprene materials and as standard with manufacturer. Molded closure strips shall be free of open voids and shall not absorb or retain water. Closure strips shall be formed to match configurations of the roofing and shall be provided where indicated and where necessary to provide weathertight construction.
- D. Sealants: ASTM C 920, Type S, Grade NS, Class 25, Use NT, polyurethane or as recommended by the roofing manufacturer. Color, where exposed, shall match roofing.
- E. Mastic: As recommended by the roofing manufacturer.
- F. Bituminous Coating: Cold-applied asphalt mastic, SSPC paint 12, compounded for 15-mil dry film thickness per coat.
- G. Underlayment: Polypropylene based roofing underlayment with UV stabilized polyolefin coating, Grace Tri-Flex 30 or approved equal.
- H. Flexible Flashing: Aluminum foil faced 45 mil rubberized asphalt or butyl rubber roll sheet as recommended by roofing manufacturer for waterproofing top set flashings.

2.4 PANEL FABRICATION; PERFORMANCES

- A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, and as required to fulfill performance requirements, which have been demonstrated by factory testing. Comply with indicated profiles and dimensional requirements, and with structural requirements. Fabricate panels in full lengths from ridge to eave to the greatest extent possible.
- B. Metal Gauges: Thicknesses required for structural performances, but not less than manufacturer's recommended minimums for profiles and applications indicated, and not less than specified under "Roof Panels".
- C. Closure Strips: Formed specifically for this purpose of laminated cross-linked polyethylene closed cell-foam or neoprene materials and as standard with manufacturer. Molded closure strips shall be free of open voids and shall not absorb or retain water. Closure strips shall be formed to match configurations of the roofing and shall be provided where indicated and where necessary to provide weathertight construction.
- D. Required Performances: Fabricate panels and other components of roof system for the following installed-as-indicated performances:
 - 1. Roof Loading: As indicated.
 - 2. Project Windloads: 110 mph, Exposure C.
 - 3. Panels must meet minimum UL windload uplift classification of 90.
- E. Performance Criteria:
 - 1. Provide wind uplift resistance in accordance with the current local ICC IBC as amended, minimum UL580 Class 90 and to meet the following wind criteria:
 - a. V effective = 110 mph
 - b. Exposure C
 - c. Live Roof Load = 20 psf
 - d. Occupancy Category = II
 - 2. Structural capacity of metal roofing system shall be determined in accordance with ASTM E 1592. A minimum of two tested spans are required in order to interpolate allowable load data between tested spans. Extrapolation of data outside the tested spans is not allowed.
 - 3. Provide a design analysis signed by a registered Professional Director, confirming that the structural capacity of the metal roofing system as determined in accordance with ASTM E 1592 is adequate to resist the design loads required by the International Building Code. Analysis shall include calculation verifying the design loads, the uplift pressures, and how those loads affect the various areas of discontinuity clearly shown and distinguished from the typical field roof elements.

4. Resistance to Water Infiltration: Roofing system shall show no infiltration at seams, edges, flashings, counterflashings and penetrations when subjected to a rainfall of 5-inches per hour with 80 mph wind.
5. Thermal Movement: The system shall be capable of withstanding thermal movement based on a temperature range of 10 degrees F below design low air temperature and 140 degrees F for light colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive metal roofing and flashing. Provide plumb and true surfaces, clean, even, smooth and as dry as possible. Ensure that surfaces are free from defects and projections which might affect the installation.
- B. Report unsuitable conditions to the Director. The Manufacturer's Technical Representative shall approve roof substrate as suitable for roofing system application.

3.2 INSTALLATION

- A. General: Comply with panel fabricator's and material manufacturers' instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the work securely in place in full and firm contact with concealed anchor clips with provisions for thermal/structural movement as well as carrying the weight of the panels. Obtain acceptance prior to installation on prefinished panels cut in the field and factory applied coverings or coatings that were repaired after being abraded or damaged during handling or installation. Make repairs with material of same color as weather coating. Completely seal openings through panels. Correct defects or errors in materials in an approved manner. Replace materials which cannot be corrected in an approved manner with new materials. Provide molded closure strips where indicated and where necessary for weathertight construction.
- B. Apply roofing panels with corrugation parallel to slope of roof. Fasten roofing panels at high point of corrugation at spacing required by manufacturer to meet wind resistance criteria specified, assuring that fasteners are anchored securely into roof framing. Dents, depressions or damage to roofing panel caused by fastening shall be cause for replacement of panel. Paint heads and washers of fasteners to match roofing.
- C. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4-inch in 20'-0" on level/plumb/slope and location line as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles. Layout lines parallel to the rakes at intervals. Use a spacing gage at each row of panels to ensure that panel width is not stretched or shortened.
- D. All field cutting of roofing panels shall be done mechanically, no saw or abrasive cutting will be allowed. Cut ends shall be touched up with paint to match roof finish as provided by manufacturer.
- E. Joint Sealers: Install joint fillers and sealants where indicated and where required for weatherproof performance of panel system. Provide types of sealants/fillers indicated or, if not otherwise indicated, types recommended by panel manufacturer. Refer to SECTION 07920 - SEALANTS of these specifications for installation requirements applicable to indicated joint sealers.

- F. Roof installation shall be for conditions indicated.
- G. Flashings: Provide flashing and related closures and accessories in connection with preformed metal panels as indicated and as necessary to provide a weathertight installation. Install flashing to ensure positive water drainage away from roof penetrations. Flash and seal roof at ridge, valleys, eaves and rakes, at projections through roof, and elsewhere as necessary. Accomplish placement of closure strips, flashing, and sealing material in an approved manner that will ensure complete weathertightness. Details of installation which are not indicated shall be in accordance with the NRCA CD, SMACNA ASMM, panel manufacturer's printed instructions and details of the accepted shop drawings. Installation shall allow for expansion and contraction of flashing.
- H. Flashing Fasteners: Fastener spacings shall be in accordance with the panel manufacturer's recommendations and as necessary to withstand the indicated design loads. Install exposed fasteners in panel valleys as recommended by the manufacturer of the panels. Install fasteners in straight lines within a tolerance of 1/2-inch in the length of a bay. Drive exposed penetrating type fasteners normal to the surface and to a uniform depth to seat gasketed washers properly and drive so as not to damage factory applied coating. Exercise extreme care in drilling pilot holes for fastenings to keep drills perpendicular and centered. Do not drill through sealant tapes. After drilling, remove metal filings and burrs from holes prior to installing fasteners and washers. Torque used in applying fasteners shall not exceed that recommended by the manufacturer. Remove panels deformed or otherwise damaged by over-torqued fastenings, and provide new panels.
- I. Closure, Closure Strips: Install closure strips as indicated and as recommended by the manufacturer.
- J. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with wood or other substrate materials which are non-compatible (i.e. copper and aluminum) or could result in corrosion or deterioration of either material or finishes

3.3 CLEAN UP AND PROTECTION

- A. Damaged Units: Replace panels and other components of the work which have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures. Touch-up paint shall not be used without the permission of the Director.
- B. Cleaning: Upon completion of panel installation, clean finished surfaces as recommended by panel manufacturer, and maintain in a clean condition during construction. Remove metal shavings, filings, nails, bolts, and wires from roofs and gutters on completion to prevent discoloration and harm to the panels and flashing. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces shall be free of dents, creases, waves, scratch marks, and solder or weld marks.

3.4 MANUFACTURER'S FIELD INSPECTION

- A. Manufacturer's technical representative shall visit the site as necessary during the installation process to assure panels, flashings, and other components are being installed in a satisfactory manner. Manufacturer's technical representative shall perform a field inspection of the installation at substantial completion and prior to issuance of warranty. After each site visit, a report, signed by the manufacturer's technical representative, shall be submitted to the Director noting the overall quality of work, deficiencies and any other concerns, and recommended corrective actions in

detail. Notify the Director a minimum of 2 working days prior to site visit by manufacturer's technical representative.

- B. Cleaning: Upon completion of panel installation, clean finished surfaces as recommended by panel manufacturer, and maintain in a clean condition during construction. Remove metal shavings, filings, nails, bolts, and wires from roofs and gutters on completion to prevent discoloration and harm to the panels and flashing. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces shall be free of dents, creases, waves, scratch marks, and solder or weld marks.

ROOFING INFORMATION CARD

FACILITY

Building Name _____ Building Desig/No. _____

Job No. _____

ROOF

Type of Roof System _____ Type of Deck _____

Type of Underlayment _____ No. of Plies _____

Product Name/Style _____ Product Color _____

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 07600

FLASHING AND SHEET METAL

PART 1 – GENERAL

1.1 SUMMARY

- A. Provide all labor, materials and equipment necessary to fabricate and install flashing, counterflashing, metal edging, gutters and downspouts, and other related work as shown on drawings and as specified herein.
- B. Related Work Described Elsewhere:
 - 1. Coordinate installation of sheet metal work with SECTION 07410 - PREFORMED METAL ROOFING.
 - 2. Sealants are specified under SECTION 07920 - SEALANTS.

1.2 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Manufacturer's Data: Submit manufacturer's product data on all manufactured items.
- C. Shop Drawings: Submit shop drawings with reference made to detail numbers on the contract drawings to the Director for approval. Contract drawings are general in nature. Furnish additional details for all the similar and unusual conditions necessary to fabricate the flashing and sheet metal work. Shop drawings shall show all fasteners and relationship to adjacent work. No fabrication will be permitted before approval is secured. Tracing or reproducing drawing details is unacceptable.
- D. Samples: Submit 3 samples of prefinished metal finishes to match colors as indicated or scheduled.
- E. Warranty: Submit warranty as stipulated in item entitled "WARRANTY" hereinbelow.

1.3 QUALITY ASSURANCE

- A. All sheet metal fabrications shall conform to State and local codes, SMACNA (latest edition) and industry standards.
- B. All roof penetrations shall be installed weathertight in such a manner to maintain integrity of the roofing.
- C. Fastening and cleating shall withstand all positive and negative wind pressures as indicated for various locations of building as indicated.

1.4 STORAGE AND HANDLING

- A. All materials shall be stored in such a manner as to afford adequate protection. Damaged materials shall not be used and shall be removed from the site.

1.5 WARRANTY

- A. The warranty provisions and number of years for the warrantee by this article shall take precedence over the standard provisions in the GENERAL CONDITIONS.
- B. Project Warranty: Submit Contractor's warranty, signed jointly by Installer covering work of this section, including all components of flashing system such as panels, base flashing, roofing accessories, fasteners, curbs, collar flashing, and other products, for the following warranty period and conditions:
 - 1. Warranty Period: Two years from the Project Acceptance Date.
 - 2. Warranty shall cover repairs or replacement of damages to the building and its finishes due to leaks.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Galvanized Steel: Minimum 24 gauge galvanized sheet metal, ASTM A 653/A 653M, G90 hot-dip galvanized, mill phosphatized where indicated for painting.
- B. Flashings Associated with Metal Roofing: Provide materials from the same source and finish as metal roofing provided under SECTION 07410 - PREFORMED METAL ROOFING.
- C. Nails and Fasteners: Use the same metal or a metal compatible with the item. Use stainless steel fasteners to fasten dissimilar metals.
- D. Underlayment: ASTM D 226, Type I (No. 15), asbestos-free, asphalt saturated roofing felt.
- E. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 but containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

PART 3 – EXECUTION

3.1 INSTALLATION AND WORKMANSHIP

- A. Surface to which sheet metal is to be applied shall be even, smooth, sound, thoroughly clean and dry, and free from defects that might affect the application. Report any unsatisfactory surfaces to the Director. In the absence of such a report, the Contractor shall be held responsible for the finished product.
- B. All accessories or other items essential for the completeness of the sheet metal installation, though not specifically indicated on the drawings or specified, shall be provided. All such items unless otherwise indicated on the drawings or specified, shall be of the same kind of materials as the item to be applied. Nails, screws, rivets, and bolts shall be of the type best suited for the purpose intended and shall be of a composition that is compatible with the metal to which it will contact.
- C. Except as otherwise indicated on the drawings or specified, the workmanship of sheet metal work, method of forming joints, anchoring, cleating, provisions for expansion, etc., shall conform to the standards details and recommendations of the Sheet Metal and Air Conditioning Contractors National Association's "Architectural Sheet Metal Manual", and shall be subject to the approval of the Director. Exposed edges shall be folded back neatly to form a minimum 1/2-inch hem on the concealed side. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration

of the work.

- D. Seams: Straight and uniform in width and height with no sealants showing on the face.
 - 1. Flat-lock Seams: Finish not less than 3/4-inch wide.
 - 2. Lap Seams: Finish soldered seams not less than one-inch wide. Overlap seams not soldered, not less than 3-inches.
 - 3. Loose-lock Expansion Seams: Not less than 3-inches wide, and shall provide minimum one-inch movement within the joint. Joint shall be completely filled with exterior sealant, applied at not less than 1/8-inch thick bed.
 - 4. Flat Seams: Make seams in the direction of the flow.
- E. All sheet metal work shall be watertight and wind-tight in compliance with the purpose intended for the items indicated on the drawings or specified herein. Sheet metal shall be held firmly in place and shall not rattle.
- F. Cleating: Cleats for sheet metal work shall be provided where required, continuous, unless otherwise indicated on the drawings. Cleats shall be of the same material and weight as the metal being installed. Hook cleating with 3/4-inch minimum hem on concealed side of flashing.
- G. Protection from Contact of Dissimilar Materials: Surfaces in contact with dissimilar metal shall be painted with heavy-bodied bituminous paint or shall be separated by means of moisture-proof building felts.

3.2 PROTECTION

- A. Protect all sheet metal work until final acceptance of the building.

3.3 CLEAN UP

- A. Clean all exposed sheet metal work at completion of installation. Grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris shall be removed, and the work scrubbed clean. All exposed metal surfaces shall be free of dents, creases, waves, scratch marks, and solder or weld marks.
- B. At completion of the work, clean up and remove all rubbish and debris from the premises which resulted from this work.

END OF SECTION

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide all labor, materials and equipment necessary to fabricate and install flashing, counterflashing, metal edging, gutters and downspouts, and other related work as shown on drawings and as specified herein.
- B. Related Work Described Elsewhere:
 - 1. Coordinate installation of sheet metal work with SECTION 07531 - SINGLE PLY TPO MEMBRANE ROOFING.
 - 2. Sealants are specified under SECTION 07920 - SEALANTS.

1.2 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Manufacturer's Data: Submit manufacturer's product data on all manufactured items.
- C. Shop Drawings: Submit shop drawings with reference made to detail numbers on the contract drawings to the Contracting Officer for approval. Contract drawings are general in nature. Furnish additional details for all the similar and unusual conditions necessary to fabricate the flashing and sheet metal work. Shop drawings shall show all fasteners and relationship to adjacent work. No fabrication will be permitted before approval is secured. Tracing or reproducing drawing details is unacceptable.
- D. Certificates: Submit manufacturer's certificates or written certification by an engineer registered in the State of Hawaii that edge securement for low-slope roofing and copings, conform with ANSI/SPRI ES-1.
- E. Samples: Submit 3 samples of prefinished metal finishes to match colors as indicated or scheduled.
- F. Warranty: Submit warranty as stipulated in item entitled "WARRANTY" hereinbelow.

1.3 QUALITY ASSURANCE

- A. All sheet metal fabrications shall conform to State and local codes, SMACNA (latest edition) and industry standards.
- B. All roof penetrations shall be installed weathertight in such a manner to maintain integrity of the roofing.
- C. Fastening and cleating shall withstand all positive and negative wind pressures as indicated for various locations of building as indicated.

- D. ANSI/SPRI ES-1-98 Test Method RE-3: Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems (current edition). The coping system shall be tested simultaneously on horizontal and vertical surfaces and shall exceed horizontal and vertical design wind pressure as calculated in accord with the ANSI/SPRI ES-1-98 Test RE-3. Use the current edition of ANSI/SPRI ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

1.4 STORAGE AND HANDLING

- A. All materials shall be stored in such a manner as to afford adequate protection.
- B. Damaged materials shall not be used and shall be removed from the site.

1.5 WARRANTY

- A. The warranty provisions and number of years for the warrantee by this article shall take precedence over the standard provisions in the GENERAL CONDITIONS.
- B. Project Warranty: Submit Contractor's warranty, signed jointly by Installer covering work of this section, including all components of flashing system such as panels, base flashing, roofing accessories, fasteners, curbs, collar flashing, and other products, for the following warranty period and conditions:
 - 1. Warranty Period: Two years from the Project Acceptance Date.
 - 2. Warranty shall cover repairs or replacement of damages to the building and its finishes due to leaks.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Galvanized Steel: Minimum 24 gauge galvanized sheet metal, ASTM A 653/A 653M, G90 hot-dip galvanized, mill phosphatized where indicated for painting.
- B. Copper: 16 oz.
- C. Nails and Fasteners: Use the same metal or a metal compatible with the item. Use stainless steel fasteners to fasten dissimilar metals.
- D. Splash Blocks: Splash blocks of 12-inch wide x 16-inch long x 4-inch deep size shall be formed with depressions in top surface to drain away from building and shall be reinforced as standard with the manufacturer. Block shall be equal to Concrete Creations of Hawaii - Splash Block or approved equal.
- E. Underlayment: ASTM D 226, Type I (No. 15), asbestos-free, asphalt saturated roofing felt.
- F. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 but containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

PART 3 - EXECUTION

3.1 INSTALLATION AND WORKMANSHIP

- A. Surface to which sheet metal is to be applied shall be even, smooth, sound, thoroughly clean and dry, and free from defects that might affect the application. Report any unsatisfactory surfaces to the Contracting Officer. In the absence of such a report, the Contractor shall be held responsible for the finished product.
- B. All accessories or other items essential for the completeness of the sheet metal installation, though not specifically indicated on the drawings or specified, shall be provided. All such items unless otherwise indicated on the drawings or specified, shall be of the same kind of materials as the item to be applied. Nails, screws, rivets, and bolts shall be of the type best suited for the purpose intended and shall be of a composition that is compatible with the metal to which it will contact.
- C. Except as otherwise indicated on the drawings or specified, the workmanship of sheet metal work, method of forming joints, anchoring, cleating, provisions for expansion, etc., shall conform to the standards details and recommendations of the Sheet Metal and Air Conditioning Contractors National Association's "Architectural Sheet Metal Manual", and shall be subject to the approval of the Contracting Officer. Exposed edges shall be folded back neatly to form a minimum 1/2-inch hem on the concealed side. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work.
- D. Seams: Straight and uniform in width and height with no sealants showing on the face.
 - 1. Flat-lock Seams: Finish not less than 3/4-inch wide.
 - 2. Lap Seams: Finish soldered seams not less than one-inch wide. Overlap seams not soldered, not less than 3-inches.
 - 3. Loose-lock Expansion Seams: Not less than 3-inches wide, and shall provide minimum one-inch movement within the joint. Joint shall be completely filled with exterior sealant, applied at not less than 1/8-inch thick bed.
 - 4. Flat Seams: Make seams in the direction of the flow.
- E. All sheet metal work shall be watertight and wind-tight in compliance with the purpose intended for the items indicated on the drawings or specified herein. Sheet metal shall be held firmly in place and shall not rattle.
- F. Cleating: Cleats for sheet metal work shall be provided where required, continuous, unless otherwise indicated on the drawings. Cleats shall be of the same material and weight as the metal being installed. Hook cleating with 3/4-inch minimum hem on concealed side of flashing.
- G. Protection from Contact of Dissimilar Materials: Surfaces in contact with dissimilar metal shall be painted with heavy-bodied bituminous paint or shall be separated by means of moisture-proof building felts.

3.2 PROTECTION

- A. Protect all sheet metal work until final acceptance of the building.

3.3 CLEAN UP

- A. Clean all exposed sheet metal work at completion of installation. Grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris shall be removed, and the work scrubbed clean. All exposed metal surfaces shall be free of dents, creases, waves, scratch marks, and solder or weld marks.
- B. At completion of the work, clean up and remove all rubbish and debris from the premises which resulted from this work.

END OF SECTION

SECTION 07920

SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Completely close with sealant all joints indicated or specified to be sealed to a watertight condition.
- B. Related Work Described Elsewhere:
 - 1. Roofing sealant is provided under SECTION 07531 – SINGLE PLY TPO MEMBRANE ROOFING.

1.2 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Manufacturer's Data: Submit copies of manufacturer's product data and specifications for type of sealant required, to the Contracting Officer for approval.
- C. Material Safety Data Sheets (MSDS): Submit MSDS for each sealant product.
- D. Color Samples: Submit sets of color finish samples of sealants.
- E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Warranty: Submit warranty as stipulated in item entitled "WARRANTY" hereinbelow.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to sealant manufacturers, for testing samples of materials that will contact or affect sealants. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain optimum adhesion of sealants to joint substrates. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant

products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

- D. Stain-Test Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

1.4 PRODUCT HANDLING

- A. Delivery: Deliver sealants to the jobsite 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.
- B. Storage: Carefully handle and store all materials to prevent inclusion of foreign materials. Remove from project site all damaged and deteriorated materials and materials exceeding shelf life.
- C. All sealant materials shall be handled in accordance with the manufacturer's specifications and installed prior to expiration of shelf life.

1.5 WARRANTY

- A. Provide a 2-year written warranty against leaks, air infiltration, cracks, and other failures of the installation and materials.
- B. Repair of sealants to seal leaks caused by faulty materials or workmanship;
- C. Repair or replace damage to the building or its finishes, equipment or furniture when occasioned by such leaks.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content and Interior Sealants and Sealant Primers: Comply with the following limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: Not more than 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: Not more than 250 g/L.
 - 3. Sealant Primers for Porous Substrates: Not more than 775 g/L.
- C. Sealants:
 - 1. At Exterior and Interior Vertical and Overhead Moving Joints: One-part polyurethane-based sealant, conforming to ASTM C 920, Type S, Grade NS, Class 25, Use NT. Provide one of the following, or approved equal:

- a. Dymonic; Tremco, Inc.
 - b. Chem-Calk 900; Bostik Construction Products Div.
 - c. Sikaflex 1 a; Sika Corp.
 - d. Dynatrol I; Pecora Corp.
 - e. NP-1; Sonneborn.
2. At Interior Vertical and Overhead Non-Moving Joints: Non-Elastomeric Sealant; acrylic-emulsion type, conforming to ASTM C 834. Provide one of the following, or approved equal:
- a. AC-20 Acrylic Latex; Pecora Corp.
 - b. Tremco Acrylic Latex 834; Tremco, Inc.
 - c. Chem-Calk 600; Bostik Construction Products Div.
 - d. Sonolac; Sonneborn.
3. Silicone Sealant: At Perimeter of All Plumbing Fixtures and Fittings: One-part mildew-resistant silicone sealant conforming to ASTM C 920, Type S, Grade NS, Class 25, Use NT, formulated with fungicide; intended for sealing interior joints with non-porous substrates. For use in kitchens and food preparation areas provide sealant complying with FDA requirements. Provide one of the following, or approved equal:
- a. Dow Corning 786; Dow Corning Corp.
 - b. SCS 1700 Sanitary; General Electric Co.
 - c. Tremsil 600 White; Tremco, Inc.
 - d. Omni Plus; Sonneborn.
 - e. 898 or 893, No. 345; Pecora Corp.
 - f. Concealed Joints: Non-drying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
 - 1) BA-98; Pecora Corp.
 - 2) Tremco Acoustical Sealant; Tremco.
 - 3) Pro-Series SC-170; Ohio Sealants.
- D. Primer for Sealants: Non-staining, as recommended by the sealant manufacturer.
- E. Sealant Backer Rod: Compressible rod stock of polyethylene foam, polyethylene-jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable, nonabsorptive material as recommended for compatibility with sealant by the sealant manufacturer to control the joint depth 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 backer which will minimize the possibility of sealant extrusion when joint is compressed. Do not use oakum or other types of absorptive materials as backstops.
- F. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer.

- G. Masking Tape: Non-staining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.

3.2 EXAMINATION

- A. Examine joint widths, 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.

3.3 JOINT 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; waterproofing; water repellants; 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. Steel Surfaces in Contact with Sealant: Scrape and wirebrush to remove loose mill scale. Remove dirt, oil, or grease by solvent cleaning, and wipe surfaces with clean cloths.
 5. Clean metal, glass, glazed surfaces of ceramic tile, 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 sealers.
 6. Do not permit solvents to air dry. Wipe surfaces free of solvent using clean, dry white cloth or white lintless paper.
- 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.
- D. Examine joint size and correct to achieve depth ratio of 1/2 of joint width with a minimum width and depth of 1/4-inch, maximum width of 1-inch unless specifically allowed otherwise by the sealant manufacturer.

3.4 INSTALLATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions. Proceed with the work only when weather conditions are favorable for proper cure and development of high early bond strength.
- C. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.
- D. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 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 movement 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. Primer: Immediately prior to application of the sealant, clean out all loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete, masonry units, wood, and other porous surfaces in accordance with compound manufacturer's instructions. Do not apply primer to exposed finish surfaces.
- G. 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.

- H. Tooling of Nonsag Sealants: Immediately after sealant application 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.

3.5 CLEAN UP

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

END OF SECTION

SECTION 08210

WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Extent and location of each type of wood door is indicated on drawings and in schedules.
- B. Types of doors required include solid core flush wood doors with painted wood veneer faces.
- C. Related Work Described Elsewhere:
 - 1. Preservative treatment is specified in SECTION 06311 – PRESERVATIVE TREATED LUMBER.
 - 2. Door hardware is provided under SECTION 08710 – FINISH HARDWARE. Door producer shall review and certify the finish hardware schedule is in conformance with the doors being furnished.
 - 3. Painting of doors is specified in SECTION 09900 – PAINTING.

1.2 SUBMITTAL

- A. Submit in accordance with SECTION 01300 – SUBMITTAL PROCEDURES.
- B. Manufacturer's Data: Door manufacturer's technical data for each type of door, including details of core and edge construction, and trim for openings and louvers.
- C. Shop Drawings: Submit shop drawings indicating location and size of each door, door swing, stile and rail dimensions, veneers, elevation of each kind of door, details of construction, all openings and louvers, location and extent of hardware blocking, fire ratings, and other pertinent data.
- D. Warranty: Submit warranty as stipulated in item entitled "WARRANTY" hereinbelow.

1.3 QUALITY ASSURANCE

- A. WDMA Quality Standard: ANSI/WDMA I.S.-1A "Wood Flush Doors", of Wood Door Manufacturers Association (WDMA).
- B. WDMA Quality Marking: Mark each wood door with WDMA Wood Door Certification Hallmark certifying compliance with applicable requirements of ANSI/WDMA I.S.-1A Series. For manufacturers not participating in WDMA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.
- C. Wood Smoke Barrier Doors: Provide wood doors which are identical in materials and construction to non-smoke barrier doors for assemblies that comply with ICC IBC Section 407.
- D. Factory seal all doors on all 6 sides using manufacturer's standard.
- E. Manufacturer: Obtain doors of similar finish from a single manufacturer.
- F. Doors shall be shop finished to reduce jobsite odor.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of ANSI/WDMA I.S.-1A Section G-20 "Care and Installation at Job Site", as well as with manufacturer's instructions.
- B. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.
- C. Do not walk on or stack other materials on top of stacked doors. Do not drag doors across one another.
- D. For all doors not factory finished, seal all four edges immediately after delivery.
- E. Store doors away from threat of termite or other insect infestation.
- F. Plastic wrapping shall be cut to allow doors to acclimatize once they are protected from the weather.

1.5 PROJECT CONDITIONS

- A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project's geographical location: AWI Section 100-S-3 "Moisture Content".

1.6 WARRANTY

- A. General: Warranties shall be in addition to, and not a limitation of, other rights the County may have under the Contract Documents.
- B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards. Where door manufacturer's warranty is voided by local preservative treatment, warranty shall be by the Contractor
 - 1. Warranty shall be in effect during following minimum period of time after date of Substantial Completion, unless longer warranty is standard with the manufacturer.
 - 2. Solid Core Interior Doors: Two years.
- C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 – PRODUCTS

2.1 FLUSH SOLID CORE WOOD DOORS

- A. Solid Core Doors for Opaque (Paint) Finish: Comply with the following requirements:
 - 1. Faces: Mahogany or any closed-grain hardwood of mill option.
 - 2. Grade: NWWDA Standard.

3. Construction: SLC-5 or SLC-7 (Glued block core, 5- or 7-ply).

2.2 FABRICATION

- A. Wood Doors: Fabricate wood doors to produce doors in sizes indicated for job-site fitting. Stile edge bands of doors to receive natural finish shall be hardwood, compatible with face veneer. No visible finger joints will be accepted in stile edge bands. When used, locate finger-joints under hardware.
- B. Adhesives: Adhesives shall be in accordance with WDMA I.S.-1A, requirements for Type II Bond Doors (water repellent) for interior doors. Adhesive for doors to receive a transparent finish shall be nonstaining. Adhesives shall contain no formaldehydes.
- C. Finish Hardware: Locate hardware to comply with DHI-WDHS-3 and each door that is an element of an accessible route shall comply with the ADA/ABAA Section 404.2.7. Comply with finish hardware schedules, door frame shop drawings, DHI A115-W series standards, and hardware templates.

2.3 PRESERVATIVE TREATMENT

- A. Treat all solid core doors at factory with water repellent after manufacturing has been completed, in accordance with WDMA Industry Standard I.S.-4 "Water-Repellent Preservative Non-Pressure Treatment for Millwork" and as specified under SECTION 06311 – PRESERVATIVE TREATED LUMBER.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine installed door frames prior to hanging door:
 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 2. Reject doors with defects that cannot be repaired in a manner that is imperceptible. Replace doors which cannot be field repaired to match new as approved by the Project Manager at no additional cost to the Project Manager. Doors warped in excess of 1/4-inch when measured in accordance with ANSI/WDMA I.S.-1A shall be rejected.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation see SECTION 08710 – FINISH HARDWARE.
- B. Manufacturer's Instructions:
 1. Install wood doors to comply with manufacturer's instructions and referenced WDMA standard and as indicated.
 2. Install smoke barrier doors in corresponding frames for assemblies that comply with ICC IBC Section 407 as amended. Securely affix installation instructions to each door.
- C. Job Fit Doors: Align and fit doors in frame with uniform clearances and bevels as indicated below;

do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

1. Fitting Clearances for Non-Rated Doors: Provide 1/8-inch at jambs and heads; and 1/2-inch from bottom of door to top of decorative floor finish or covering unless undercut as scheduled. Where threshold is shown or scheduled, provide 3/8-inch clearance from bottom of door to top of threshold unless indicated for undercut.
2. Bevel non-rated doors 1/8-inch in 2-inches at lock and hinge edges.

D. Prefit Doors: Fit to frames for uniform clearance at each edge.

3.3 ADJUSTING AND PROTECTION

- A. Operation: Rehang or replace doors which are hinge bound and do not swing or operate freely. Replace or rehang doors which are warped, twisted, or which are not in true planes.
- B. Protection: Protect doors as recommended by door manufacturer to assure that wood doors will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 08220

FIBERGLASS REINFORCED PLASTIC DOORS AND FRAMES

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section Includes the following:
 - 1. Fiberglass Reinforced Plastic (FRP) Doors.
 - 2. Fiberglass Resin Transfer Molded Door Frames
- B. Related Sections Include The Following:
 - 1. Division 8 – Finish Hardware.

1.2 QUALITY ASSURANCE

- A. Reference Standards.
 - 1. Door Properties.
 - a. Successfully completed 1,000,000 cycles test in accordance with:
 - 1) AAMA 920-03 – Specification for Operating Cycle Performance of Side-Hinged Exterior Door Systems.
 - 2) ANSI A250.4-2001 – Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings
 - 2. Laminate Properties

Door face plate is a minimum of 0.125 inch thick fiberglass reinforced plastic molded into one continuous sheet starting with a 25 mil resin-rich gelcoat layer resin integrally molded with multiple layers of 1.5 oz. sq ft fiberglass mat and one layer of 18 oz per square yard fiberglass woven roving saturated with special resin. Door plate weight shall not be less than 0.97 lbs per square foot at a ratio of 30/70 glass resin.
 - 3. Core Properties
 - a. ASTM C 177 Thermal Properties of Materials
 - b. ASTM D 1622 Density and Specific Gravity
 - c. ASTM E 84 Surface Burning Characteristics of Materials
 - d. WDMA TM-10 and TM-5 Firestop ASTM E 152 U.L 10(b)
 - e. ASTM E90-04- Sound Transmission Loss
 - f. ASTM E413-04- Classification for Rating Sound Insulation
 - g. ASTM E1332-90- Standard Classification for Determination of Outdoor-Indoor Transmission Class
 - h. ASTM E2235-04- Standard Test for Determination of Decay Rates for Use in

Sound Insulation Methods

B. Qualifications

1. Manufacturer Qualifications: A company specialized in the manufacture of fiberglass reinforced plastic (FRP) doors and frames as specified herein with a minimum of 20 years documented experience and with a record of successful in-service performance for the applications as required for this project.
2. Installer Qualifications: An experienced installer who has completed fiberglass door and frame installations similar in material, design, and extent to those indicated and whose work has resulted in construction with a record of successful in-service performance.
3. Source limitations: Obtain fiberglass reinforced plastic doors and resin transfer molded fiberglass frames through one source fabricated from a single manufacturer.
4. Source limitations: Hardware and accessories for all FRP doors as specified in Section 08710 shall be provided and installed by the fiberglass door and frame manufacturer or certified fabricator approved by the Manufacturer.

1.4 SUBMITTALS

A. Product Technical Data Including:

1. Acknowledgment that products submitted meet requirements of standards referenced
2. Manufacturer shall provide certificate of compliance with current local and federal regulations as it applies to the manufacturing process
3. Manufacturer's installation instructions.
4. Schedule of doors and frames indicating the specific reference numbers used on the owner's project documents, noting door type, frame type, size, handing and applicable hardware.
5. Details of core and edge construction. including factory construction specifications.
6. Certification of manufacturer's qualifications.

B. Shop Drawings for Customer Approval Shall be Submitted Prior to Manufacture and Will Include the Following Information and Formatting:

1. Summary door schedule indicating the specific reference numbers as used on owner's drawings, with columns noting door type, frame type, size, handing, accessories and hardware.
2. A drawing depicting front and rear door elevations showing hardware with bill of material for each door.
3. Drawing showing dimensional location of each hardware item and size of each door.
4. Individual part drawing and specifications for each hardware item and FRP part or product
5. Construction and mounting detail for each frame type.

6. Documented Strength of Frame screw holding value after third insert must be submitted.

C. Samples:

1. Provide three 3"x 3" samples of door finished surface, including molded in gelcoat color and face plate construction.
2. Provide color chart of manufacturer's standard range of colors.

D. Operation and Maintenance Manual

1. Include recommended methods and frequency for maintaining optimum condition of fiberglass doors and frames under anticipated traffic and use condition.
2. Include certificate of warranty for door and frame listing specific door registration numbers.
3. Include hardware data sheets and hardware manufacturer's warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Each door and frame shall be delivered individually crated for protection from damage in cardboard containers, clearly marked with project information, door location, specific reference number as shown on drawings, and shipping information. Each crate shall contain all fasteners necessary for installation as well as complete installation instructions.

1. Doors shall be stored in the original container on edge, out of inclement weather for protection against the elements.
2. Handle doors pursuant to the manufacturer's recommendations as posted on outside of crate.

1.6 WARRANTY

A. All fiberglass doors and frames shall have a lifetime guarantee against failure due to corrosion. Additionally, fiberglass doors and fiberglass frames shall be guaranteed for ten years against failure due to materials and workmanship, including warp, separation or delamination, and expansion of the core.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Chem-Pruf Door Co., Ltd., Tier Door, Chase Doors / Fib-R-Dor or approved equal. Manufacturer named purely for design purposes and to demonstrate level of quality and performance.
- B. Substitutions may be considered, provided manufacturer can comply with the specifications as written herein and said products are manufactured in the United States of America.

2.2 FRP DOORS

A. Doors shall be made of fiberglass reinforced plastic (FRP) using Class 1 premium resin with no fillers that is specifically tailored to resist chemicals and contaminants typically found in

environment for which these specifications are written. Doors shall be 1 ¾ inch thick and of flush construction, having no seams or cracks. For consistency in the resin chemistry tailored for this application and to maintain the same physical properties throughout the structure, all fiberglass components including face plates, stiles and rails and frames must be fabricated by the same manufacturer.

- B. Door Plates shall be 0.125 inch thick minimum, molded in one continuous piece, starting with 25 mil gelcoat of the color specified, integrally molded with multiple layers of 1.5 ounces per square foot fiberglass mat and one layer of 18 ounce per square yard fiberglass woven roving. Each layer shall be individually laminated with resin as described above. Door plate weight shall not be less than 0.97 lbs per square foot at a ratio of 30/70 glass to resin. Face plates manufactured using the pultrusion process be allowed. Finish shall be "Small Pebble" textured finish.
- C. Stiles and Rails shall be constructed starting from the outside toward the inside, with a matrix of at least three layers of 1.5 ounce per square foot of fiberglass mat. The stile and rail shall be molded in one continuous piece to a U-shaped configuration and to the exact dimensions of the door. No miter joints and disparate materials shall be allowed to form the one-piece stile and rail.
- D. Core material shall be Polypropylene plastic honeycomb core with a non woven polyester veil for unparalleled plate bonding, 180 PSI typical compression range unless otherwise requested.
- E. Internal Reinforcement shall be #2 SPF of sufficient amount to adequately support required hardware and function of same.
- F. Finish of door frame shall be gloss with 25 mil resin-rich gelcoat of the specified color integrally molded in at time of manufacture resulting in a smooth gloss surface that is dense and non-porous. Gelcoat shall be cured within a temperature range of 120F to 170F creating an impermeable outer surface, uniform color throughout, and a permanent homogeneous bond with the resin/fiberglass substrate beneath. Paint and/or post application of gelcoat will be unacceptable for this application. The finish of the door and frame shall be field repairable without compromising the integrity of the original uniform composite structure, function or physical strength.

2.3 FRP FRAMES

- A. Frames (rated and non-rated) shall be fiberglass and manufactured using the resin transfer method creating one solid piece (no voids) with complete uniformity in color and size. Beginning with a minimum 25 mil gelcoat layer molded in and a minimum of two layers of continuous strand fiberglass mat saturated with resin, the frame will be of one-piece construction with molded stop. All frame profiles shall have a core material of 2 psf polyurethane foam. Metal frames or pultruded fiberglass frames will not be accepted.
- B. Finish of frame shall be identical to the door with 25 mil resin-rich gelcoat of the specified color integrally molded in at time of manufacture. Gelcoat shall be cured within a temperature range of 120F to 170F creating an impermeable outer surface, uniform color throughout, and a permanent homogeneous bond with the resin/fiberglass substrate beneath. Paint and/or post application of gelcoat will be unacceptable for this application. The finish of the door and frame must be field repairable without compromising the integrity of the original uniform composite structure, function or physical strength.
- C. Jamb/Header connection shall be mitered for tight fit.
- D. Internal Reinforcement shall be continuous within the structure to allow for mounting of specified hardware. Reinforcing material shall be a dense matrix of cloth glass fibers and premium resin with a minimum hinge screw holding value of 1000 lbs per screw. All reinforcing materials shall be completely encapsulated. Dissimilar materials, such as steel, will be deemed unacceptable as

reinforcement for hardware attachment.

- E. Mortises for hardware shall be accurately machined by CNC to hold dimensions to +/- 0.010 inch in all three axis.
- F. Hinge pockets shall be accurately machined by CNC to facilitate heavy duty hinges at all hinge locations, using shims when standard weight hinges are used.

2.4 HARDWARE

- A. See Section 08710
- B. All related hardware as specified for FRP doors shall be furnished and installed by the door frame manufacturer.

PART 3 – EXECUTION

3.1 INSTALLATION CONDITIONS

- A. Verification of Conditions
 - 1. Verify openings are correctly prepared to receive doors and frames.
 - 2. Verify openings are correct size and depth in accordance with submittal drawings.
- B. Installer's Examination.
 - 1. Door installer shall examine conditions under which construction activities of this section are to be performed and submit a written report to general contractor if conditions are unacceptable.
 - 2. Installer shall not proceed with installation until all unacceptable conditions have been corrected.

3.2 INSTALLATION

- A. Install door opening assemblies in accordance with shop drawings and manufacturer's printed installation instructions, using installation methods and materials specified in installation instructions.
- B. Field alteration of doors or frames to accommodate field conditions without the Manufacturer's consent is strictly prohibited..
- C. Site tolerances: Maintain plumb and level tolerance specified in manufacturer's printed installation instructions..

3.3 ADJUSTING

- A. Adjust doors in accordance with the door manufacturer's maintenance instructions to swing open and shut without binding and to remain in place at any angle without being moved by gravitational influence.
- B. Adjust door hardware to operate correctly in accordance with hardware manufacturer's maintenance instruction.

3.4 CLEANING

- A. Clean surfaces of door opening assemblies and exposed door hardware in accordance with respective manufacturer's maintenance instructions..

3.5 PROTECTION OF INSTALLED PRODUCTS

- A. Protect door opening assemblies and door hardware from damage by subsequent construction activities until final inspection.

END OF SECTION

SECTION 08511

ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Extent of aluminum windows is shown on drawings. Type of window includes the following: Projected window and fixed windows.
- B. Related Work Described Elsewhere:
 - 1. Sealants shall be exterior type for moving joints as specified in SECTION 07920 – SEALANTS.
 - 2. Glazing requirements, including windows specified to be factory glazed are included under GLAZING - SECTION 08800.

1.2 PRE-CONSTRUCTION SUBMITTALS

- A. Manufacturer's Data: Submit manufacturer's descriptive literature and data along with shop drawings for approval.
- B. Shop Drawings: Submit shop drawings to the Contracting Officer for approval. Do not fabricate prior to acceptance.
- C. Samples: Submit 3 samples of required finish. Submit samples of finishes, including hardware to the Contracting Officer for acceptance.
- D. Test Reports: Where manufacturer's data does not clearly indicate conformance with performance requirements submit test reports from an independent laboratory certifying performance requirements of all exterior systems.
- E. Certification: Supply certification by the manufacturer that the windows, including finish, conform to specifications.

1.3 POST-CONSTRUCTION SUBMITTALS

- A. Warranty: Submit warranty as stipulated in item entitled "WARRANTY" hereinbelow.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Provide systems produced by a firm with at least 5 years of experience in the fabrication of aluminum windows of the types required for this project.
- B. To establish quality and type, the following specifications are based on products manufactured by EFCO Inc. Similar products of Kawneer, Peerless Products Inc., Arcadia, Architectural Products, Oldcastle Glass, United States Aluminum, Corp., and Vistawall and other manufacturers as approved, will be considered provided they meet the design criteria, profiles, and specifications, and when submitted for substitution approval in accordance with GENERAL CONDITIONS.

1.5 WARRANTY

- A. Provide a written warranty from the manufacturer or his authorized representative and countersigned by the Contractor, that the completed work will not be defective in workmanship, materials or installation (including watertightness of the entire application) for a period of 2 years from the date of final acceptance and that repair or replacement of any defective work will be done promptly. This warranty does not extend to defects caused by unusual abuse.

1.6 PERFORMANCE REQUIREMENTS

- A. Standards:
 - 1. Comply with the applicable provisions of the Architectural Aluminum Manufacturers Association (AAMA).
 - 2. International Code Council, International Building Code (ICC IBC)
 - 3. American Society of Civil Engineers, Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE/SEI 7-16)
 - 4. American Society for Testing and Materials or ASTM International (ASTM)
- B. Submit evidence of compliance to the following minimum requirements for exterior windows.
 - 1. Thermal Movement: Fabricate exterior components from manufacturer's stock systems which have been designed to provide for expansion and contraction resulting from ambient temperature range of 120 degrees F.
 - 2. Wind Loading: Fabricate exterior components from manufacturer's stock systems which have been tested in accordance with ASTM E 330 to withstand wind velocity and Exposure specified in accordance with current ICC IBC and ASCE 7, partially endorsed condition, no terrain effects as amended.
 - 3. Weather Resistance: Fabricate window components from manufacturer's stock systems which have been tested to demonstrate permanent resistance to leakages as follows:
 - a. Air Infiltration: Not more than 0.10 cfm per metre of sash when tested in accordance with ASTM E 283 at pressure difference of 6.24 psf.
 - b. Water Infiltration: No uncontrolled water shall pass the interior vertical face of the window when tested in accordance with ASTM E 331 at pressure difference of 12.0 psf.
 - 4. Uniform Load Deflection: When closed and locked, a minimum static air pressure difference of 65 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of 1/175 of the span of any framing member.
 - 5. Uniform Load Structural Test: When closed and locked, a minimum static air pressure difference of 97 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. The unit shall be evaluated after each load.
 - 6. Forced Entry Resistance: All windows shall conform to AAMA 1302.5 or ASTM F 588, Performance Level 10.

1.7 PROTECTIVE COVERING

- A. Prior to shipment from the factory, finished surfaces of aluminum shall receive a protective covering. Covering shall not chip, peel, or flake due to temperature or weather, and shall protect against discoloration and surface damage from transportation, storage, and construction activities. Covering shall be readily removable without affecting the finish.

1.8 DELIVERY AND STORAGE

- A. Materials delivered to the jobsite shall be inspected for damage and stored according to manufacturer's recommendations. Damaged windows shall be repaired to an "as new" condition or replaced if materials cannot be repaired.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum extrusions shall conform to ASTM B 221 or ASTM B 221M, 6063-T5 alloy and temper.

2.2 ALUMINUM WINDOWS

- A. General: All windows shall conform to the requirements of ANSI/AAMA 101, and shall bear the AAMA label for type of classification specified.
- B. Fasteners: All exposed fasteners shall be stainless steel. Perimeter anchors shall be hard aluminum or stainless steel. Exposed fasteners shall match finish of adjoining material.
- C. Weatherstripping: Provide for ventilating sections of all windows to ensure a weathertight seal meeting the infiltration requirements specified in ANSI/AAMA 101. Provide easily replaceable factory-applied weatherstripping. Use molded vinyl, molded or molded-expanded neoprene or molded or expanded Ethylene Propylene Diene Terpolymer (EPDM) weatherstripping for compression contact surfaces. Use treated woven pile or wool, or polypropylene or nylon pile bonded to nylon fabric and metal or plastic backing strip weatherstripping for sliding surfaces. Do not use neoprene or polyvinylchloride weatherstripping where they will be exposed to direct sunlight. Weather stripping shall withstand the 120 degree temperature range.
- D. PVC Filler: Provide manufacturer's PVC filler to assist in shimming and sealing the perimeter of the units.

2.3 FINISH

- A. All exposed aluminum surfaces shall be free of scratches and other blemishes. Provide clear anodized finish conforming to Aluminum Association Standard AA DAF-45, "Designation System for Aluminum Finishes" AA-M12-C22-A41, Architectural Class I, (0.7 mil of greater) and AAMA 611, "Anodized Architectural Aluminum", for all exposed surfaces, including fasteners and hardware.
- B. Color to match aluminum windows of the finish of existing aluminum windows.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions are in accordance with manufacturer's acceptable tolerances. Verify field measurements for window installation.

3.2 INSTALLATION

- A. Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, and other components of work.
- B. Set units plumb, level, and true to line, without warp or rack of frames or sash. Anchor securely in place.
- C. Seal frames with an elastomeric sealant in color to match frames, making a neat fully weatherproof job, comply with requirements of SECTION 079200 – JOINTS AND SEALANTS.
- D. Dissimilar Materials: Provide separation of aluminum materials and other corrodible surfaces from sources of corrosion or electrolytic action contact points by complying with AAMA 101, Appendix, titled "Dissimilar Materials".

3.3 PROTECTION

- A. After installation, protect by masking or other acceptable covering all exposed parts of the work from damage by grinding and polishing machines and/or by cement, acid or other harmful substances.

3.4 ADJUSTING AND CLEANING

- A. Clean and maintain aluminum surfaces in accordance with AAMA 609, "Cleaning and Maintenance of Architectural Anodized Aluminum".
- B. Clean surfaces promptly after installation of windows, exercising care to avoid damage to protective finishes. Remove temporary coverings and protection from adjacent surfaces. Remove excess glazing and sealant compounds, dirt and other substances. Lubricate hardware and moving parts. Repair or replace damaged installed materials.

END OF SECTION

SECTION 08530

VINYL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Extent of vinyl windows is shown on drawings. Type of window includes the following: Sliding, Jalousie, Double-hung, Hopper, Pass Through, Casement and Fixed Windows..
- B. Scope of Work
 - 1. Sealants shall be exterior type for moving joints as specified in SECTION 07920 - SEALANTS.
 - 2. Glazing requirements, including windows specified to be factory glazed are included under SECTION 08800 - GLAZING.

1.2 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Manufacturer's Data: Submit manufacturer's descriptive literature and data along with shop drawings for approval.
- C. Shop Drawings: Submit shop drawings to the Project Manager for approval. Do not fabricate prior to acceptance.
- D. Samples: Submit three samples of required finish. Submit samples of finishes, including hardware to the Project Manager for acceptance.
- E. Test Reports: Where manufacturer's data does not clearly indicate conformance with performance requirements submit test reports from an independent laboratory certifying performance requirements of all exterior systems.
- F. Certification: Supply certification by the manufacturer that the windows, including finish, conform to specifications.
- G. Warranty: Submit warranty as stipulated in Article 1.04 "WARRANTY".
- H. Maintenance Manual: Submit three maintenance manuals for each type of window and finish.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Provide systems produced by a firm with at least five years of experience in the fabrication of windows of the types required for this project.

- B. To establish quality and type, the following specifications are based on products manufactured by Milgard but equal products from Fleetwood, Jeld Wen Windows and other manufacturers as approved, will be considered provided they meet the design criteria, profiles, and specifications, and when submitted for substitution approval in accordance with GENERAL CONDITIONS.

1.4 WARRANTY

- A. Provide a written warranty from the manufacturer or his authorized representative and countersigned by the Contractor, that the completed work will not be defective in workmanship, materials or installation (including watertightness of the entire application) for a period of two years from the date of final acceptance and that repair or replacement of any defective work will be done promptly. This warranty does not extend to defects caused by unusual abuse.
- B. Manufacturer's Commercial Warranty: Ten Year Warranty, guaranteed against defects in materials and workmanship including costs for replacement parts and labor.

1.5 PERFORMANCE REQUIREMENTS

- A. Submit evidence of compliance to the following minimum requirements for exterior windows.
 - 1. Thermal Movement: Fabricate exterior components from manufacturer's stock systems which have been designed to provide for expansion and contraction resulting from ambient temperature range of 120 degrees F.
 - 2. Wind Loading: Fabricate exterior components from manufacturer's stock systems which have been tested in accordance with ASTM E 330 to withstand wind velocity of 105 mph, Exposure C in accordance with current ICC IBC and ASCE 7, partially endorsed condition, no terrain effects as amended.
 - 3. Weather Resistance: Fabricate window components from manufacturer's stock systems which have been tested to demonstrate permanent resistance to leakages as follows:
 - a. Air Infiltration: Not more than 0.10 cfm per foot of sash when tested in accordance with ASTM E 283 at pressure difference of 6.24 psf.
 - b. Water Infiltration: No uncontrolled water shall pass the interior vertical face of the window when tested in accordance with ASTM E 331 at pressure difference of 12.0 psf.
 - 4. Uniform Load Deflection: When closed and locked, a minimum static air pressure difference of 65 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of 1/175 of the span of any framing member.
 - 5. Uniform Load Structural Test: When closed and locked, a minimum static air pressure difference of 97.5 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. The unit shall be evaluated after each load.

1.6 PROTECTIVE COVERING

- A. Prior to shipment from the factory, finished surfaces of vinyl shall receive a protective covering. Covering shall not chip, peel, or flake due to temperature or weather, and shall protect against discoloration and surface damage from transportation, storage, and construction activities. Covering shall be readily removable without affecting the finish. Covering shall be either adhesive paper, waterproof tape, or strippable plastic.

1.7 DELIVERY AND STORAGE

- A. Materials delivered to the jobsite shall be inspected for damage, and shall be unloaded with a minimum of handling. Use care in handling and hoisting windows during transportation and at the jobsite. Store windows and components out of contact with the ground, under a weathertight covering, so as to prevent bending, warping, or otherwise damaging the materials. Windows shall not be covered with tarps, polyethylene film, or similar coverings.
- B. Damaged windows shall be repaired to an "as new" condition as approved. If materials cannot be repaired, provide a new unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Milgard.
 - 2. Fleetwood
 - 3. Jeld Wen Windows
 - 4. Coastal Windows
 - 5. Or other approved manufacturer and products.
- B. Basis of Design: To establish quality, performance, and type; the following specifications are based on products manufactured by Milgard.
- C. Substitutions will be considered provided the products and manufacturer meet the design criteria, profiles, these specifications; and when submitted prior to bid for approval in accordance with Division 01.

2.2 VINYL SLIDING, HOPPER, CASEMENT AND FIXED WINDOWS

- A. General: All windows shall conform to the requirements of ANSI/AAMA, and shall bear the AAMA label for type of classification specified. Commercial C-40 Rating.
- B. All frame and sash corners shall be coped, tenon joined and welded.
- C. Hardware: Hardware shall be heavy duty. Cam locking hardware, strikes, and keepers shall be high pressure die-cast zinc. Finishes shall be stainless steel. All hardware fasteners penetrating frame or inside plane of window shall be factory sealed with resilient non-hardening compound.

- D. Sliding System for Sliding Windows: Delrin rollers
- E. Fasteners: All exposed fasteners shall be type 304 or 316 stainless steel. Perimeter anchors shall be type 304 or 316 stainless steel. Exposed fasteners shall match finish of adjoining material.
- F. Weather-stripping: Provide for ventilating sections of all windows to ensure a weathertight seal meeting the infiltration requirements specified in ANSI/AAMA 101. Provide easily replaceable factory-applied weather-stripping. Use molded vinyl, molded or molded-expanded neoprene or molded or expanded Ethylene Propylene Diene Terpolymer (EPDM) weather-stripping for compression contact surfaces. Use treated woven pile or wool, or polypropylene or nylon pile bonded to nylon fabric and metal or plastic backing strip weather-stripping for sliding surfaces. Do not use neoprene or polyvinylchloride weatherstripping where they will be exposed to direct sunlight.
- G. PVC Filler: Provide manufacturer's PVC filler to assist in shimming and sealing the perimeter of the units.

2.3 JALOUSIE WINDOWS

- A. General: Principal frame to be surround type and sash sections must be extruded PVC.
- B. Construction
 - 1. Size Profile: 4-5/8" nominal frame depth.
 - 2. Frame Construction: Extruded sill with weeping system that allows for complete water drainage to the exterior
 - 3. Weatherstripping: Manufacturer's standard to comply with AAMA 701.2
 - 4. Glazing: Glass to be field installed per manufacturer's specifications. Glass vanes shall be 4" wide by 1/4" thick with exposed edges weberized or polished.
- C. Performance Rating:
 - 1. Air Infiltration: Assembly limited to 1.2 cfm/sq ft at 1.57 psf when tested in accordance with ASTM E 283.
 - 2. Water Infiltration: No water penetration of assembly when subjected to 6 gallons per sq ft per hour at 3.75 psf when tested n accordance with ASTM E 547.
 - 3. Uniform Structural Test Pressures: No glass breakage, permanent fastener or hardware damage or permanent deformation of any member in excess of 0.4% of its span at 45 psf when tested in accordance with ASTM E 330
- D. Hardware and Accessories:
 - 1. Locking Device: Manufacturer's standard locking mechanism. All pivoting systems enclosed.

2. Hardware Channels: All hardware channels to be of the extruded vinyl enclosed channel type.
3. Hardware Blade clips to be of injection molded ultraviolet stabilized polypropylene, each with two integral pivot studs on the back surface. Clips must be 1/4" wide to accommodate to accommodate 1/4" thick glass blades.
4. Operating lever to be of heavy-duty type, 6061-T6 aluminum 1/8" minimum thickness and be self-locking over center travel type. Operating levers to have eye cutouts lined with an injection molded smooth insert to facilitate hand or pole operation. No more than 7-4" slats or 5-6" slats shall be operated by one lever. Jalousie operator height shall conform to ADAAG 308 and 309. Provide permanently mounted extension for operating lever as required.
5. Hardware to be mounted against inside of vinyl frame heights, located near inside edge against raised vinyl shoulder.

2.3 FINISH

- A. Interior and Exterior: Standard White

PART 3 – EXECUTION

3.1 EXAMINATION

Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive window units and sill plate is level in accordance with manufacturer's acceptable tolerances. Verify field measurements for window installation.

3.2 PREPARATION

Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

3.3 INSTALLATION

- A. Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, and other components of work.
- B. Exterior Windows:
 1. Install windows to be weather-tight and freely operating.
 2. Maintain alignment with adjacent work.
 3. Secure assembly to framed openings, plumb and square, without distortion and within the specified in the manufacturer's installation instructions.

4. Field alteration of window or frames to accommodate field conditions is strictly prohibited.
- C. Weatherproofing
1. Integrate window system installation with exterior weather-resistant barrier using lashing/sealant tape. Apply and integrate flashing/sealant tape with weather-resistant barrier using watershed principles in accordance with door manufacturer's instructions.
 2. Place interior seal around window perimeter to maintain continuity of building thermal and air barrier using insulating-foam sealant.
 3. Seal window to exterior wall material with sealant and related backing materials at perimeter of assembly.
- D. Dissimilar Materials: Provide separation of aluminum materials and other corrodible surfaces from sources of corrosion or electrolytic action contact points by complying with AAMA 101, Appendix, titled "Dissimilar Materials".

3.3 INSTALLATION

- A. Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, and other components of work.
- B. Exterior Windows:
1. Install windows to be weather-tight and freely operating.
 2. Maintain alignment with adjacent work.
 3. Secure assembly to framed openings, plumb and square, without distortion and within the specified in the manufacturer's installation instructions.
 4. Field alteration of window or frames to accommodate field conditions is strictly prohibited.
- C. Weatherproofing:
1. Integrate window system installation with exterior weather-resistant barrier using lashing/sealant tape. Apply and integrate flashing/sealant tape with weather-resistant barrier using watershed principles in accordance with door manufacturer's instructions.
 2. Place interior seal around window perimeter to maintain continuity of building thermal and air barrier using insulating-foam sealant.
 3. Seal window to exterior wall material with sealant and related backing materials at perimeter of assembly.

- D. Dissimilar Materials: Provide separation of aluminum materials and other corrodible surfaces from sources of corrosion or electrolytic action contact points by complying with AAMA 101, Appendix, titled "Dissimilar Materials".

3.4 PROTECTION

- A. After installation, protect by masking or other acceptable covering all exposed parts of the work from damage by grinding and polishing machines and/or by cement, acid or other harmful substances.
- B. Initiate and maintain all protection and other precautions required to ensure that window units will be without damage or deterioration (other than normal weathering) at time of acceptance.

3.5 ADJUSTING AND CLEANING

- A. Adjust operating sash and hardware to provide tight fit at contact points and at weather-stripping, for smooth operations and weathertight closure.
- B. Clean surfaces promptly after installation of windows, exercising care to avoid damage to protective finishes. Remove temporary coverings and protection from adjacent surfaces. Remove excess glazing and sealant compounds, dirt and other substances. Lubricate hardware and moving parts. Repair or replace damaged installed materials.
- C. After completion of all other work in the vicinity of the windows, remove all masking and/or other covering used to protect the work and thoroughly clean surfaces as recommended by the window manufacturer. Do not use abrasive cleaning agents.

END OF SECTION

SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide all finishing hardware required for all doors and cabinet work, complete as specified.
- B. It is the intent of this Specification to cover in general the class and character of all finish hardware required.
- C. the hardware list specified has been made for the convenience of the Contractor and covers in general the necessary hardware for doors, casework, etc., but all other doors, etc., shown on the Drawings and not covered by the general characterization shall be fitted with appropriate hardware of the same standards as the hardware described throughout these specifications. Contractor shall furnish hardware schedule as specified.
- D. Suppliers proposing substitutes of equivalent products of other than the manufacturers named shall submit schedules listing the product and manufacturer specified and the product and manufacturer of proposed substitute. This schedule shall be submitted in accordance with the GENERAL CONDITIONS.
- E. Related Work Described Elsewhere:
 - 1. Door silencers are provided under SECTION 08220 – FIBERGLASS REINFORCED PLASTIC DOORS AND FRAMES.
 - 2. Coordinate the work with other directly affected sections involving manufacturer or fabrication of internal reinforcement for door hardware.

1.2 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Door Hardware Schedule: Furnish copies of the schedule of hardware in compliance with specifications and Drawings. Schedule format shall be vertical type as listed in DHI document "Sequence and Format for the Hardware Schedule". List each opening using same door numbers as shown and hardware to be applied. State materials finish, and manufacturer's number for each item. Required types are listed. Double space entries and number and date each page. Include the following information:
 - 1. Identification number, location, hand, fire rating and material of each door and frame.
 - 2. Type, style, function, size, quantity and finish of each door hardware item.
 - 3. Complete designations of every item required for each door opening including name and manufacturer.

4. Fastenings and other pertinent information.
 5. Location of each door hardware set, cross referenced to the Drawings, both on floor plans and in door schedules.
 6. Explanation of abbreviations, symbols, and codes contained in the schedule.
 7. Mounting locations for door hardware.
 8. Door and frame sizes and materials
 9. List of related door devices specified in other Sections for each door and frame.
- C. Manufacturer's Data: Submit manufacturer's descriptive literature along with schedule.
- D. Keying Schedule: Submit a keying schedule prepared by or under the supervision of the Architectural Hardware Consultant detailing final keying instructions for locks for approval by the Director; using keying nomenclature as listed in DHI document "Keying Terminology". Door designation listed in the Keying Schedule shall be same as those used on Drawings and Hardware Schedule. Include schematic keying diagram. Keying of locks shall be as directed by the Director.
- E. Tools and Maintenance Instructions: Furnish a complete set of special wrenches, tools, maintenance instructions applicable to each different or special hardware component, but not less than the number supplied with the finish hardware materials.
- F. Certification: After completion and inspection by hardware supplier or manufacturer's representative of all construction work, certify on an approved form, that all items of finish hardware have been adjusted and are working properly and factory assembly of all locks and cylinders as well as master keying of all locks and cylinders.
- G. Warranty: Submit written warranty as specified in paragraph entitled "WARRANTY" herein below.

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with current ICC IBC, as amended, NFPA 80 for fire doors, and NFPA 101 for exit doors as applicable. Required hardware shall bear the label of Underwriters Laboratories, Inc. and be listed in the current UL Building Materials Directory or labeled and listed by another testing laboratory acceptable to the Director.
- B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 3 years documented experience. Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.
- C. Hardware Supplier: Company specializing in architectural finish hardware.
- D. Hardware Supplier Personnel: Employ an experienced Architectural Hardware Consultant (AHC), or Director accepted equal, who is available at reasonable times during the course of the Work, to the Director and Contractor for consultation about Project's hardware requirements, to verify specified hardware with door function and hardware finishes, and to establish keying system.

- F. Manufacturer's Warranty Response Time: Complete repair or replacement within 36 hours after being notified by the user. If repair at the site is not possible because the exact make and model replacement is not available within the specified response time, a temporary substitute of equal quality shall be provided within the specified response time. If a temporary replacement is provided, the permanent repair/replacement response time will be extended to 7 calendar days.

1.4 REGULATORY REQUIREMENTS

- A. Conform to applicable code for accessibility and requirements applicable to fire rated doors and frames.
- B. Definition: "Door Hardware" includes items known commercially as finish hardware which are required for swing and sliding doors, except special types of unique and non-matching hardware specified in same Section as door and door frame.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Delivery, store, protect and handle products to prevent damage of any kind and to maintain security to site.
- B. Inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- C. Deliver individually packaged hardware items at proper times to proper lo-cations (shop or project site) for installation.
- D. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.
- E. Deliver permanent keys as directed by Director.
- F. Provide secure lock-up for hardware delivered to project but not yet in-stalled. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the Work will not be delayed by hardware losses, both before and after installation.

1.6 WARRANTY

- A. Locks shall have a minimum 5-year manufacturer's warranty.
- B. Door closers shall have a minimum 10-year manufacturer's warranty. Exterior door closers shall have warranty against failure due to high wind conditions (50 mph or less).
- C. Panic exit devices shall have a minimum 5-year manufacturer's warranty.
- D. The Surety shall not be liable for manufacturer's warranty beyond 1 year of the project acceptance date.
- F. Procedure for providing manufacturer warranty is described in General Conditions, Contractor shall complete the manufacturer's forms in the name of the Department and submit such forms to

the manufacturer with-in such time as required to validate the warranty/guaranty and submit the forms to the Director.

1.7 PROJECT RECORD DOCUMENTS

- A. Record actual locations of installed cylinders and their master key code.

1.8 OPERATION AND MAINTENANCE DATA

- A. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- B. The manufacturer's representative shall instruct the User's staff on the hardware's maintenance procedures (type of lubricant needed and frequency of maintenance).

PART 2 – PRODUCTS

2.1 SCHEDULED HARDWARE

- A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in HARDWARE GROUPS at end of this Section. Products are identified by using proprietary catalog numbers, and are used to establish quality and function of products desired.
- B. Product numbers indicated in the HARDWARE GROUPS are those of the manufacturers listed and are used to establish the quality of products in-tended.
- C. Products listed hereinafter are pre-approved as equals to those products listed in the HARDWARE GROUPS.

2.2 MATERIALS AND FABRICATION

- A. Hand of Door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of indicated door.
- B. Base Metals: Produce hardware units of basic metal and forming method specified, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for fin-ish designations indicated.
- C. Fasteners: Provide hardware manufactured to conform to published tem-plates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated. Fasteners exposed to the weather shall be non-ferrous metal or stainless steel.
- D. Furnish appropriate screws for installation, with each hardware item. Pro-vide Phillips flat head screws except as otherwise indicated. Finish ex-posed screws to match hardware finish. If exposed in surfaces of other work, to match finish of such other work as closely as possible, including prepared-for-paint finish in surfaces to receive painted finish.

- E. Provide concealed fasteners for hardware units which are exposed when door is closed, except to the extent no standard units of the type specified are available with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the Work. In such cases, provide sleeves for each through bolt or use sex screw fasteners.
- F. Expansion shields in concrete or masonry shall fill the depth and diameter of drilled holes.
- G. Bring to the attention of the Director any discrepancy between the Hardware Groups and door schedule prior to ordering.

2.3 HINGES

- A. General: Hinges shall conform to ANSI/BHMA A156.1, Grade 1 as a certified product by BHMA and the requirements of this specification.

- 1. The following hinges will be considered equal subject to project conditions:

- a. Hager:
 - Type 1: BB1279
 - Type 2: BB1191
 - Type 3: BB1168
 - Type 4: BB1199
- b. McKinney:
 - Type 1: TA2714
 - Type 2: TA2314
 - Type 3: T4A3786
 - Type 4: T4A3386
- c. Stanley:
 - Type 1: FBB179
 - Type 2: FBB191
 - Type 3: FBB168
 - Type 4: FBB199

- 2. Hinge Application Requirements:

- a. Exterior Outswing Doors: Type 4 x NRP.
- b. Exterior Inswing Doors and Vestibule Doors: Type 3 or 4.
- c. Interior Doors With Closers: Type 1 or 3.
- d. Interior Doors Over 36 Inches Wide. Type 4.
- e. Interior Doors 36 Inches or Less Without Closer: Type 1.

- B. Templates: Except for hinges to be installed entirely (both leaves) into wood doors and frames, provide only template producing units.

- C. Screws: Furnish Phillips flat head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges.
- D. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Nonferrous Hinges: Stainless steel pins.
 - b. Exterior, Out-swing Doors: Non-removable pins (NRP).
 - c. Interior Doors: Nonrising pins.
 - d. Tips: Flat button and matching plug, finished to match leaves.
 - e. Oil impregnated or ball bearing hinges are acceptable products.
- E. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90-inches or less in height and one additional hinge for each 30-inches of additional height.
- F. Size of hinges shall be as follows:

Door Thickness/Width	Hinge Height	Hinge Width
1-3/4 inches to 36-inches	4-1/2 inches	
1-3/4 inches over 36-inches	5-inches	
1-3/4 inches over 48-inches	5-inches	
4-1/2 inches extra heavy ball bearing		
4-1/2 inches extra heavy ball bearing		
4-1/2 inches extra heavy ball bearing		

Note: Hinge width shall be of sufficient size to clear frame and trim when door swings 180 degrees.

2.4 LOCK CYLINDERS AND KEYING

- A. Existing Schlage key system shall be verified by contractor. All locks shall be an extension of this system. All work shall be in compliance with requirements of this Section. Cylinders and cores shall have 6 pin tumblers unless scheduled otherwise.
- B. Provide the number of individual keys equal to not less than 4 times the number of cylinders provided. The number of keys cut to each key cut shall be as directed by the Director. All remaining keys shall be blanks. All locks shall be master keyed and Grandmaster keyed to a single lock system. During period of construction, all locks shall be operated by a special construction master key. Regular day and master keys are to be retained by the Contractor so they cannot be obtained or duplicated by unauthorized persons. All keys shall be stamped "DO NOT DUPLICATE" at the point of manufacture. The special construction master key shall become inoperative when regular keys are turned over to the Director. Proper certification of factory assembly of all locks and cylinders and master keying of all locks and cylinders shall be furnished by the Contractor prior to final acceptance of this portion of the work. Certificate shall then be given to the Director. Provide 10 construction master keys, 6 grand master keys, and 6 master keys per set.

- C. Removable Core Locks: This project shall require that all locks be provided with removable core locks and construction removable cores. Provide 4 control keys for removable cores and 10 percent but not less than 4 extra cores for the Director's use.
- D. Upon acceptance of the project, the Contractor shall arrange for temporary keys, obtained from custodian if further access is required.

2.5 LOCKS, LATCHES AND BOLTS

- A. General: Mortise locks and latches shall conform to ANSI/BHMA A156.13, Series 1000, Grade 1 unless Grade 2 is listed; bored locks and latches shall conform to ANSI/BHMA A156.2, Series 4000, Grade 1 unless Grade 2 is listed; auxiliary locks shall conform to ANSI/BHMA A156.5, Grade 1; bolts shall conform to ANSI/BHMA A156.16, Grade 1; ADA/ABA 404.2.7 and the requirements of this specification.
 - 1. The following mortise locksets and deadbolts will be considered equal:
 - a. Best 38H series, 40H Series.
 - b. Sargent 4800 series, 8200 series.
 - c. Schlage L400 series, L9000 series.
 - 2. The following cylindrical locksets and deadbolts will be considered equal:
 - a. Best 93K series, 83T Series.
 - b. Sargent 10 series, 480 series.
 - c. Sargent 11 series, 480 series.
 - d. Schlage "ND" series, B600 series.
- B. Mortise locksets shall be manufactured in a single sized case formed from 12-gauge minimum steel. The case shall be closed on all sides and back. The lockset shall have a field-adjustable, beveled armored front, with a 0.125-inch minimum thickness.
- C. Mortise locksets shall have freewheeling or breakaway vandal resistant design outside levers on all exterior doors. The freewheeling lever design shall allow the lever to swing freely up to 70 degrees, when the door is locked.
- D. Strikes: Provide manufacturer's standard wrought box strike for each latch of lock bolt, with lip extended to protect frame, finish matching hardware set. Provide dustproof recessed floor strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolts.
- E. Lock Throw:
 - 1. Provide 3/4-inch minimum throw of latch and one-inch minimum for deadbolt.
 - 2. Flush Bolt Heads: Minimum of 1/2-inch diameter rods of brass, bronze or stainless steel, with minimum 12-inches long rod for doors up to 7-feet in height; minimum 42-inches long rod for doors up to 9-feet 6-inches in height.

- F. Provide locksets, latches, and cylinders equal in all respects to those specified in the Hardware Groups.

2.6 CLOSERS AND DOOR CONTROL DEVICES

- A. General: Closers shall conform to ANSI/BHMA A156.4, Series CO2000, Grade 1, with features necessary for the particular application, UL10C listed for fire rated doors, ADA/ABA 404.2.7, and the requirements of this specification.
 - 1. The following closers will be considered equal for heavy use on exterior doors:
 - a. Corbin Russwin DC6000 series.
 - d. Doromatic SC71 series.
 - e. LCN 4041 Series, 4011/4111 Series.
 - f. Norton 7500 series.
 - g. Sargent 351 Series, 281 Series.
 - 2. The following closers will be considered equal for medium use on interior doors:
 - a. Corbin Russwin DC3000 series.
 - b. Doromatic SC81 series
 - c. LCN 1461 series.
 - d. Norton 8501 series.
 - e. Sargent 1431 series.
- B. Size of Units: Provide non-sized closers, adjustable to meet maximum opening force requirements of ADA. Comply with manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather, and anticipated frequency of use. Where parallel arm closers are installed, provide closer unit one size larger than recommended for use with standard arms.
- C. Closers shall have adjustment operating valves for closing speed, latching speed, and backcheck control as a standard feature.
- D. Provide parallel arm or regular arm closer as required to mount closer on door face least exposed to public traffic.
- E. Provide drop plates, brackets, or adapters for arms as required to suit de-tails or conditions.
- F. Closer covers shall be rectangular, full cover type, high impact non-corrosive, and flame retardant.
- G. Closer shall not require removal for adjustments to be made.
- H. Provide hold-open arms where indicated.

2.7 FLAT GOODS

- A. General: Flat goods shall conform to ANSI/BHMA A156.6 and the types listed in the HARDWARE GROUPS.
1. The products of the following manufacturers will be considered equal subject to project conditions:
 - a. Baldwin Hardware Corporation
 - b. Burns Manufacturing Incorporated
 - c. Hager Companies
 - d. Ives Hardware
 - e. Rockwood Manufacturing Company
 - f. Trimco
- B. Door plates for single doors shall be 2-inches less than door width. Door plates for double doors shall be 1-inch less than door width. Height of plate shall be as listed but 1-inch less than bottom rail for panel doors.

2.8 STOPS AND HOLDERS

- A. General: Stops and holders shall conform to ANSI/BHMA A156.16 and the types listed in the HARDWARE GROUPS.
1. The products of the following manufacturers will be considered equal subject to project conditions:
 - a. Architectural Builders Hardware MFG., Inc.
 - b. Baldwin Hardware Corporation
 - c. Burns Manufacturing Incorporated
 - d. Hager Companies
 - e. Ives Hardware
 - f. Trimco

2.9 THRESHOLDS

- A. General: Thresholds shall conform to ANSI/BHMA A156.21 and ADA/ABA 404.3.3.

Provide size, thickness, and profile as listed in the hardware groups

1. The products of the following manufacturers will be considered equal subject to project conditions:
 - a. Hager Companies
 - b. National Guard Products

- c. Pemko Manufacturing Co.
- d. Reese Enterprises
- e. Zero International

2.10 WEATHERSTRIPPING AND GASKETING

- A. General: Weather-stripping and smoke gasketing shall conform to ANSI A156.22 and the types listed in the HARDWARE GROUPS.
 - 1. The products of the following weatherstripping and gasketing man-ufacturers will be considered equal subject to project conditions:
 - a. Hager Companies
 - b. National Guard Products
 - c. Pemko Manufacturing Co.
 - d. Reese Enterprises
 - e. Zero International

2.11 FINISHES

- A. Finishes: Identified in schedule at end of Section.
 - 1. Designations used are those listed in ANSI/BHMA A156.18 "Materials and Finishes", including coordination with traditional U.S. finishes shown by certain manufacturers for their products.
 - 2. If no BHMA finishes are established, match specified product.
- B. Provide matching finishes for hardware units at each door or opening to greatest extent possible, except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where base metal or metal forming process is different for individual units of hardware exposed at same door or opening.
- C. 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 for applicable units of hardware by referenced standards.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Pre-Installation Meeting: Before start of work under this contract, the Contractor, hardware installer, hardware manufacturer's representative or supplier, the Director, and a user representative shall meet to review the keying system, hardware installation instructions, and installation conditions.
- B. Verify that doors and frames are ready to receive Work and dimensions are as indicated.

3.2 INSTALLATION

- A. Install each hardware item in compliance with manufacturer's instructions and recommendations.
- B. Mount hardware units at height indicated in the Door and Hardware Institute's Recommended Locations for Builders Hardware for Standard Steel Doors and Frames, except:
 - 1. As otherwise indicated or as required to comply with governing regulations.
 - 2. Mount deadbolt (if any) centerline not more than 5-inches above latch set handle centerline.
- C. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protection with finishing work. Do not install surface mounted items until finishes have been completed on the substrate.
- D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set metal thresholds for exterior doors in full bed of butyl rubber, polyiso-butylene mastic sealant, or preformed butyl-polyisobutylene sealant tape as specified under SECTION 07920 - SEALANTS.
- G. Fit face of all mortise parts snug and flush.
- H. Operating parts shall move freely and smoothly without binding, sticking or excessive clearance.
- I. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- J. Install with manufacturer's fasteners conforming to requirements of this section or those required for substrate. Expansion shields securing hardware such as door stops/holders to concrete or solid grouted masonry substrates shall completely fill the depth and diameter of the drilled holes. Shimming of the shields or using of plastic shields is not acceptable.
- K. Protect hardware from damage or marring of finish during construction. Use strippable coatings, removable tapes or other approved means.
- L. Ensure that hardware displays no evidence of finish paint after building cleanup with exception of prime coated hardware installed for finish painting. The Contractor may achieve this by sequencing installation, removing after fittings and reinstalling after painting is completed, providing protection, cleaning original hardware finish, or other approved means.
- M. Latch and Bolt: Install latch and bolt to automatically engage in keeper, whether activated by closer or manual push. In no case shall additional manual pressure be required to engage latch or bolt in keeper.

N. Closers:

1. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
2. Carefully adjust closers to operate noiselessly and evenly.
3. Have manufacturer's representative regulate closers prior to Director's acceptance of building.

3.3 FIELD QUALITY CONTROL

- A. If requested by the Director, the Certified Architectural Hardware Consultant from door hardware supplier or manufacturer's representative shall inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified at no additional cost to the Director.

3.4 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace items which cannot be adjusted to operate freely and smoothly as intended for application made.
- B. Clean adjacent surface soiled by hardware installation.
- C. Final Adjustment:
1. Clean operating items as necessary to restore proper function and finish of hardware and doors.
 2. Adjust door control devices to compensate for final operation of ventilating equipment.
 3. Lubricate bearings surface of moving parts and adjust latching and holding devices for proper function.
 4. Test keys in every lock for proper operation and conformance with keying system.

3.5 HARDWARE GROUPS

- A. Abbreviations:

ARR: ARROW LOCK COMPANY

MCK: MCKINNEY PRODUCTS COMPANY

PEM: PEMKO MANUFACTURING

ROC: ROCKWOOD MANUFACTURING

SAR: SARGENT MANUFACTURING COMPANY

GROUP 1 – EXTERIOR STORAGE SGL

3	HINGES	TA2314 4 1/2 X 4 1/2	US32D	MCK
1	LOCKSET (OFFICE)	21 8216 LNL	US32D	SAR
	*KEY TO EXISTING SYSTEM			
1	KICKPLATE	K1050 16" X 1"	LDW CSK B4E US32D	ROC
1	OVERHEAD STOP	590S	US32D	SAR

THRESHOLD AS DETAILED, MODIFY AS NEEDED.

GROUP 2 – EXTERIOR METAL GATE

2	HEAVY DUTY PADLOCKS			SAR
	SEE DETAIL FOR BALANCE OF HARDWARE			

END OF SECTION

SECTION 08800

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide all glass and glazing materials to complete all glazing work as shown and as specified herein.
- B. Related Work Described Elsewhere:
 - 1. Framed mirrors in toilet rooms are provided under SECTION 10800 - TOILET ACCESSORIES.

1.2 QUALITY ASSURANCE

- A. Glass Standards: All glass, except as noted otherwise, shall comply with ASTM C 1036, "Flat Glass". Tempered glass shall comply with ASTM C 1048, "Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass". Laminated glass shall comply with ASTM C 1172, "Laminated Architectural Flat Glass".
- B. Safety Glass Standard: All glass indicated on the drawings or as required to be safety glass shall meet all the requirements of the "Safety Standard for Architectural Glazing Material", 16 CFR Part 1201 dated January 6, 1977 of the Consumer Product Safety Commission or ANSI Z97.1, "Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings", as applicable.
- C. Exterior glass thickness shall be as indicated but no less than required to with-stand a 80 mph and wind loading pressure (positive and negative), as indicated for various locations of building, acting normal to pane of glass as calculated in accordance with the Exposure C, and ASTM E 1300, "Determining Load Resistance of Glass in Buildings", and ASTM E 330, "Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference".
- D. Limit glass deflection to 1/200 flexure limit of glass with full recovery of glazing materials.
- E. Tinted Glass: Where tinted glass is scheduled, thickness shall be uniform within spaces or building elevation for uniform appearance.
- F. Sealants for glazing shall conform to AAMA 800, "Voluntary Specifications and Test Methods for Sealants" and AAMA 850, "Fenestration Sealant Guide Manual".
- G. Fire Rated Safety Glass:
 - 1. Fire Protective Rated Glass: Each lite shall bear permanent, nonremovable label of UL certifying it for use in tested and rated fire protective assemblies.

2. Fire Protective Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or WHI or other certification agency acceptable to authorities having jurisdiction.
3. National Fire Protection Association (NFPA):
 - a. NFPA 80: Fire Doors and Windows.
 - b. NFPA 252 – Fire Tests of Door Assemblies.
 - c. NFPA 257 – Fire Tests of Window Assemblies.
4. Underwriters Laboratories, Inc. (UL):
 - a. UL 9 – Fire Tests of Window Assemblies.
 - b. UL 10B – Fire Tests of Door Assemblies.
 - c. UL 10C – Positive Pressure Fire Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Manufacturer's Data: Submit copies of manufacturer's product specifications, and instructions for handling, storing, installing, cleaning, and protecting each type of glass and glazing material. Provide data indicating structural and physical characteristics of each type of glass and glazing.
- C. Samples: Submit 3 each 4-inch x 4-inch samples of each type and thickness of glass and glazing for acceptance prior to ordering.
- D. Installation Specifications: Submit manufacturer's and referenced glass and glazing manual, etc. for installation of field installed glazing.
- E. Warranty: Submit warranty as stipulated in item entitled "WARRANTY FOR INSULATED GLASS UNITS" hereinbelow.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, dry locations and do not unpack until needed for installation.
- B. Comply with manufacturer's instructions for shipping, handling, storing and protecting glass and glazing materials. Exercise exceptional care to prevent edge damage to glass.

1.5 LABELING

- A. Each piece of glass shall be of domestic manufacture and label, except as noted otherwise, showing the name of the manufacturer and the grade or quality there-of. The labels shall be intact before and after installations. When glass is not cut to size by the manufacturer, and is furnished

unlabeled from local stock, the Contractor shall submit an affidavit stating the quality, thickness, type and manufacturer of the glass furnished.

- B. All safety glass shall bear a marking as specified in ANSI 297.1 on each separate glass panel that shall remain visible after installation.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

1.7 WARRANTY FOR INSULATED GLASS UNITS

- A. Warrant insulation glass units against development of material obstruction to vision (such as dust or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 5-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of no-tice from the State. The Surety shall not be liable beyond 2 years of the project acceptance date.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Glass: All glass products shall be of the quality as manufactured by PPG Industries, Inc., Pilkington LOF, ASG Industries, CE Glass Company, Globe Amerada Glass Co., Guardian Industries, Interpane Glass Co., Sierracin/Sylmar, Viracon, Inc., or approved equal.
 - 1. Float Glass, Clear: Type I, Class 1, Quality q3, 1/4-inch thick, unless indicated or required otherwise.
 - 2. Float Glass, Clear, Tempered, (Safety Glass): Kind FT (fully tempered), Condition A, Type I, Class 1, Quality q3, 1/4-inch thick unless indicated or required otherwise.
 - 3. Float Glass, Tinted, Tempered (Safety Glass): Kind FT (fully tempered), Condition A, Type I, Class 3, Quality q3, 1/4-inch thick unless indicated otherwise, light green tint, 1/4-inch thickness.
 - 4. Laminated Glass (Safety Glass): Two pieces of Type I, Class 1 or 3 as applicable, Quality q3 glass laminated together with a clear 0.030-inch thick minimum polyvinyl butyral interlayer under pressure or alternatives such as resin laminates conforming to requirements of 16 CFR 1201 or ASTM C 1172. Total thickness shall be not less than nominal 1/4-inch.
 - 5. Insulated Glazing: Insulating glass shall be Class A preassembled units of dual-seal construction consisting of two lites of glass (light green exterior and clear interior) as specified with low-e coating on surface No. 2, separated by a spacer with desiccant and dehydrated space conforming to ASTM E 773, "Accelerated Weathering of Sealed Insulating Glass Units". The insulating glass units shall be free of parallax or optical distortions. Dimensional tolerances shall be as specified in the Insulating Glass

Manufacturers Alliance (IGMA) TR-1220, "Commercial Insulating Glass Dimensional Tolerances". Air space shall be 1/2-inch with argon gas.

6. Provide the following minimum performance level: Visible Light Transmittance of minimum 40% Solar Heat Gain Coefficient of 0.24 U-Value of 0.57
 7. Fire-rated Glass: ceramic clear and wireless glazing material with fire rating to meet time rating as specified with hose stream test.
 - a. Fire Rated: 3/16" thick or as required by glass manufacturer to meet rating as scheduled for use in clerestory windows or borrowed lites; standard grade.
 - b. Fire/Impact Rated: 3/4" thick laminated with film listed for use in impact safety-rated locations such as doors, transoms and borrowed lites; premium grade.
- B. Glazing Compounds - Sealant for Exterior Glazing: One-Part silicone, medium modulus, non-sag, equal to Dow Corning No. 795, "Silglaze-II 2800", by General Electric Corp., or "Spectrum 2" by Tremco, Inc., Pecora 895NST, or approved equal as recommended by the glass manufacturers.
- C. Glazing Tape For Interior Glazing: Preformed butyl-polyisobutylene glazing tape. Provide one of the following, or approved equal:
1. "Chem-Tape 401; Bostick Construction Products Div.
 2. "Extru-Seal"; Pecora Corp.
 3. "Tremco 440 Tape"; Tremco, Inc.
- D. Miscellaneous Glazing Materials:
1. Cleaners, Primers and Sealers: Of type recommended by sealant manufacturer.
 2. Setting Blocks: Neoprene or EPDM, 80-90 Shore A durometer hardness.
 3. Spacers: Neoprene or EPDM, 50-60 Shore A durometer hardness.

2.2 FABRICATION

- A. Fabricate glass to sizes required to comply with wind loads for glazed openings indicated with edge clearances, bite and tolerances complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.1 GENERAL

- A. Perform all glazing in strict accordance with applicable provisions of the "Glazing Manual" and "Sealant Manual" published by the Glass Association of North America (GANA).

- B. Verify that openings for glazing are correctly sized, within tolerance, and glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
- C. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- D. Insulated glass shall be installed in accordance with manufacturer's instructions and IGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units", and as herein specified.
- E. All interior glazing shall be clear unless indicated otherwise.

3.2 INSTALLATION

- A. Glass shall be set true and tight by skilled glaziers. Glazing compound shall be neatly and cleanly run with corners carefully made, using putty knife for all work. Glazing stops shall be carefully handled and accurately secured in place.
- B. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6-inches from corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.
- C. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- D. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.
- E. Set units of glass in each series with uniformity of draw, bow and similar characteristics.
- F. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.
- G. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
- H. Tool exposed surfaces of sealants to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, to eliminate dirt and moisture pockets.
- I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement.
- J. Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacture to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

- K. Glass where secured by glazing stops, shall unless shown on drawings or specified herein, be set in full bed of glazing compound. Then force glazing stop into glazing compound on both sides and strike off flush.
- L. Glass where required or recommended by glass frame manufacturer shall be set in extruded vinyl or neoprene glazing strips provided by others and shall be installed in strict accordance with manufacturer's instructions.
- M. Clear glass shall be used for interior glazing.
- N. Laminated Glass: Conform to manufacturers recommendations for edge clearance, type of sealant and tape, and method of installation.
- O. Sheet glass shall be cut and set with visible lines or horizontal waves.
- P. Insulating Glass Units: Do not grind, nip, or cut edges or corners of units after the units have left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike frames or other objects. Installation shall conform to applicable recommendations of IGMA TM- 3000.

3.3 PROTECTION AND REPLACEMENT

- A. All glass shall be immediately protected against damage. Glazed openings shall be identified with suitable warning tapes, cloth or paper flags, or other acceptable method that will not damage glazing or surrounding materials. At completion of work, all imperfect glass which cannot be properly cleaned shall be replaced in kind. All broken, chipped, abraded, cracked or otherwise damaged glass must be replaced subject to the acceptance of the Contracting Officer.

3.4 CLEANING AND WASHING

- A. At the completion of construction, this Contractor shall clean and wash all of the glass provided by him, removing all labels, dirt, putty stains, paint, etc., and shall leave the glass perfectly cleaned and polished.

END OF SECTION

SECTION 09250

GYPSUM WALLBOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Complete all gypsum wallboard work as indicated or required by the drawings and as specified herein. Work shall include, but not be limited to, the following:
 - 1. Gypsum wallboard on wood framing and furring.
 - 2. Cementitious backer board on wood framing and furring.
- B. Related Work Described Elsewhere:
 - 1. SECTION 05400 – COLD FORMED STEEL FRAMING
 - 2. SECTION 07920 - SEALANTS

1.2 QUALITY ASSURANCE

- A. Fire Resistive Design: The construction shall comply with the applicable provisions of the International Building Code, including all local amendments thereto and shall have been tested according to ASTM E 119 by an independent testing and inspecting agency acceptable to the authorities having jurisdiction. Installation and materials shall be in strict accordance with the above-mentioned code. The Fire-Resistant Design shall be as indicated by UL's "Fire Resistance Directory", FM's "Approval Guide, Building Products", GA-600 "Fire Resistance Design Manual", or as listed otherwise.
- B. Industry Standard: Comply with applicable requirements of GA 216 "Application and Finishing of Gypsum Board" and GA 214, "Recommended Specification: Levels of Gypsum Board Finish" by the Gypsum Association, except where more detailed or more stringent requirements are indicated, including the recommendations of the manufacturer.
- C. Transverse Loading: The non-load bearing wood framing shall be capable of carrying a transverse load of 5 psf without exceeding the allowable stress or a deflection of U360. Increase stud size, decrease stud spacing, or provide hidden from view lateral bracing to comply with these requirements at no additional cost to the County.
- D. Gypsum Board Terminology: Refer to ASTM C 11, "Terminology Relating to Gypsum and Related Building Materials and Systems", for definition of terms for gypsum board assemblies not defined in this section or in referenced standards.
- E. VOC content of adhesives shall be less than the current VOC content limits of the South Coast Air Quality Management District Rule 1168, "Adhesive and Sealant Application".

- F. Impact Resistance: ASTM C 1629 - Standard Classification for Abuse Resistant Nondecorated Interior Gypsum Panel Products.

1.3 SUBMITTALS

- A. Submit in accordance with SECTION 013000 - SUBMITTAL PROCEDURES.
- B. Manufacturer's Data: Material description and manufacturer's recommended installation procedures for each material.
- C. Shop Drawings: Submit shop drawings indicating fabrications and location of control and expansion joints, including plans, elevations, sections, de-tails, and attachment to adjoining work. Submit drawings for backing plates and anchors.
- D. Material Safety Data Sheets (MSDS): Submit MSDS for each product.

1.4 PRODUCT HANDLING

- A. Deliver gypsum wallboard materials in sealed containers and bundles, fully identified with manufacturer's name, brand, type and grade; stored in a dry well-ventilated space, protected from the weather, under cover and off the ground. Stack gypsum panels flat to prevent sagging. Joint materials shall be stored in accordance with manufacturer's printed instructions. Damaged or deteriorated materials shall be removed from jobsite.
- B. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

1.5 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) when in-stalling insulation or sanding joint compound.
- B. Open Flame: Do not allow open flames or sources of ignition during installation of blanket insulation.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General: Provide panels in maximum lengths and widths available that will minimize joints and correspond with the applicable support system.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M "Gypsum Board", 5/8-inch thick, tapered edge type, 48-inches wide, Type "X" (Special Fire Retardant).

- C. Water Resistant Board: ASTM C 1396/C 1396M, Type "WR-X" (Special Fire Retardant) water-resistant backing board, 5/8-inch thick unless indicated otherwise, with tapered edges, 48-inches wide, unless indicated otherwise (for walls only).
- D. Cementitious Backer Board (CBB): ANSI A118.9 "Cementitious Backer Units" or ASTM C 1325, "Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets", glass mesh reinforced mortar backer board, nominal 5/8-inch thick for interior hard tile backing. Provide tape and joint compound materials as recommended by manufacturer.
- E. Wallboard Fasteners: ASTM C 1002 "Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs", standard bugle head self-drilling, self-tapping corrosive-resistant drywall screws. Screws used in fire-resistive rated construction shall be of type approved for use by governing building code. Screws for structural studs shall conform to ASTM C 954 "Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033-inch (0.84 mm) to 0.112-inch (2.84 mm) in Thickness". Fasteners for cementitious backer board shall have a polymer coating.
- F. Reinforced Tape and Cement: ASTM C 475/C 475M "Joint Compound and Joint Tape for Finishing Gypsum Board", materials for treating joints and fastener heads shall be as manufactured or recommended by the Manufacturer of the wallboard used. Provide "setting" type joint compound and fiberglass tape that is unaffected by humidity for water resistant board.
- G. Non-Load Bearing Studs: See SECTION 061000 – ROUGH CARPENTRY
- H. Ceiling Support Materials and Systems:
 - 1. General: Size ceiling support components to comply with ASTM C 754 "Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products" unless indicated otherwise.
 - 2. Direct Suspension Systems: Manufacturer's standard zinc-coated or painted steel system of furring runners, furring tees, and accessories designed for concealed support of gypsum drywall ceilings; of proper type for use intended.
 - a. System Manufacturer: Equal to one of the following:
 Armstrong World Industries, Inc.
 Chicago Metallic Corp.
 USG Interiors, Inc.
 - 3. Wire for Hangers and Ties: ASTM A 641/A 641M "Zinc-Coated (Galvanized) Carbon Steel Wire", Class 1 zinc coating, soft temper, 8 gauge for hangers supporting up to 12.5 square feet and 6 gauge where supporting up to 16 square feet and 18 gauge for ties.
- I. Wallboard Accessories: ASTM C 1047 "Accessories for Gypsum Wallboard and Gypsum Veneer Base", Vinyl Corp., Plastic Components Inc., Vinyl Tech or approved equal.
 - 1. Standard Corner Bead: Vinyl Corp. Corner Bead CB 125 at all outside corners of wall, ceiling, and soffit as indicated.
 - 2. Casing Trim: Vinyl Corp. "L" Bead SB 50 or 58, "J" Bead MJB 50 or 58, as applicable, or approved equal as indicated.

3. Control Joint: Vinyl Corp. CJV 16 or approved equal.
 4. Other Accessories: As indicated or necessary for complete installation.
 5. All accessories shall be vinyl, PVC, or approved equal.
- J. Joint Treatment Materials: ASTM C 475/C 475M; type recommended by manufacturer for the application indicated, except as otherwise noted. Perforated tape, and joint and topping compound, or "all-purpose" compound.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with ASTM C 840 "Application and Finishing of Gypsum Board", Gypsum Association GA 216 and ASTM C 754 as applicable to the type of substrate and drywall support system indicated.
- B. Tolerances:
1. Maximum variation of finish surface from true flatness shall be 1/8-inch in 10-feet in any direction unless specified otherwise.
 2. Maximum variation of plumbness of wall shall be 1/8-inch in 10-feet of height.
 3. Maximum variation from true position shall be 1/8-inch.
- C. Ceiling Support Suspension Systems:
1. Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to inserts, clips or other anchorage devices or fasteners as indicated. Ensure that structural anchorage provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.
 2. Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.
 3. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where re-quired to miss obstructions and offset resulting horizontal forces by bracing, counterplaying, or other equally effective means.

4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, in-install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
5. Secure hangers to structure, including intermediate framing members, by attaching them 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.
6. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyes screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
7. Sway brace ceiling to conform to the applicable seismic load and uplift, applicable requirements of ASTM E 580/E 580M, "Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint", and the manufacturer's recommendations.
8. Space main runners 4-feet on center and space hangers 4-feet on center along runners, except as otherwise shown.
9. Level main runners to a tolerance of 1/8-inch in 12-foot, measured both lengthwise on each runner and transversely between parallel runners.
10. Wire-tie or clip furring members to main runners and to other structural supports as indicated or as recommended by the manufacturer.
11. Direct-hung Metal Support System: Attach perimeter wall track or angle wherever support system meets vertical surfaces. Mechanically join support members to each other and butt-cut to fit into wall track.
12. Space furring member 16-inches on center, except as otherwise indicated.
13. Install auxiliary framing at termination of drywall work, and at openings for light fixtures and similar work, as required for support of both the drywall construction and other work indicated for support thereon.
14. Do not connect or suspend steel framing from ducts, pipes or conduit.
15. Do not attach hangers to steel deck tabs.
16. Do not attach hangers to steel deck unless otherwise indicated. At-tach hangers to structural members. Locations and manner of securing hangers shall conform to criteria indicated for structural elements.
17. Keep hangers and braces 2-inches clear of ducts, pipes and conduits.

D. Framing:

1. See SECTION 06100 – ROUGH CARPENTRY
2. Install supplementary framing, blocking and bracing to support fixtures, equipment services, heavy trim, furnishings and similar work which cannot be adequately supported on gypsum board alone to comply with details indicated and with recommendations of gypsum board manufacturer, or if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.
3. Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.
4. Install each framing and furring member so that fastening surface does not vary more than 1/8-inch from plane of faces of adjacent framing.
5. Seal sills for sound rated partitions with continuous beads of acoustical sealant along each face prior to installation of gypsum board.

E. Gypsum Wallboard, General:

1. Locate exposed end-butt joints as far from center of walls and ceilings as possible.
2. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. But boards together for a light contact at edges and ends with not more than 1/16-inch open space between boards. Do not force into place.
3. Locate either edge or end joints over support, except in horizontal applications or where intermediate support or gypsum board back-blocking is provided behind end joints. Position boards so that both tapered edge joints abut, and mill-cut or field-cut end joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
4. Attach gypsum panels to studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
5. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.
6. Cover both faces of stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are properly braced internally. Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 square foot area and may be limited to not less than 75 percent of full coverage.
7. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4-inch to 3/8-inch space and trim edge with J-type semi-finishing edge trim. Seal joints with acoustic sealant. Do not fasten drywall directly to stud system.

8. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.
9. Install insulation at framing as indicated after cover material has been installed on one side of cavity. Size insulation to width of members spacing. Press friction fit insulation between members as recommended by the insulation manufacturer. When unfaced insulation is used and the stud depth is larger than the insulation thickness, install wire or metal straps to hold insulation in place.

F. Methods of Gypsum Wallboard Application:

1. On ceilings, apply gypsum board prior to wall/partition board application, to greatest extent possible and at right angle to framing, unless otherwise indicated.
2. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
3. Single-Layer Application:
 - a. On partitions/walls higher than 8'-1", apply gypsum board vertically (parallel), unless otherwise indicated, and provide sheet lengths which will minimize end joints.
 - b. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular); use maximum length sheets possible to minimize end joints.
4. Single-Layer Fastening Method: Apply gypsum boards to supports by fastening with screws, spaced not to exceed 16-inch centers for walls and 12-inch centers for ceilings.
5. Gypsum wallboard construction for fire rated and acoustic rated assemblies shall be in accordance with the design number indicated or if not indicated in accordance with the International Building Code.

G. Installation of Trim Accessories:

1. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, attach trim in accordance with manufacturer's instructions and recommendations.
2. Install corner beads at external corners.
3. Install edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Interwork andrim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).
4. Install J or LC-type semi-finishing trim where indicated.

5. Install control joints where indicated or necessary in large ceiling and wall expanses. Use door header to ceiling or floor to ceiling in long partitions and wall furring runs and from wall to wall in large ceiling areas. Where joint will be conspicuous, obtain approval prior to installation.

H. Drywall Texture: Smooth finish, to match existing.

3.3 DRYWALL FINISHING

A. General: Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fasteners heads, surface defects and elsewhere in accordance with ASTM C 840 and Gypsum Association GA 216 and GA 214 as required to prepare work for decoration. Prefill open joints, rounded or beveled edges, and damaged surfaces using type of compound recommended by manufacturer.

1. Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated that does not require tape.
2. Apply joint compound in 3 coats (not including prefill of openings in base), and sand between last 2 coats and after last coat. Fastener heads, dents, gouges, and cut-outs shall be filled with joint compound and sanded.
3. Accessories at exposed joints, edges, corners, openings, and similar locations shall be taped, floated with joint compound, and sanded in accordance with manufacturer's instructions and MSDS to produce surfaces ready for gypsum board finishes.
4. Treatment for water-resistant gypsum wallboards shall be as recommended by the gypsum wallboard manufacturer.

B. Finish interior gypsum wallboard by applying the following levels of gypsum board finish in accordance with GA-214.

1. Level 1: For ceiling plenum areas and other concealed areas.
2. Level 2: Where wall panels form substrates for rigid sheet vinyl.
3. Level 3: For wall surfaces to receive heavy-duty wallcoverings.
4. Level 4: For ceiling surfaces to receive flat paint.
5. Level 5: For wall surfaces to receive semi-gloss enamel.
6. Where Level 5 gypsum board finish is indicated, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories; and apply a thin, uniform skim coat of joint compound over entire surface. For skim coat, use joint compound specified for third coat, or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects, tool marks, and ridges and ready for decoration.

7. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.
8. Where Level 3 gypsum board finishes, embed tape in joint compound and apply first and fill (second) coats of joint compound.
9. Where Level 2 gypsum board finishes is indicated, embed tape in joint compound and apply first coat of joint compound.
10. Where Level 1 gypsum board is indicated, embed tape in joint compound.

3.4 BACKING PLATES AND ANCHORS

- A. Backing plates and anchors or blocking which are to be attached to studs or furring for anchoring items and work indicated on the drawings or specified in other sections shall be installed and secured. Plates and anchors shall be welded or fastened in place in accordance with approved setting drawings.

3.5 CLEANING AND REPAIRING

- A. After installation and before painting, correct surface damage and defects. Leave surface clean and smooth, satisfactory to the painter. No painting shall be done over gypsum board work until the joints are thoroughly dry. Joints and fastenings are to be invisible after painting.
- B. Remove all drywall materials from electrical boxes, hardware, fixtures, flooring, and similar items and surfaces not intended to receive drywall materials.

END OF SECTION

SECTION 09672
RESINOUS FLOORING

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

As specified in Section 00700.

1.2 SUMMARY

- A. Section includes resinous flooring systems.
- B. Related Sections:
 - 1. Section 03300 – CAST-IN-PLACE CONCRETE.
 - 2. Section 01450 – MOISTURE VAPOR AND ALKALINITY TESTING

1.3 PREINSTALLATION MEETING

- A. Preinstallation Conference: Conduct conference at project location, exact location to be determined.
- B. Participants include but are not limited to Director or his/her Representative, General Contractor and Flooring Installation Contractor.

1.4 SUBMITTALS

- A. Product Data: For each type of product include manufacturer's technical data, safety data sheets, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Verification: For each resinous flooring system required, 6-inches square, applied to a rigid backing by Installer for this Project. Samples must comply with specified system materials, application thickness, color and finish texture.
- C. Installer Certificates: Installer certification by material manufacturer for the system(s) specified.
- D. Material Data Sheets, Safety Data Sheets (SDS) and Installation Instructions: For each resinous flooring component and system from manufacturer.
- E. Maintenance Data: For each resinous flooring system maintenance instructions and period system evaluation from material manufacturer.
- F. Warranty: Installation and material warranty from installer and material manufacturer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A resinous flooring installer who has completed industry qualified training or experienced with similar flooring systems and project scope (references required).
- B. Engage an installer who is certified, in writing, by resinous flooring system manufacturer as qualified to apply the resinous flooring systems indicated.

- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Apply full-thickness mockups on 10-foot square floor area selected by Director.
 - 2. Simulate finished lighting conditions for Director's review of mockups.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Director specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Final Contract Acceptance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring system manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for 24-hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Volatile Organic Content (VOC) of Liquid-Applied Flooring Coatings: Ultra-Low VOC (<23 g/L) when calculated according to 40 CFR 59, Subpart D (EPA Method 24) or ASTM D2369.
- B. Moisture Vapor Emissions: Flooring system must accommodate up to 10lbs/1000ft²/24hrs (4.5 kg/92.9m²/24hrs) vapor emissions as measured by ASTM F1869.
- C. Flammability: Self-extinguishing according to ASTM D635.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, aggregates, grouting coats, and sealers, from a single manufacturer or the resinous flooring system manufacturer's approved supplier. Obtain secondary materials, including patching and fill material, joint sealant, divider and termination strips, and repair materials recommended in writing by manufacturer of primary resinous flooring materials.

2.3 RESINOUS FLOORING

- A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor.

- B. For reasons of convenience and to establish minimum standard of quality, character, design aesthetics, performance, functional and experiential quality for this project, the products of the following manufacturers are incorporated into these Specifications, along with general descriptions of the minimum resinous flooring components.
1. Basis-of-Design Product: Subject to compliance with requirements, provided by Green Chemistry Innovations; GSPE - Textured Flooring System; Dex-O-Tex, Tek-Crete SL-B, three-part urethane resin; or comparable product approved via request for Substitution.
 2. The products of other manufacturers not listed shall be pre-qualified in accordance with paragraph 6.2 SUBSTITUTION OF MATERIALS AND EQUIPMENT of the County's General Requirements and Covenants as amended by the Special Provisions.
 - a. The burden of proof as to the comparative quality and suitability of any alternate brand or make shall be upon the bidder, and it shall furnish, at its own expense, all information relating thereto at the time of making such a request. The County shall be the sole judge as to the suitability of the alternate brand or make, and its decision shall be final. Additionally, the requestor shall identify the components it proposes to use in satisfaction of the specific resinous flooring component described in this Section. Approval of any substitution request does not inherently provide approval for deviations from any other requirement of the Section or of the project.
- C. System Characteristics:
1. Color and Pattern: Colors are produced using combinations of aggregates, cement and resin. Standard color palette is provided by the manufacturer.
 - a. To be selected by Director's representative from Manufacturer's standard Colored Quartz/Colored Quartz Blend:
 2. Wearing Surface: Finish texture/gloss as described by SSPC Concrete Coating Texture Standard (CTS):
 - a. To be selected by Director's representative from Manufacturer's standard concrete finished texture/gloss wearing surface.
 - 1) Roughness value (A-D): to be selected by Director's representative
 - 2) Gloss value: High Gloss (topcoat), BYK-Gardner Micro-gloss 60 \square >85 units.
 - 3) Overall System Thickness: 1/4-inch.
- D. Primer: Required when concrete substrate moisture vapor emission (MVE) rates are less than 10lb/1000ft² in-24 hours according to ASTM F1869.
1. Basis-of-Design Product: Subject to compliance with requirements, provide by manufacturer Green Chemistry Innovations or comparable product compatible with resinous flooring system and approved via Request for Substitution.
 2. Formulation Description:
 - a. Mixed solids: 98-100%

- b. Volatile Content: Ultra-Low VOC (<23 g/L) when calculated according to 40 CFR 59, Subpart D (EPA Method 24) or ASTM D2369.
- E. Patching and Fill Material: Resinous product approved by resinous flooring system manufacturer and recommended by manufacturer for application indicated and approved via Request for Substitution.
- F. Body Coats:
 - 1. Manufacturers: Green Chemistry Innovations or comparable manufacturer approved via request for Substitution.
 - 2. Coating: GSPEC-FC Coating (GSPEC-FC) Clear/Pigmented as required to meet system specified color(s).
 - a. Formulation Description: High Solids, Ultra-Low VOC Epoxy-urethane resin containing zero isocyanates.
 - 3. Aggregates: GSPEC Bag Mix supplied by resinous flooring system manufacturer to match specified color(s)
 - 4. Application Method: Trowel or gauge rake.
 - 5. Number of Coats: Apply one coat to achieve specified system thickness.
- G. Broadcast:
 - 1. Manufacturers: Green Chemistry Innovations or manufacturer approved via Request for Substitution.
 - 2. Aggregate:
 - a. Colored quartz as recommended by coating manufacturer to meet specified system color to be selected by Director's representative from Manufacturer's standard products.
- H. Topcoat:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by Green Chemistry Innovations or manufacturer approved via Request for Substitution.
 - 2. Coating: GSPEC-FC Coating (GSPEC-FC) Clear/Pigmented as required to meet system specified color(s).
 - 3. Formulation Description: High Solids, Ultra-Low VOC Epoxy-urethane resin containing zero isocyanates.
- I. System Physical Properties: Provide resinous flooring system with the following physical property requirements when tested according to test methods indicated:
 - 1. Tensile Strength: 5700 psi minimum according to ASTM D638.
 - 2. Water Absorption: 0.5 percent maximum according to ASTM D570.
 - 3. Abrasion Resistance: <40 mg maximum weight loss according to ASTM D4060 (Taber Wheel CS-17, 1000g).

4. Hardness: 75-85 Shore D according to ASTM D2240.
 5. Bond Strength to Concrete: 100% Concrete Failure according to ASTM D4541.
 6. Elongation at break: 3-7% according to ASTM D638.
- J. System Chemical Resistance: Provide resinous flooring system with the following minimum chemical resistant property requirements:
1. 10% Sulfuric Acid - <1.0% weight gain; minimum staining
 2. 10% Sodium Hydroxide – No effect.
 3. Gasoline – No effect.
 4. Motor Oil – No effect.
 5. Brake Fluid – No effect.
 6. Vegetable Oil – No effect.
 7. Bleach – No effect.
 8. Ammonia – No effect.
 9. Spray Paint – No effect.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Prepare and clean substrates according to resinous flooring system manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 1. New Cast-in-Place Concrete must be placed over an effective moisture retarder >15 mils according to ACI 302.
 2. Roughen concrete substrates as follows:
 - a. Shotblast or diamond grind surfaces to Concrete Surface Profile (CSP) of 3-5 (ICRI Guideline 310.2R) with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with SSPC-SP 13/NACE No. 6, "SURFACE PREPARATION OF CONCRETE" requirements unless manufacturer's written instructions are more stringent.
 3. Repair damaged and deteriorated concrete according to resinous flooring system manufacturer's instructions.

4. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions. Moisture evaluation and testing is to be conducted by an independent certified inspector to be retained by and paid for by the General Contractor.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with application of resinous flooring without primer only after substrates have maximum moisture-vapor-emission rate of 10lb/1000ft² in 24-hours.
 - 1) If CaCl test (ASTM F1869) results are higher than 10lb/1000ft² in 24-hours, a primer application is required and the resinous flooring system manufacture must be consulted before proceeding.
 - b. Relative Humidity Test: Use in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 80-percent relative humidity level measurement. If concrete humidity values exceed 80%, consult resinous flooring system manufacturer before applying system.
 5. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- D. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to industry standards as detailed in Joint NACE Publication 02203/ICRI Technical Guideline 710.1/SSPC-TR 5 Technical Committee Report: "Design, Installation, and Maintenance of Protective Polymer Flooring Systems for Concrete".
- E. Resinous Materials: Mix components and prepare materials according to resinous flooring system manufacturer's written instructions.

3.2 APPLICATION

- A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness specified.
1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 3. Expansion and Isolation Joint Treatment: Honor all expansion/isolation joints located in the substrate utilize preformed joint strips or L-strips on both sides of the joint to terminate flooring system and fill joints with flexible sealant as detailed in Section 07900.
- B. Primer: Primer is only required if moisture vapor emissions exceed 10lb/1000ft² in 24 hours according to ASTM F1869. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

- C. Body Coats: Apply self-leveling slurry body coats with a gauge rake or trowel in thickness indicated for flooring system. Allow the slurry to self-level prior to subsequent aggregate broadcast.
- D. Broadcast: Broadcast selected aggregate (silica sand/colored quartz/colored paint chip to refusal. Allow to cure and remove excess aggregate.
- E. Topcoat: Apply topcoat (Pigmented/Clear) using a squeegee, trowel and/or roller according to resinous flooring system manufacturer's instructions to achieve the desired texture. Allow to cure. (Cure time and open to service will depend upon temperature.)

3.3 FIELD QUALITY CONTROL

- A. Material Sampling: Director may, at any time and any number of times during resinous flooring application, require material samples for testing for compliance with requirements.
 - 1. General Contractor shall engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
 - 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.
- B. Core Sampling of Finished Floor System: At the direction of Director and at locations designated by Director, take one core sample per 1000-sq. ft. of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring. Correct deficiencies in installed flooring as indicated by testing.

3.4 PROTECTION

- A. After application of the topcoat, the Work shall be ready for final inspection and acceptance by the Director or his agent.
- B. The General Contractor shall protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring system manufacturer.

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, Director will select from standard colors and finishes available.
 - 2. Interior and Exterior surfaces scheduled to be finished.
 - 3. 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.
 - 4. Pipes, conduit, ducts, support apparatus and other exposed mechanical and electrical items in areas to be painted. 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. Finish hardware.
 - 3. Lighting fixtures, and electrical device plates.
- 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. Prefinished metal roofing, flashing and accessories.
 - b. Finished mechanical and electrical equipment.
 - c. Light fixtures.
2. Finished metal surfaces include the following:
- a. Anodized aluminum
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass
3. 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 05500 - METAL FABRICATIONS
- B. SECTION 09672 - RESINOUS FLOORING

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. PDCA (Painting and Decorating Contractors of America) - Painting - Architectural Specification Manual.
- E. SSPC (The Society for Protective Coatings - Steel Structures Painting Manual).

1.4 DEFINITION

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1.5 SUBMITTALS

- A. Submit in accordance with SECTION 01330 – SUBMITTAL PROCEDURES.

B. 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.
2. For products with premixed colors, provide manufacturer's standard color chips for selection by Director.
3. 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

C. 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.

D. Schedule of Finishes: Provide finish schedule including paint spread rates required to achieve final dry film thickness indicated in the schedule.

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.

F. Provide a Comprehensive Spray Plan when airless spraying is proposed.

G. Qualification Data: For Applicator.

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 primers for each coating system from the same manufacturer as the finish coats.

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

1.7 REGULATORY REQUIREMENTS

- A. Comply with State OSHL (Occupational Safety and Health Law) and pollution control regulations of the State Department of Health and EPA.

1.8 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:

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 clean. Lock any storage structures when not in use or when no visual supervision is possible.

All rejected materials shall be removed from the job site immediately.

1.9 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. Provide, erect and maintain safety barricades around scaffolds, hoists and where construction 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 to 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 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 Director 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 and in several rooms.
 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

2.1 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide 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: 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 color schedule 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 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.

- E. Colors: As scheduled or as selected by the Director.

- F. 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.

2.2 WOOD DECKING FINISH

- A. Provide a factory-prepared, penetrating oil finish specifically formulated for dense tropical hardwoods, including Ipe (Lapacho), for exterior decking boards and handrails. Finish shall be non-film-forming and designed to penetrate wood fibers without creating a surface coating. Material shall include a finely graded, transparent anti-slip aggregate or additive engineered for exterior pedestrian walking surfaces, providing enhanced slip resistance while preserving the natural appearance and texture of the wood. Finish shall be UV-resistant, water-repellent, mildew-resistant, and breathable to allow moisture vapor transmission and minimize peeling, blistering, or cracking. Product shall contain no varnishes, surface sealers, or film-building resins. Finish shall comply with applicable VOC content limits and environmental regulations. Provide products from a single manufacturer for all exterior Ipe decking and handrail surfaces.

2.3 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

3.1 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.
 - 2. Ensure that concrete and masonry surfaces are cured and dried to meet paint manufacturer's recommendations.
 - 3. 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 Director about anticipated problems when using the materials specified over substrates primed by others.

3.2 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, patch, caulk, 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.
 2. Prepare and sand Gym wood flooring according to coating manufacturer's instructions and as necessary to prepare for new refinishing. Do not cause divots or depressions with excessive sanding. Fill cracks and splits in wood according to coating manufacturer's instructions.
- D. 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.
- E. 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.

3.3 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.

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. 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. Electrical Work: Painting of electrical work is limited to items exposed items.
- F. Electrical items to be painted include, but are not limited to, the following:
 - 1. Exposed conduit, junction boxes, fasteners and hangers.
 - 2. Switchgear.
 - 3. Panelboards
 - 4. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- G. 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.
- H. 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.
- I. Concrete floor surface preparation and inspection: All concrete floor surfaces must be sound, clean, dry, cured, and profiled, free of surface hardeners, form release agents, curing compounds, laitance, efflorescence, chloride contamination, hydrostatic water pressure or excessive capillary water action, and/or water vapor emission. All concrete surfaces shall be cleaned first with a strong detergent to remove oils, grease, and dirt before proceeding with acid etching, abrasive blasting, shot-blasting, or mechanical scarification as required by finish coating manufacturer.
- J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL TESTING

- A. Moisture and Alkalinity Testing: Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces do not comply with manufacturer's recommended limits.

3.5 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.

3.6 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 Director.
- 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.

3.7 INTERIOR AND EXTERIOR PAINT SCHEDULE

- A. Concrete and Masonry (Other Than Concrete Unit Masonry and Concrete Floors): Provide the following finish systems over exterior concrete, stucco, and brick masonry substrates.
 - 1. Acrylic Finish: Two finish coats over a primer.
 - 2. Full Primer: PPG 17-921XI Series Seal Grip Acrylic Universal Primer minimum 1.6 mils DFT.
 - 3. 2 Finish Coats: PPG PERMANIZER Exterior Semi-Gloss Finish Acrylic Latex Paint & Primer Min 2.3 mils DFT/Coat
- B. Concrete Unit Masonry:
 - 1. Acrylic Finish: Two finish coats over a primer.
 - a. Primer: SPEEDHIDE Interior/Exterior Masonry Hi Fill Latex Block Filler minimum 7.0 mils DFT

- b. 2 Finish Coats: PPG PERMANIZER Exterior Semi-Gloss Finish Acrylic Latex Paint & Primer Min 2.3 mils DFT/Coat

C Wood:

- 1. Acrylic Finish: Two finish coats over a primer.
 - a. Exterior wood primer: PPG 17-921XI Series Seal Grip Acrylic Universal Primer minimum 1.6 mils DFT.
 - b. 2 Finish Coats: PPG PERMANIZER Exterior Semi-Gloss Finish Acrylic Latex Paint & Primer Min 2.3 mils DFT/Coat

D. Zinc Coated Metal: Provide the following finish systems over exterior zinc coated metal surfaces, including metal water tank.

- 1. Acrylic Finish: Two finish coats over a rust inhibitive primer.
- 2. Primer: PPG PITT-TECH PLUS 4020 Single Component Waterborne Acrylic Primer Minimum 2.5 mils DFT
- 3. 2 Finish Coats: PPG PITT_TECH PLUS 4216 Single Component Waterborne S/G Acrylic Enamel Min 1.3 mils DFT/Coat

E. Ferrous Metal: Provide the following finish systems over exterior zinc coated metal surfaces.

- 1. Acrylic Finish: Two finish coats over a rust inhibitive primer.
- 2. Full Prime: PPG MULTIPRIME 4160 Single Component Multi-Purpose Primer Minimum 2.2 mils DFT
- 3. 2 Finish Coats: PPG PITT_TECH PLUS 4216 Single Component Waterborne S/G Acrylic Enamel Min 1.3 mils DFT/Coat

F. Concrete Floors: Provide the following finish systems over interior concrete restroom floor surfaces.

- 1. Acrylic Finish: Two finish coats over a rust inhibitive primer.
- 2. Full Prime: PPG AMERLOCK SEALER Two Component Penetrating Epoxy Primer Sealer Min 2.0 mils DFT

3. 2 Finish Coats: PPG AMERLOCK 2/400 Two Component High Solids Epoxy Coating Minimum 8 mils DFT/coat
4. Optional Top Coat

2 Coats Finish: PPG AMERCOAT 450H Gloss Aliphatic Polyurethane Top Coat Minimum 2.5 mils DFT/coat
5. Apply non-skid grit: Provide silicon non-slip additive, large mesh 20-40 size as approved by the flooring manufacturer and Director.

END OF SECTION

SECTION 10165

PLASTIC TOILET COMPARTMENTS

PART 1 – GENERAL

1.1 SUMMARY

- A. Work under this section shall include but not be limited to the following: Floor and wall anchored plastic toilet compartment doors and partitions.
- B. Related Work Described Elsewhere: Coordinate the installation of doors and partitions with grab bars, toilet tissue dispensers, etc. noted under SECTION 10800 - TOILET ACCESSORIES.

1.2 REFERENCES

- A. The publications listed below form a part of this specification:
 - 1. Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) 2010 Accessibility Guidelines.
 - 2. American Society for Testing and Materials (ASTM) E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 GENERAL REQUIREMENTS

- A. Toilet compartments which are accessible to the physically handicapped shall be in conformance with the criteria noted in the ADA/ABA Sections 404, 604, and 308 and 309. Outswinging doors shall have self closing hinges.

1.4 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Manufacturer's Data: Submit sets of the proposed (selected) manufacturer's current brochures and specifications.
- C. Shop Drawings: Submit shop drawings showing construction and installation details. Indicate the elevations of partitions/screens, hardware, fittings, mounting brackets, proposed method of anchoring, and other related items and installation details.
- D. Samples: Submit sets of solid plastic samples for color selection.
- E. Certification: Submit manufacturer's certificate attesting that materials meet or exceed the specified requirements.

1.5 PRODUCT HANDLING

- A. Materials shall be delivered to the job-site in their original sealed containers bearing the name of the manufacturer and brand designation.
- B. Items shall be delivered and stored in a manner that ensures they will be protected against damage.

PART 2 – PRODUCTS

2.1 MATERIALS AND CONSTRUCTION

- A. General: Compartments shall be of the type and size specified and as shown on the plans.
- B. Solid Plastic Doors, Partitions, Stiles and Pilasters:
 - 1. Shall be fabricated from polymer resins formed under high pressure into a single component section which is waterproof and non-absorbent. The color shall extend from the surface through the entire thickness of the panel.
 - 2. The exposed finish surfaces shall be self-lubricating; smooth; waterproof; non-absorbent; stain, chemical and graffiti resistant.
 - 3. Solid plastic shall have a maximum Smoke Density Rating of 75 when tested in conformance with ICC IBC.
 - 4. Edges shall be machined to a radius of between 1/16-inch and 1/4-inch and shall be free of saw marks.
- C. Doors:
 - 1. Doors shall be solid plastic a minimum of 1-inch thick.
 - 2. Unless otherwise noted on the drawings, a minimum clear door opening width of 32-inches shall be provided at the door leading to an accessible toilet stall. This clear width shall be measured between the edge of the door bumper/keeper and the face of the door when opened 90 degrees.
- D. Partitions, Stiles and Pilasters:
 - 1. Pilasters and stiles for compartments shall have adjustable floor anchors with leveling devices, studs, and locking nuts to firmly secure pilasters and stiles to the floor.
 - 2. Partitions, stiles and pilasters shall be of solid plastic a minimum of 1-inch thick.
 - 3. Partitions to which grab bars are fastened, along with their respective brackets and connectors, shall be capable of supporting the imposed loads noted in the ADA/ABA Section 609.
- E. Headrails: Headrails for overhead-braced compartments shall be of anodized, extruded aluminum alloy with end-caps, of anti-grip design or as standard with the manufacturer; or solid wood core surfaced with plastic laminate and having minimum cross-sectional dimensions of 1-1/4 inch x 2-inch.
- F. Hardware and Fittings:
 - 1. Doors, partitions, pilasters and screens shall be furnished with the necessary hardware and fittings to provide a complete installation. They shall be pre-cut to facilitate erection and minimize field errors.
 - 2. Materials: Hardware and fittings shall be either satin-finish Type 304 or 316 stainless steel or anodized extruded aluminum. Chrome plated brass is not desired. Non-ferrous

alloys such as Zamac castings shall not be used.

3. Door Hinges: Stainless steel (minimum 16 ga.) or extruded aluminum, continuous the full height of the door, through bolted to the door and stile with twelve (12) theft resistant one way stainless steel screws at approximately 12" o.c.
 4. Brackets: Stainless steel (18 ga. minimum, Type 304) or extruded aluminum approximately 1/8" thick), continuous the full height of the partition or stile. Acceptable bracket sections are "L", "T" and "F". Brackets shall be through-bolted to partitions and stiles/pilasters with theft resistant one way stainless steel screws spaced at approximately 12" o.c. Brackets shall be secured to concrete or solid grouted masonry walls using theft resistant one way stainless steel or chrome plated brass bolts with lead or steel expansion shields spaced at approximately 12 inches o.c. Bracket attachment to masonry walls at ungrouted cells shall be with theft resistant stainless steel toggle bolts at approximately 12 inches o.c. The number of fasteners to be provided at each connection are as follows:

Bracket to Partition:	6
Bracket to Stile/Pilaster:	12
Bracket to Wall:	12
 5. Latches: The latch shall be of a shape which is easy to grasp with one hand and which does not require tight grasping, tight pinching or twisting of the wrist to operate and shall be operable by a person on the outside in the event of an emergency. Mechanisms such as slide bolts with a projecting handle on the inside of the stall which can be opened by a person on the outside reaching over the door with a stick are acceptable.
 6. Door Pulls: Handicap accessible toilet stall doors shall be furnished with a grab bar/door pull, 18-inches long, mounted horizontally on the inside face of the door adjacent to the hinge to facilitate closing of the door upon entry.
 7. Coat Hook/Door Bumper: Furnish one each per door, mount at middle of door. At accessible stalls, coat hook shall be mounted at middle of door 54-inches above the finish floor for outward swing doors and no higher than 48-inches above the finish floor for inward swing doors.
 8. Shoe: All pilasters and stiles shall have a 3-inch-high minimum trim cover or shoe at the floor.
 9. Hardware Mounting Heights: The highest part of any handle, pull, grab bar, latch or operating mechanism shall be at 36-inches maximum above the finished floor.
 10. Fasteners: Hardware and fittings shall be fastened with theft-resistant one-way stainless steel or chrome plated brass through-bolts or machine screws in factory installed steel inserts. Do not use "one-way" screws.
- G. Backer Plates: Provide manufacturer's galvanized steel or stainless steel backer anchor plates for all stud wall anchorage.

PART 3 – EXECUTION

3.1 INSPECTION

- A. The Installer together with the Contractor and the Director shall examine the areas and conditions under which toilet stall doors, partitions, stiles/pilasters and screens are to be installed. Should any condition be found unsuitable, no work shall be performed until the unsatisfactory conditions have

been corrected and are acceptable to the Installer. Proceeding with the work will imply acceptance of the conditions by the Installer.

3.2 INSTALLATION

- A. Compartments shall be erected in strict accordance with the manufacturer's instructions.
- B. All parts shall be securely screwed and/or bolted tight, well-anchored to the wall, true to line, level and plumb, with doors and hardware placed at the proper heights and in proper operating condition.
- C. The following uniform clearances shall be provided:
 - 1. 1/2-inch maximum between the stiles/pilasters and partitions.
 - 2. 1-inch maximum between stiles/pilasters/partitions and walls.
 - 3. 3/16-inch maximum between stiles/pilasters and doors.
- D. Anchorage to concrete or to masonry at grouted cells shall be bolts with lead or steel expansion shields. Anchorage to masonry at ungrouted cells or to gypsum board walls shall be with toggle bolts.
- E. Adjust hardware and lubricate moving parts as necessary to ensure smooth operation.

3.3 PROTECTION AND CLEANING

- A. Protect the work of other trades against damage, injury or soiling.
- B. After installation, clean exposed surfaces with cleaners recommended and approved by the manufacturer and protect from damage.
- C. Repair (or replace as necessary) and restore adjacent surfaces that are marred or damaged as a result of the installation of toilet partitions to their original condition. Leave adjacent surfaces in a neat and clean condition.

END OF SECTION

SECTION 10400
IDENTIFYING DEVICES

PART 1 – GENERAL

1.1 SUMMARY

- A. Provide all signage as shown and as specified herein, including the following:
 - 1. Metal Signs
- B. Sign Type and Locations: As indicated and scheduled.

1.2 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Manufacturer's Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.
- C. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
 - 1. Provide message list for each sign required, including large-scale details of wording and layout of lettering.
 - 2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of work in other sections.
 - 3. Furnish full-size spacing templates for individually mounted dimensional letters and numbers.
- D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
 - 1. Samples for initial selection of color, pattern, and texture: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate, showing the full range of colors available.
 - 2. Samples for verification of color, pattern, and texture selected, and compliance with requirements indicated:
 - a. Metal: Provide a full-size sample panel for each material indicated. Include a panel for each color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.
 - b. Acceptable samples will be returned and may be used in the work.

1.3 QUALITY ASSURANCE

- A. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

1.4 ACCESSIBILITY COMPLIANCE

- A. The 2010 Americans with Disabilities Act Accessibility Guidelines (ADAAG). Signage shall comply with ADAAG Section 703.4 and Section 703.5 for mounting heights, finish, Braille characters and type of characteristics.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General Requirements: Character proportion, color contrast, dimension, depth, and heights of symbols, Grade II braille, and letters, location, and mounting heights shall be in accordance with the requirements noted in the 2010 Americans with Disabilities Act Accessibility Guidelines (ADAAG) Sections 703.4, 703.5 and 703.6.
- B. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for installations as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.2 METAL SIGNS

- A. Signs shall be anodized die-stamped aluminum approximately 3/32-inch or cast aluminum approximately 1/4-inch thick. Signs shall be provided with a baked-on enamel background color finish.
- B. Letters, symbols, and borders shall be raised. Signs of individually cast letters shall not be used.
- C. Signs shall be mounted with one-way, tamper-proof fasteners. Fastener heads shall be finished to match the background finish of the sign.
- D. Manufacturers:
 - 1. A.R.K. Ramos Architectural Signage Systems
 - 2. ASE, Inc.
 - 3. Brandy
 - 4. Matthews Bronze
 - 5. Supersine Company
 - 6. Approved equal

2.3 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Project Manager from the manufacturer's standards.

B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:

1. Installation of all signage shall be in strict accordance with manufacturer's printed instructions and approved shop drawings. Installation shall be accomplished by experienced mechanics and in a workmanlike manner.
2. Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
3. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance in accordance to 2010 ADAAG Section 703.

B. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using one-way, tamper-proof fasteners. Shields shall be provided as required to suit the mounting conditions. Double-stick tape or adhesives shall not be used.

3.2 CLEANING AND PROTECTION

A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Project Manager. Remove all tools, equipment, debris, and surplus materials.

END OF SECTION

SECTION 10719

PROTECTIVE METAL SCREENS

PART 1 - GENERAL

1.1 SUMMARY:

- A. Provide all protective metal screens with insect type screening as shown and as specified herein for large and small missile protection to include the following:
 - 1. Fixed protective metal screens.
- B. Screen Locations: As indicated and scheduled.
- C. Related Work Described Elsewhere: Field painting of non-prefinished materials is specified in Section 09900 – PAINTING.

1.2 SUBMITTALS:

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Manufacturer's Data: Submit manufacturer's technical product data, construction details related to materials, dimensions of individual components, profiles, and finishes for each type of screen required.
- C. Shop Drawings: Submit shop drawings for fabrication and erection of screens. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, fasteners, reinforcement, accessories, layout, and installation details.
- D. Samples: Submit samples of each screen component for color as required and for verification of compliance with requirements indicated.
- E. Certified Test Data: Submit certified test data stating materials meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

- A. Furnish each protective metal screen as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components, for installation to the type of existing structural substrate and wall finishes as indicated. All materials shall have permanently affixed labels with manufacturer's name, address, and approval number/certifications.
- B. To the greatest extent possible, furnish screens from one manufacturer for the entire project.
- C. Design wind pressure shall be as indicated and is based upon minimum 115 mph peak gust, Exposure as applicable, Importance Factor 1.15.
- D. All screens shall be tested under either or both of the following:
 - 1. ASTM E 1886, "Standard Test Method For Performance of Exterior Windows, Curtain Walls, Doors, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials" and ASTM E 1996, "Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes" and comply with minimum Missile Level D (9 pound 2x4 at 50

f/s).

2. Miami-Dade County, Building Code Compliance Office, Product Control Division, Notice of Acceptance (NOA) for Large and Small Missile Impact, http://www.maimidade.gov/buildingcode/pc-search_app.asp

1.4 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate Fabrication schedule with construction to avoid delay.

1.5 DELIVERY AND STORAGE

- A. Protect screens and accessories from damage during delivery, storage, and handling. Clearly mark manufacturer's brand name. Store in dry locations with adequate ventilation, free from dust, water, and in such a manner as to permit access for inspection and handling. Handle screens to prevent damage. Remove damaged items that cannot be restored to like new condition and provide new items.

1.6 WARRANTY

- A. Provide manufacturers' standard 5-year limited material and workmanship warranty that metal storm screens are free from factory defects.
- B. The Surety shall not be liable beyond 2 years of the project acceptance date.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General Requirements: All screens shall conform to design requirements.
- B. Aluminum: ASTM B 221, 6063-T6 alloy and temper unless specified otherwise, nominal 0.062-inch minimum wall thickness for primary framing members.
- C. Screen: Stainless Steel, Type 304 or 316, 10 or 12 mesh, minimum 0.028-inch diameter.
- D. Anchors and Anchor Fasteners: Aluminum or 300 series stainless steel. [Provide tamperproof fasteners and special tool as indicated.]
- E. Security Beads:
 1. The security bead for perforated barrier screen shall be minimum 0.080-inch extruded aluminum, not less than 0.925 inches in width, running the full perimeter of the inside master frame. Finish shall match frame or screen as standard with the manufacturer.
 2. Extrusions shall be single or double hollow configuration.
- G. Mulling and Stiffener Tubes: Aluminum, 6063-T6 or approved equal.
- H. Provide screens manufactured by Fort Hurricane Products, Kane Manufacturing Corp., Protech Screens, Inc., Crimsafe North America LLC, or approved equal.

2.2 FABRICATION

- A. General: Screen frame protection shall cover the existing window opening as indicated.
 - 1. Depth of frame shall be not less than 1-1/4-inch.
 - 2. Horizontal and vertical site lines shall be equal and not exceed 1-1/2-inch.
- B. Frame: Frame joints shall be neatly mitered to form hairline joints. Corners shall be reinforced with solid stainless steel or aluminum corner key that is either welded or mechanically fastened with stainless steel fasteners in place.
- C. Glazing Legs: Glazing legs shall be mechanically fastened with #10 self-tapping fasteners, 5/8-inch in length, vertically and horizontally on 6-inch centers and be concealed for service maintenance only.
- D. Stacking or mulling of screen frames unless stated in the specifications or shown on the drawings shall not be permitted. Screen mullions shall only occur at existing window mullions where required.

2.3 FINISHES

- A. Aluminum: All exposed aluminum surfaces shall be free of scratches and other blemishes. Pre-clean surfaces and provide a conversion coating and provide exposed surfaces of aluminum with a minimum 2 coat fluoropolymer coating system containing 70 percent by weight polyvinylidene fluoride, PVF2 resin, factory-applied, oven baked conforming to AAMA 2604, "High Performance Organic Coatings on Aluminum Extrusions and Panels" or better, with a total dry film thickness of not less than 1.2 mils. Color should be as indicated or as selected by the Contracting Officer from manufacturer's standard colors.
- B. Stainless Steel Screen: Factory powder coat black finish.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Field Measurement: Field measure for exact dimensions prior to fabrication of screens.

3.2 INSTALLATION

- A. Installation of all screens shall be in strict accordance with manufacturer's printed instructions and approved shop drawings. Installation shall be accomplished by experienced mechanics and in a workmanlike manner.
- B. Locate screen units and accessories where indicated, using mounting methods and the type described and in compliance with the manufacturer's instructions.
- C. Install screens level, plumb, and at the height indicated, with screen surfaces free from distortion or other defects in appearance.
- D. Where aluminum surfaces are in contact or fastened to masonry, concrete, wood, or dissimilar metals, the aluminum surface shall be protected from dissimilar materials as recommended in the Appendix to AAMA 101, "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors". Surfaces in contact with sealants after installation shall not be coated with any type of protective material.

3.03 CLEANING AND PROTECTON

- A. At completion of the installation, clean soiled screen surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Contracting Officer. Remove all tools, equipment, debris, and surplus materials.

END OF SECTION

SECTION 10800

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. The extent of each type of toilet accessory is shown on the drawings and herein specified.
- B. Related Work Described Elsewhere: Coordinate surface applied and through partition accessories with SECTION 10165 - SOLID PLASTIC TOILET COMPARTMENTS.

1.2 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish inserts and anchoring devices for toilet accessories. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.
- B. The structural strength of all grab bars and all fasteners and mounting devices shall meet or exceed the accessibility requirements of ADA Section 609.
- C. Products:
 - 1. Provide products of the same manufacturer for each type of accessory unit and for units exposed in the same areas, wherever possible.
 - 2. Coordinate with the Director for acceptable designs and finishes.
 - 3. Stamped names of labels on exposed faces of units will not be permitted, except where otherwise specified.
 - 4. Provide locks where specified or standard with the manufacturer. One key shall fit all locks of one brand. Provide a minimum of 4 keys.
- D. Accessibility: Mount accessories for accessible toilets in accordance with Americans with Disabilities Act (ADA) Sections 603.3, 603.4, 604.5, 604.7, 609, where either in an accessible stall or accessible by all.
- E. Drawings may be general in nature. Accessories shown for one stall or room shall be repeated in similar stalls or rooms unless noted otherwise.

1.3 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Manufacturer's Data: Submit copies of manufacturer's specifications and installation instructions for each toilet accessory.
- C. Schedule: Submit a schedule listing types, quantities, and installation locations by room for each toilet accessory to be provided.
- D. Samples: When requested, submit full-size samples of units to the Director for review of finishes. Acceptable samples will be returned and may be used in the work. Compliance with all other requirements is the exclusive responsibility of the Contractor.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Toilet accessories shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging and stored in a clean, dry area protected from construction damage and vandalism.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: AISI, Type 302/304. Provide satin finish, unless otherwise specified.
- B. Galvanized Steel Mounting Devices: Hot-dip galvanized after fabrication ASTM A 123/A 123M.

2.2 LIST OF TOILET ACCESSORIES (Refer to drawings for locations)

- A. For convenience and to establish standards of quality and design, the following list indicates items manufactured by Bobrick Washroom Equipment Co. Equal products of the following manufacturers will be accepted:
 - 1. Bradley Corp., Washroom Accessories Division
 - 2. McKinney Parker Products Co.
- B. Grab Bars (GB): B-6806 Series, with concealed mounting and snap flange covers, 1-1/2 inch outside diameter, extra heavy stainless steel grab bar, satin gripping finish surface. Anchor plate with vandal-proof set screws. Provide sizes indicated. Provide manufacturer's metal backer plates 2562 series as applicable and appropriate stainless steel mounting kits for sub-strate. Provide as shown on the drawings.

- C. Seat Cover Dispenser: B-221, surface mounted, for 250 single or half-fold toilet seat covers. Provide 1 ea at each Women's toilet stall, adjacent to water closet on far side wall
- D. Sanitary Napkin Disposal: B-254, surface mounted. Provide 1 ea at each Women's toilet stall, adjacent to water closet on far side wall,
- E. Wall Mounted Soap Dispenser (SD): B-2112, wall mounted, capacity 40 fluid ounces, vandal resistant. Provide 1 ea at adjacent wall of each lavatory,
- G. Paper Towel Dispenser (PTD): B-262, surface mounted, for 400 C-fold or 525 multi-fold towels. Provide 1 ea at adjacent wall of each lavatory,
- H. Mop and Broom Holder (MBH): B-223 x 24, surface mounted; stainless steel, with 3 anti-slip mop holders with spring-loaded cam grips. Provide 1 ea at Storage Rm,
- I. Robe Hook: B-233. Provide 1 ea at each toilet stall door, interior face, centered horizontally, 48" AFF

PART 3 – EXECUTION

3.1 INSPECTION

- A. Installer must examine the areas and conditions under which toilet accessories are to be installed. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- B. Determine that all blocking and concealed backer plates have been installed to allow mounting of accessories.

3.2 INSTALLATION

- A. Use concealed fastenings wherever possible.
- B. Provide anchors, bolts, backer plates, and other necessary fasteners, and attach accessories securely to walls and partitions in locations as shown or directed.
- C. Install concealed mounting devices and fasteners fabricated of the same material as the accessories or of galvanized steel.
- D. Install exposed mounting devices and fasteners finished to match the accessories.
- E. Provide theft-resistant fasteners for all accessory mountings.

- F. Secure toilet room accessories to adjacent walls and partitions complying with the manufacturer's instructions for each item and each type of sub-strate construction.
- G. Where accessories transition uneven substrates such as between ceramic tile wainscoted and wall surface above, provide finish wood spacers to completely fill all voids. Finish to match wall surface or as directed.

3.3 CLEAN UP

- A. Clean exposed surfaces as recommended by the manufacturer and re-store damaged work to its original condition or replace with new.

END OF SECTION

SECTION 10850
COMPOSTING TOILET SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide complete waterless composting toilet system, including compost tank, ventilation fan, liquid removal pump, waterless toilet, and accessories.

1.2 REFERENCES

- A. NSF Standard 41 – Non-Liquid Saturated Treatment Systems
- B. ASTM Standards as referenced

1.3 SUBMITTALS

- A. Product Data
- B. Shop Drawings
- C. Operation and Maintenance Data
- D. Warranty

1.4 QUALITY ASSURANCE

- A. System shall be listed and approved under NSF Standard 41.
- B. Manufacturer shall have minimum five (5) years experience producing composting systems.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in manufacturer's original packaging.
- B. Store in dry, protected location.
- C. Protect from damage.

1.6 WARRANTY

- A. Provide manufacturer's standard warranty.

- B. Provide minimum five (5) year warranty for ventilation fan.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Clivus Multrum M35 Compost System
- B. Substitutions: Subject to approval

2.2 COMPOST TANK

- A. Tank shall be rotationally molded high-density cross-link polyethylene.
- B. Material Properties:
 - 1. Density: 0.941 g/cm³ (ASTM D-1505)
 - 2. Tensile Strength: 2600 psi (ASTM D-638)
 - 3. Impact Brittleness: Less than minus 180°F (ASTM D-746)
 - 4. Dart Impact: 190 ft-lbs at minus 40°C
 - 5. Environmental Stress Crack Resistance: Greater than 1000 hours (ASTM D-1693)
 - 6. Wall Thickness: 3/8 inch nominal
- C. Physical Properties:
 - 1. Weight: 800 pounds
 - 2. Volume: 234 cubic feet (1,747 gallons)
- D. Capacity:
 - 1. Daily Capacity: 180 uses minimum at 65°F
 - 2. Annual Capacity: 65,000 uses minimum at 65°F
- E. Features:
 - 1. Integral liquid separation tank, 45 gallons

2. Separation tank constructed of rotationally molded high-density cross-link polyethylene
3. Fiberglass baffle separating active and finished compost
4. Separate chamber for finished compost
5. Front-access maintenance from standing position

F. Dimensions:

1. Length: 103 inches
2. Width: 70-1/2 inches
3. Height: 89 inches

G. Access and Working Areas:

1. Working Area on Top: 53 inches by 51 inches
2. Upper Access Door: 10 inches by 30 inches
3. Compost Access Lid: 32 inches by 70-1/2 inches

2.3 COMPOSTER FAN

A. Provide ventilation fan for odor control and aeration.

B. Construction:

1. Housing: GE NORYL N190 plastic
2. Motor and blades coated with waterproof lacquer for corrosion resistance
3. 1.75-inch lip collars
4. External terminal box with pre-wired capacitor

C. Motor:

1. Totally enclosed
2. Suitable for high moisture, dust, and lint conditions

3. Class B insulation
4. Continuous operation in air streams up to 140°F
5. Permanently sealed ball bearings with special lubricant
6. Thermal overload protection with automatic reset

D. Performance:

1. Voltage: 115V
2. Power: 93W
3. Frequency: 60 Hz
4. Current: 0.8 amp
5. Airflow: 243 CFM

E. Fan:

1. Backward-inclined blades attached to rotating motor

F. Listings:

1. CSA and UL listed

G. Dimensions:

1. Height: 7-6/8 inches
2. Diameter: 11-3/4 inches

2.4 LIQUID REMOVAL PUMP

A. Provide submersible pump system for removal of compost liquid.

B. Requirements:

1. 115 VAC
2. 1/6 horsepower

3. Float switch controlled
4. Outlet: 1-inch NPT

C. Construction:

1. Cast aluminum housing with protective epoxy coating
2. Mounted in 5-gallon polypropylene isolation chamber with check valve

2.5 WATERLESS TOILET

A. Toilet shall be constructed of impact-resistant ABS with sanitary white finish.

B. Components:

1. Plastic seat and lid
2. Rotationally molded polyethylene liner

C. Configuration:

1. Install directly above compost tank
2. Provide 14-inch diameter polyethylene chute connection

D. Dimensions:

1. Standard Height: 14 inches
2. Accessible Height: 18 inches
3. Width: 18-1/2 inches
4. Length: 24-1/4 inches

2.6 WATERLESS URINAL

A. Urinal shall be vitreous china with white porcelain finish.

B. Features:

1. One-piece hanger

C. Dimensions:

1. Height: 18.5 inches
2. Width: 13-1/2 inches

D. Connection:

1. Drain: 2 inches

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify site conditions prior to installation.
- B. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Locate toilet directly above compost tank.
- C. Provide required venting and piping connections.
- D. Provide access for maintenance and servicing.

3.3 FIELD QUALITY CONTROL

- A. Verify operation of ventilation fan.
- B. Verify operation of liquid removal pump.
- C. Verify airflow and liquid removal.

3.4 CLEANING

- A. Clean system after installation.

3.5 PROTECTION

- A. Protect system from damage until acceptance.

3.6 DEMONSTRATION

- A. Provide instruction to Director on operation and maintenance.

END OF SECTION

SECTION 12365

PLASTIC-LAMINATE-CLAD COUNTERTOPS

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 plastic laminate countertops.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including high-pressure decorative laminate and adhesive for bonding plastic laminate.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of cutouts and holes for plumbing fixtures faucets and other items installed in plastic-laminate countertops.
- C. Samples for Verification:
 - 1. Plastic laminates, 200 by 250 mm (8 by 10 inches), for each type, color, pattern, and surface finish.

1.4 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system operates and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 16 and 32 deg C (60 and 90 deg F) and relative humidity between 43 and 70 percent during the remainder of

the construction period.

- C. Field Measurements: Where countertops are 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.
- D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
- B. Grade: Custom.
- C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGP.
- D. Chemical-Resistant, High-Pressure Decorative Laminate: NEMA LD 3, Grade HGP, and as follows:
 - 1. Laminate has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.9.5:
 - a. Nitric Acid (30 Percent): Moderate effect.
 - b. Sulfuric Acid (77 Percent): Moderate effect.
 - c. Hydrochloric Acid (37 Percent): Moderate effect.
 - d. Phosphoric Acid (75 Percent): No effect.
 - e. Acetic Acid (98 Percent): No effect.
 - f. Formaldehyde: No effect.
 - g. Ethyl Acetate: No effect.
 - h. Ethyl Ether: No effect.
 - i. Phenol (85 Percent): Moderate effect.
 - j. Benzene: No effect.
 - k. Xylene: No effect.
 - l. Butyl Alcohol: No effect.
 - m. Furfural: No effect.
 - n. Methyl Ethyl Ketone: No effect.
 - o. Sodium Hydroxide (25 Percent): No effect.
 - p. Sodium Sulfide (15 Percent): No effect.
 - q. Ammonium Hydroxide (28 Percent): No effect.
 - r. Zinc Chloride: No effect.

- s. Gentian Violet: No effect.
 - t. Methyl Red: No effect.
- E. Colors, Patterns, and Finishes: Match existing color, pattern and finish.
 - F. Edge Treatment: Same as laminate cladding on horizontal surfaces.
 - G. Core Material: medium-density fiberboard made with exterior glue or exterior grade plywood.
 - H. Core Thickness: 19 mm (3/4 inch).
 - 1. Build up countertop thickness to 38 mm (1-1/2 inches) at front, back, and ends with additional layers of core material laminated to top.
 - I. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.2 WOOD MATERIALS

- A. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 - 2. Softwood Plywood: DOC PS 1.

2.3 MISCELLANEOUS MATERIALS

- A. Adhesives: Do not use adhesives that contain urea formaldehyde.
- B. VOC Limits for Installation Adhesives and Sealants: Use products 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. Multipurpose Construction Adhesives: 70 g/L.
 - 3. Structural Wood Member Adhesive: 140 g/L.
 - 4. Architectural Sealants: 250 g/L.

2.4 CONSTRUCTION

- A. AWI Type 6, Post-Formed Edge with Coved Splash with 100 mm.
- B. Provide countertops to provide front and end overhang of 25 mm (1 inch) over base cabinets.

2.5 FABRICATION

- A. Complete fabrication, including assembly, 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.
- B. Shop cut openings to maximum extent possible to receive 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.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
- B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and back priming.

3.2 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
 2. Seal edges of cutouts by saturating with varnish.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
 1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 150 mm (6 inches) of front and back edges and at intervals not exceeding 600 mm (24 inches). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 3 mm in 2400 mm (1/8 inch in 96 inches).
- E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 1. Install countertops with no more than 3 mm in 2400-mm (1/8 inch in 96-inch) sag, bow, or other variation from a straight line.
 2. Secure backsplashes to tops with concealed metal brackets at 400 mm (16 inches) o.c. and to walls with adhesive.
 3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 15000

GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. These general mechanical requirements govern work specified under all sections of Division 15 - MECHANICAL.
- B. The Contractor shall furnish all labor, materials, tools and equipment and perform all work and services necessary for a complete and properly operating mechanical equipment and systems, as shown on drawings and as specified, in accordance with provisions of the Contract Documents and completely coordinated with work of all other trades.
- C. The Contractor shall completely examine the Contract Documents and shall report to the Director any error, inconsistency or omission he discovers.
- D. Furnish and install all supplementary or miscellaneous items, 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 and not indicated or work indicated and not specified as though mentioned in both.
- F. 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 and in conformance with Contract Documents for a guaranteed period of one year after the date of acceptance as specified.
- G. The Contractor shall maintain at the site one (1) copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders and other modifications, in good order and marked (in red) to record all changes made during construction. These shall be made available to the Director.
- H. The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of the work, he 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.
- I. The Contractor shall give the Director timely notice of its readiness for testing any work including the data arranged so the Director may observe such testing. The Contractor shall bear all cost of such tests.
- J. The Director shall have the right to accept or reject material, equipment, and/or workmanship and determine when the Contractor has complied with the contract documents.

1.2 INSPECTION OF SITE

- A. 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 and no extra payments will be allowed to the Contractor on account of extra work made necessary by his failure to visit the site. If there are any questions or discrepancies in the design, the Contractor shall bring it to the attention of the Director before submitting his proposal.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 – SUBMITTAL PROCEDURES.
- B. Submit electronic PDF files of shop drawings, manufacturers data and certificates for equipment, materials and finish and pertinent details for each system and have them approved before procurement, fabrication or delivery of the items to the job site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable industry and technical society publication references and other information necessary to establish contract compliance of each item the Contractor proposed to furnish.
 - 1. Shop Drawings: Drawings shall be a minimum of 22 inches by 34 inches in size, except as specified otherwise. Drawings shall include floor plans, sectional views, wiring diagrams and installation details of equipment; and equipment spaces identifying and indicating proposed location, layout and arrangement of items of equipment, control panels, accessories, piping and other items that must be shown to assure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and interconnection between each type of equipment. Drawings shall indicate adequate clearance for operation, maintenance and replacement of operating equipment devices. If equipment is disapproved, drawings shall be revised to show acceptable equipment and be resubmitted.
 - a. The Contractor shall review, stamp with his approval and submit, all Shop Drawings required by the Contract Documents or subsequently by the Director as covered by modifications. At the time of submission, the Contractor shall inform the Director in writing of any deviation in the Shop Drawings from the requirements of the Contract Documents. 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.
 - b. Provide Shop Drawings prior to installation of equipment, piping, etc.
 - c. All costs to changes required to work done prior to Director's review of Shop Drawings shall be incurred by the Contractor and shall be at no additional cost to State.
 - 2. Manufacturer's Data: Submittals for each manufactured item shall be manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves and catalog cuts.
 - 3. Standards Compliance: When materials or equipment must conform to the standards of organizations such as the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA) and Underwriters Laboratories (UL), proof of such conformance shall be submitted to the Engineer for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual sections. In lieu of the label or listing, the Contractor shall submit a certificate from an independent testing organization, which is competent to perform acceptable test and is approved by the Engineer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's

standard. For materials and equipment whose compliance with organizational standards or specifications is not regulated by an organization using its own listing or label as proof of compliance, a certificate of compliance from the manufacturer shall be submitted for approval. The certificate shall identify the manufacturer, the product and the referenced standard and shall simply state that the manufacturer certifies that the product conforms to all requirements of the project specification and of the referenced standards listed.

4. Certified Test Reports: Before delivery of materials and equipment, certified copies of all test reports specified in the individual section shall be submitted for approval.
5. Certificates of Conformance or Compliance: 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. Pre-printed certifications will not be acceptable; certifications shall be in the original. 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.
6. "Field Posted As-Built" Drawings: Keep at the job site a complete, accurate record of all approved deviations from the contract drawings, shop drawings and specifications. Keep these changes on prints of the drawings affected and turn over one (1) set to the Engineer at the completion of the project.

1.4 LAWS, REGULATIONS AND CODES

- A. All work shall be in accordance with government laws, ordinances, rules and regulations and orders.
- B. The following shall govern where applicable; the Plumbing Code of the County of Hawaii, the Building Code of the County of Hawaii, State of Hawaii Department of Health Regulations, U.S. Department of H.E.W., Applicable National Fire Protection Association Standards, OSHA, Rules and Regulations, County of Hawaii Energy Code and all other codes and standards referenced in these specifications. Where requirements differ in these code and standards, the more stringent shall apply.

1.5 TRADE NAME

- A. Mentioning a trade name in the plans and specifications indicates that the manufacturer is acceptable to the Engineer. However, certain specified construction and details may not be regularly included in the manufacturer's catalogued product. The Mechanical Contractor shall provide the material or equipment complete as specified.

1.6 PERMITS AND INSPECTIONS

- A. Applications for permits will be done by the contractor, the Contractor shall pay for all necessary licenses, permits and fees.
- B. The Mechanical Contractor shall apply and pay for all necessary inspections required by any public authority having jurisdiction.

1.7 DISCREPANCIES

- A. The Drawings and Specifications are intended to be cooperative. Any materials, equipment or system related to this section and exhibited on the Architectural, Structural, Electrical or

Mechanical 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. Drawings and Specifications are intended to be fully cooperative and to agree, but should any discrepancy or apparent difference occur between Drawings and Specifications or should error occur in the work of others affecting the work, the Contractors 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 or defect. The Engineer shall clarify all interpretations of Drawings and specifications.

1.8 WORKMANSHIP AND MATERIALS

- A. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. The Contractor shall furnish the services of an experienced superintendent, who will be constantly in charge of the erection of the work, until completed and accepted.
- B. Unless otherwise hereinafter specified, each article of its kind shall be the standard product of a single manufacturer.
- C. 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.
- D. The Engineer shall have the right to accept or reject material, equipment and/or workmanship and determine when the Contractor has complied with the requirements herein specified.
- E. 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.
- F. Reference to standards is intended to be the latest revision of the standard specified.

1.9 MANUFACTURERS' 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 material being installed, printed copies of these recommendations shall be furnished to the Director, 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 of rejection of the material.

1.10 OPENINGS, CUTTING AND REPAIRING

- A. The Mechanical Contractor shall cooperate with the work to be done under other sections in providing information as to openings required in walls and slabs for all piping including sleeves where required.
- B. Any drilling or cutting required for the performance of work under this Section shall be the

responsibility of this Contractor and the cost shall be borne by him.

- C. Holes in Concrete: The Mechanical Contractor shall pay all costs for cutting holes. All holes through existing concrete shall be either core drilled or saw cut. All holes required shall have the approval of the Director prior to cutting and drilling.
- D. It shall be the responsibility of this Contractor to ascertain that all openings are properly located.

1.11 ELECTRICAL WORK

- A. All power wiring, including final hook-up to all mechanical equipment will be provided. Control devices required on the power wiring shall be provided by the Mechanical Contractor, to be wired by the Electrical Contractor.
- B. The Mechanical Contractor shall furnish all starters for installation by the Electrical Contractor. The Mechanical Contractor shall turn over these items to the Electrical Contractor at the site after receipt of notice from the Electrical Contractor that he is ready to install said items.

PART 2 - PRODUCTS

2.1 MATERIALS

- 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 or equipment and shall be manufacturer's latest design that comply with the specification requirements. Materials and equipment shall be 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 name, address, model number and serial number on the nameplate.

2.2 SUBSTITUTIONS

- A. The material, products and equipment described in these specifications establish a standard of required function, quality, dimension, capacity, and appearance to be met by any proposed substitution.
- B. Specific product listings in these specifications shall not preclude alternate product selections of comparable or superior quality. The Contractor may make reasonable substitutions, provided that these are submitted to the Director for acceptance prior to bid in accordance with the Special Provisions and Interim General Conditions. The Contractor shall be responsible for design changes to accommodate the substituted product, at no additional costs to the State.

PART 3 - EXECUTION

3.1 EQUIPMENT

- A. Mechanical Equipment, Fixtures and Accessories
 - 1. All mechanical equipment, accessories, plumbing fixtures and plumbing accessories shall be purchased by a Hawaii based manufacturers representative who is factory authorized

to furnish these items in the State of Hawaii. The manufacturers' representative shall be knowledgeable in the operation and functioning of the items furnished by him and must meet the following conditions:

2. The manufacturer's representative shall furnish recommendations on the installation and operation of the items furnished in a capacity conforming to that of the actual manufacturer.
 3. The manufacturer's representative shall stock a reasonable amount of replacement parts locally.
 4. The manufacturer's representative shall have the ability to provide warranty replacement parts for equipment in a timely fashion to reduce the down time of equipment.
- B. Maintenance Service Contractor: The maintenance service contractor shall have a local office, staffed with competent and qualified field service personnel. The personnel shall be certified by the manufacturer to perform service and maintenance tasks on all equipment in accordance with the one-year maintenance service contract and the terms and conditions of all equipment manufacturers' warranties and recommendations. Field service personnel shall be fully capable of providing technical assistance instruction, routine maintenance and emergency maintenance service on all system equipment components.
- C. Trouble Calls: Emergency service and repairs required between regular service calls shall be rendered within 24 hours after the Contractor is notified, non-work days excluded.
1. The Contractor shall call the State, the next working day after being notified of the problem and report the status of repairs.

3.2 PIPING IDENTIFICATION

- A. Identification of all pipelines shall be by means of colored, waterproof, all temperature, self-adhering labels and directional arrow.
- B. At Contractor's option, each and every system may be identified by painting with contrasting colors, using 3/4" high minimum stencil letters. Painting shall be done by the Mechanical Contractor.
- C. All exposed pipes, whether insulated or not shall be identified. Labels may be omitted from piping where the use is obvious, due to its connection to equipment and where the appearance would be objectionable in finished rooms, as approved by the Director.
- D. Identification labels shall be placed as follows:
 1. Near each valve and branch connection.
 2. Wherever piping merges or disappears from view from the floor of the room in which it is installed.
 3. Labels shall not be more than 50 feet apart.

3.3 VALVE INDEX

- A. The Mechanical Contractor shall provide brass or plastic tags on all valves with letters stamped or engraved thereon-designating service of each valve.

3.4 FIELD TEST

- A. The Mechanical Contractor shall perform all tests of the installed work and shall provide all services, labor, equipment, materials and instruments needed for the tests. During pressure tests, all items in the system to be tested, not designed for test pressures shall be removed or isolated from the system and shall be reconnected or unblocked after tests are completed. Should operating tests require the presence of manufacturers' representatives, the Mechanical Contractor shall cooperate with them and shall place at their disposal all assistance, materials and services required to perform such test. The Mechanical Contractor shall certify in writing that all work has passed all required tests.

3.5 POSTED OPERATING INSTRUCTION

- A. Furnish approved operating instructions for each principal item of equipment for the use of the operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams and control sequence for each principal item of equipment. Operating instruction shall be printed or engraved and shall be framed under glass or in approved laminated plastic and posted where directed by the Director. Operating instructions shall be attached to or posted adjacent to each principal item of equipment including start up, procedure in the event of equipment failure and other items of instruction as recommended by the manufacturer of each item of equipment. Operating instructions exposed to the weather shall be made of weather-resistant materials or shall be suitably enclosed to be weather protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

3.6 INSTRUCTION TO MAINTENANCE PERSONNEL

- A. The Contractor shall furnish the services of competent instructors who will give full instruction to the designated personnel in the adjustment, operation and maintenance, including pertinent safety requirements, of the equipment or system specified. Each instructor shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the State for regular operation. When significant changes or modifications in the equipment or systems are made under the term of the contract, additional instruction shall be provided to acquaint the operating personnel with the changes or modifications.

3.7 SAFETY REQUIREMENTS

- A. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded. High temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of a type as specified herein. Items such as catwalks, ladders and guardrails shall be provided where required for safe operation and maintenance of equipment.

3.8 INSPECTIONS

- A. All work and materials are subject to field observation at any and all times by the Director.
- B. Contractor shall notify the Director a minimum of two days prior to testing any piping or ducting systems which must be witnessed and approved before they are covered up or enclosed. Should the Contractor fail to notify the Director at the times prescribed, it shall then be the Contractor's responsibility to make duct work accessible, expose any concealed lines, or demonstrate the acceptability of any part of the system. Any extra cost caused by the removal of such work shall be borne by the Contractor.

- C. If the Director finds any material or work not conforming to these Specifications, Contractor within three days of being notified shall remove said materials from the premises and replace with approved material, at no cost to the State.
- D. FINAL INSPECTION
- E. Final inspection shall be requested by the Contractor only after submittal of all required certificates. No final inspection will be made until all moving parts of equipment are properly guarded, all controls and safety devices tested and operative, all painting required done and the site cleaned up.

3.9 OPERATIONAL AND MAINTENANCE MANUAL

- A. Submit Three (3) hard bound copies of the Operating and Maintenance Manual on all equipment and the system as a whole. The manual shall identify project name and number, contractor, consultant, date and all equipment provided. It shall include the equipment manufacturer's name, model and serial number, tag no., capacity, quantity of units, their location and area (room) served and shall include the manufacturer's operation and maintenance manuals including control and wiring diagrams and source of service and replacement parts. 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.
- B. Distribution of Submittal:
 - 1. Copies: State

END OF SECTION

SECTION 15400

PLUMBING SYSTEM: BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section 15000 - GENERAL MECHANICAL REQUIREMENTS, applies to this section with the additions and modifications specified herein.

1.2 WORK SPECIFIED IN THIS SECTION

- A. All materials, labor and equipment necessary for complete and operating interior plumbing system within 5 feet of the building line, including complete sanitary and potable water piping.

1.3 STANDARDS AND CODES

- A. Installation shall conform to all applicable provisions of the latest editions of the following, as well as to specific standards listed elsewhere in these Specifications.
 - 1. Uniform Plumbing, with The County of Hawaii Amendments.
 - 2. American Society for Testing and Materials (ASTM):
 - a. A74 92 Cast Iron Soil Pipe and Fittings
 - b. A53-90 (Rev. B) pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
 - c. B88 92 Seamless Copper Water Tube
 - 3. American National Standards Institute (ANSI):
 - a. B16.18 84 Cast Bronze Solder Joint Pressure Fittings
 - b. B16.23 92 Cast Copper Alloy Solder Joint Drainage Fittings - DWV
 - c. Z21.22-86 (Addendum 1990) Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems

1.4 SUBMITTALS

- A. Submit in accordance with Section 01300 - SUBMITTAL PROCEDURES.
- B. As indicated in Section 15000 - GENERAL MECHANICAL REQUIREMENTS.
- C. Certificate of compliance by the test laboratory analyzing the water samples following the pipeline disinfection and flushing.
- D. Guarantee: Provide written guarantee for all plumbing work as described in Section 15000 - GENERAL MECHANICAL REQUIREMENTS.
- E. Record Drawings: Provide "as-built" record drawings for all plumbing work as described in Section 15000 - GENERAL MECHANICAL REQUIREMENTS.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for products specified with equivalent models shall be submitted for acceptance in accordance with Section 15000 - GENERAL MECHANICAL REQUIREMENTS of these Specifications.

2.2 PIPING MATERIALS

- A. Soil, Waste and All Vent Piping: Schedule 40 drain, waste and vent pipe shall be Rocky Mountain Colby Pipe Company PVC DWV Cellular Core manufactured to ASTM F-891 and certified by a recognized listing agency, or, Rocky Mountain Colby Pipe Company ABS DWV Cellular Core manufactured to ASTM F-628 and certified by a recognized listing agency. PVC joints shall be made-up with Weld-On PVC 705 medium bodied, fast setting, PVC cement and suitable primer. ABS joints shall be made-up with Weld-On ABS 733 medium bodied, fast setting, ABS cement.
- B. Potable Water:
 - 1. Water Lines Above Grade: Copper Type L, hard temper, with wrought copper or cast bronze fittings made up with 95-5 solder. All copper piping in walls and thru floors shall be provided with IPS Weld-On Pipe Insulators at all wood contact with the copper piping.
 - 2. Water Lines Below Grade: Copper Type K, soft temper, with silver solder brazed joints.

2.3 VALVES

- A. General: Model and number listed in these specifications are the basis for type and quality. Pressure ratings indicated are "working steam pressure" (WSP).
- B. Ball Valves: Nibco S-FP-600 brass ball valves, provide with locking lever for balancing valves or approved equal.
- C. Pressure Reducing Valve: Pressure reducing valves shall be Watts Series U5B or equal.

2.4 UNIONS

- A. Copper: bronze body, 200 psig.
 - 1. For pipes 2 inches and smaller use ground joint
 - 2. For pipes 2-1/2 inches and larger use flanged face.
- B. Dielectric Unions shall separate all ferrous and nonferrous metals in all piping systems. Unions shall match those above, except that of metal-to-metal contact shall be avoided. Where flanges are used, the bolts shall be electrically insulated from the body of the flange.

2.5 AIR CHAMBERS

- A. Air chambers shall be 12" long copper tubing, the same size as branch pipe to fixture. Pipe shall be capped, crimping is not allowed.

2.6 ROUGH IN PIPING SPECIALTIES

- A. Floor Cleanouts (FCO): Smith Fig. 4028 Duco cast iron body, round top, bronze plug, taper thread, inside caulk outlet
- B. Wall Clean Out (WCO): Smith Fig. 4472 Cast Bronze taper thread plug with stainless steel cover and screw.

2.7 ESCUTCHEONS

- A. Brass body, chrome plated finish. Provide sizes sufficient to cover pipe openings through the floor, wall, or ceiling. Escutcheons shall be secured in place by either spring clips or setscrews.

2.8 PIPE SLEEVES

- A. Schedule 40 galvanized steel pipe sleeves in concrete, 18 gauge galvanized sheet metal sleeves in other construction. Sleeves shall be sized to provide a minimum of 1/4" clearance around bare or insulated piping or as otherwise required by Code.

2.9 PIPE HANGERS AND SUPPORTS

- A. General: Elcen, Fee and Mason, Globe, Grinnell, Superstrut, and Unistrut are approved. Fee and Mason figure numbers indicate type and quality. Provide concrete insert at all pre-stressed planks for pipe and equipment installation and coordinate with pre-stressed plank contractor.
- B. For Uninsulated Copper Tubing: Fee and Mason No. 307, 364, or 365.
- C. For Insulated Copper Tubing: Fee and Mason No. 800.
- D. Riser Clamps: Black steel, Fee and Mason No. 241. Copper coated, Fee and Mason No. 368.
- E. Hanger Spacing:

<u>Pipe</u>	<u>Maximum Spacing</u>
Copper tubing, 1 1/2" and smaller	6 feet
Copper tubing, 2" and larger	10 feet
Cast iron soil pipe	At each joint and at intervals not to exceed 8 feet.

- F. Hanger Rods: Continuous threaded rod conforming to ASTM A 107. Eye rods shall be Fee and Mason Figure No. 228 and 228 WL. Sizes shall be as follows:

<u>Pipe Size</u>	<u>Rod Size</u>
1/2" to 2"	3/8"
2 1/2" to 3"	1/2"
4" to 6"	5/8"

- G. Section 15450 PLUMBING FIXTURES AND TRIM.

PART 3 - EXECUTION

3.1 WORKMANSHIP AND COORDINATION

- A. All work shall be of the highest standard. Poor workmanship will be rejected by the State and shall be replaced at no additional cost to the State.
 - B. Coordinate this work with schedules of other trades, specifically sanitary and water lines below concrete slabs or concealed in walls. Set all required inserts and sleeves.
 - C. Lay out piping to insure a neat and orderly arrangement, with vertical lines plumb.
- Carefully handle all exposed piping to avoid tool marking. Handle polished fittings with extra care so tool marks do not show.

3.2 PIPING INSTALLATION

- A. Roughing In:
 - 1. Proceed with the rough in work as rapidly as general construction will permit and have all the roughing in stubbed out and tested before any finished work is in place.
 - 2. Fit all piping to follow the building structural elements as closely as possible.
- B. General Installation Guidelines: Inspect all pipes fully inside and out for defects. Ream out ends of pipe and remove all burrs. Water lines shall be protected during construction to prevent contamination of interior surfaces.
- C. Do not close up before pipe inspection and accepted by the State.
- D. Provide pipe sleeves where pipes pass through concrete masonry below grade. Fill annular space within sleeves with 3-hour rated, UL accepted fireproof caulking. Flash around base of pipes penetrating the roof. Penetrations shall not leak even under the heaviest rainfall conditions.
- E. Slope sanitary piping not less than ¼-inch per foot of horizontal, unless otherwise indicated on drawings. Grade vent pipes to expel water.
- F. Protect copper tubing from coming in contact with dissimilar metal with dielectric union. Wrap underground copper lines with 3 layers of plastic tape.
- G. All piping shall be properly and safely supported. Support soil stacks at their bases and at each floor with metal clamps.
- H. Install unions at all equipment and system specialties, whether specifically shown on the drawings or not.
- I. Apply pipe insulation in accordance with the National Insulation Contractors Association (NICA). Insulate all fittings and valve bodies, and cover to match straight pipe sections, or use pre-formed PVC insulation covers. All hot water lines shall be insulated with one-inch-thick fiberglass insulation.

3.3 EQUIPMENT SUBSTITUTIONS ACCEPTANCE

- A. Do not commence with installation until proposed equipment substitution submittals are accepted.

3.4 FIXTURE INSTALLATION

- A. Set all plumbing fixtures in an accepted workmanlike manner. Point up edges against wall with accepted caulking.
- B. Flanges at wall penetrations shall be flush against wall and shall not spin when rotated by hand.
- C. Adjust equipment and plumbing fixtures and trim to operate properly and clean all fixtures just prior to final inspection.

3.5 DISINFECTION OF WATER LINES

- A. Flush out water lines to remove foreign matter. After flush water runs clear, disinfect the lines with chlorine in accordance with AWWA Standard C601, pertaining to methods, concentrations, and contact times. Flush out until residual is reduced to 0.3 parts per million. Submit a certificate of completion for this work from a contractor experienced and licensed to do disinfecting work.
- B. Obtain 2 water samples from selected points and submit them to a licensed laboratory for bacteriological testing. Water shall meet Federal water purity standards. Submit the laboratory report or a certification of satisfactory completion of disinfection. All costs of testing shall be borne by the Contractor.

3.6 TEST AND ACCEPTANCE INSPECTIONS

- A. Test all new plumbing lines in accordance with methods described in the Plumbing Code. Repair all leaks and repeat the test until all lines are leak free.
- B. Contractor shall arrange for inspections by the County and conduct required tests in the presence of the State and inspectors for the State.
- C. Tests shall be repeated as necessary to satisfy the State, or such tests shall be done by the State and charged to the Contractor.

END OF SECTION

SECTION 15450

PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: plumbing fixtures and trims.

1.2 RELATED SECTIONS

- A. SECTION 15400 - Plumbing System: covering water piping and waste piping, sanitary systems and drains, and plumbing installation.

PART 2 - PRODUCTS

2.1 WATER CLOSET (WC-1)

- A. Kohler Model K-PR96057-T4HS Highcliff Ultra Toilet with Mach Tripoint flushometer, Vitreous china, 1.28-gallon flush. Elongated bowl design, 16-5/8" high, 1-1/2" top spud, bowl shall have 2-1/8" passageway. Touchless toilet flushometer, HES-powered 1.28 gpf, polished chrome finish, battery operated, 1" I.P.S. screwdriver Bak-Chek angle stop. Adjustable tail piece. Or approved equal.
- B. Beneke Model 523 SS NCH heavy duty solid plastic seat for elongated bowl, with self-sustaining feature and check hinges. Or approved equal.
- C. ProFlo Model No. PFWRWH heavy duty wax bowl ring with horn. Or approved equal.
- D. PASCO Model No. 184 1/4" x 3-1/2" heavy S.S. closet bolt sets. Or approved equal.
- E. Fixtures and installation shall conform to ADAAG Section 604: Water Closets.

2.2 WATER CLOSET (WC-2)

- A. Kohler Model K-PR96053-TD4 Wellcomme Ultra Toilet with Mach Tripoint flushometer, Vitreous china, 1.28 gallon flush. Elongated bowl design, 15-3/16" high, 1-1/2" top spud, bowl shall have 2-1/8" passageway. Touchless toilet flushometer, HES-powered 1.28 gpf, polished chrome finish, battery operated, 1" I.P.S. screwdriver Bak-Chek angle stop. Adjustable tail piece. Or approved equal.
- B. Beneke Model 523 SS NCH heavy duty solid plastic seat for elongated bowl, with self-sustaining feature and check hinges. Or approved equal.
- C. ProFlo Model No. PFWRWH heavy duty wax bowl ring with horn. Or approved equal.
- D. PASCO Model No. 184 1/4" x 3-1/2" heavy S.S. closet bolt sets. Or approved equal.

2.3 LAVATORY (L-1)

- A. Kohler K-2027 Greenwich Wall Mounted Lavatory, vitreous china, three-hole drilling, drilled for concealed arm carrier. Or approved equal.
- B. Symmons S-20-2-OFG single lever lavatory faucet with off-set grid strainer. Polished Chrome

finish. Or approved equal.

- C. Kohler K-8999 P-Trap with 1-1/4" inlet and 1-1/2" outlet with slip joint and cleanout plug. Or approved equal.
- D. Brass Craft SCR 3912-A angle stop with riser. Or approved equal.
- E. Brass Craft 649SS stainless steel escutcheon. Or approved equal.
- F. J.R. Smith Series 700 floor mounted lavatory carrier. Or approved equal.
- G. ProFlo Model No. PF202WH Lavatory Guard ADA conforming, wheelchair accessible lavatory under sink protective pipe cover. Or approved equal.
- H. Fixtures and installation to conform to ADAAG Section 606 Lavatories and Sinks.

2.4 URINAL (UR)

- A. Kohler K-4991-ET Bardon Wall Mounted Urinal, vitreous china, 3/4" top spud, 1 gallon per flush. Or approved equal.
- B. Sloan Model G2 8186-1.0 Sensor flushometer, 1.0 gpf, polished chrome finish, top spud, single flush, battery, Sloan g2 Exposed Sensor Urinal Flushometer. Or approved equal.
- C. Fixtures and installation shall conform to ADAAG Section 605 Urinals. Fixtures and installation shall conform to ADAAG Section 605 Urinals.

2.5 MOP SINK (M.S.)

- A. Kohler K-6718 Bannon Service Sink, Acid-resistant Kohler Cast Iron, Blank back, with K-8936 stainless steel rim guard and wall hanger supports. Or approved equal.
- B. Chicago Faucets 952-269CP Inside sill fitting, wall mounted, chrome plated. Vandal proof 2-3/8" heat-resistant lever handle. Vacuum breaker assembly. wall-mounted service sink faucet with atmospheric vacuum breaker spout. Or approved equal.
- C. Kohler K-6672 2" enameled inside trap. Or approved equal.

2.6 ELECTRIC WATER COOLER (EWC)

- A. Elkay model LZSTL8WSSK Self-contained, vandal-resistant Bi-Level electric water cooler with bottle filling station that shall deliver 8.0 gallons per hour of water at 50 degrees Fahrenheit cooled from 80 degrees Fahrenheit inlet water and 90 degrees Fahrenheit ambient. Front vandal-resistant push button activation with less than 5 lbs of force. One-piece, vandal-resistant, water-efficient bubbler which operates on 20-105 psi supply line pressure. Unit shall include front access stream height adjustment. Bottle filling unit shall include an auto 20-second shut-off timer. Unit shall include Green Ticker displaying count of plastic bottles saved from waste. Bottle filler shall provide 1.1-1.5 gallons per minute flow rate with laminar flow to minimize splashing. Unit shall be constructed of 14-gauge stainless steel with integral basin. Venting shall include protective screening. Cooling system shall include insulated, tube on stainless steel evaporate tank, R134a refrigerant and calibrated capillary tube for refrigerant control. Shall include adjustable, accessible thermostat. Furnish with Elkay LKAPREZL Accessory Apron. Shall comply with ANSI 117.1 and American with Disabilities Act for both children and adult frontal approach. The manufacturer shall certify the unit to meet the requirements of NSF/ANSI 61, Safe Drinking Water Act and be UL Listed. Or approved equal.

- B. 1-1/2-inch x1-1/2-inch Brass tubular P-Trap. Brass nuts and ground joints. 20 gauge. Or approved equal.
- C. 1/4 turn angle ball stop and riser with loose key. Compression x Compression. Or approved equal.
- D. Fixtures and installation shall conform to ADAAG Section 602 Drinking Fountains.

PART 3 - EXECUTION

3.1 EQUIPMENT SUBMITTAL APPROVAL

- A. Do not commence installation until proposed equipment submittals are approved.

3.2 FIXTURE INSTALLATION

- A. Set all plumbing fixtures in an approved workmanlike manner. Point up edges against wall with approved caulking.
- B. Flanges at wall penetrations shall be flush against wall and shall not spin when rotated by hand.
- C. Adjust equipment and plumbing fixtures and trim to operate properly and clean all fixtures just prior to final inspection.

END OF SECTION

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

As specified in Section 00700.

1.02 SUMMARY

- A. This section specifies the basic requirements for the electrical installations and includes requirements common to more than one section of Division 16. In addition, this section and Division 16 specifications apply to the raceway systems for the low voltage structural cable plant. It expands and supplements the requirements specified in sections of Division 1.
- B. Standards of the organizations listed below but referred to in the various sections by basic designation only, form a part of this specification to the extent indicated by the reference thereto:
1. American Society for Testing and Materials (ASTM).
 2. National Fire Protection Association (NFPA).
 3. American National Standards Institute (ANSI).
 4. Illuminating Engineering Society (IES).
 5. Institute of Electrical and Electronics Engineers (IEEE).
 6. Insulated Cable Engineers Association (ICEA).
 7. National Electrical Manufacturer's Association (NEMA).
 8. National Electrical Contractors' Association (NECA).
 9. Underwriters' Laboratories, Inc. (UL).
 10. Factory Mutual (FM).
 11. Federal Specifications (FS).
 12. National Electrical Code (NEC) with local Amendments.
- C. References shall mean to the latest edition of the standard.
- D. Conform to local ordinances and codes.

1.03 QUALITY ASSURANCE

Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Contractor shall coordinate with the appropriate supplier, vendor, or subcontractor regarding the exact and specific rough-in requirements for equipment actually supplied.

1.04 ELECTRICAL INSTALLATIONS

- A. Coordinate electrical equipment and materials installation with other building components.
- B. Provide stainless steel enclosures unless otherwise indicated on the drawings.
- C. Verify all dimensions by field measurement. Do not scale drawings.
- D. Arrange for chases, slots, and openings in other building components to allow for electrical installations.
- E. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior closing-in the building.
- F. Coordinate the access panel requirements with General Contractor to accommodate the installation of electrical equipment and materials.
- G. Where mounting heights are not detailed or dimensioned, install electrical services and overhead equipment to provide the maximum headroom possible.
- H. Install electrical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum interference with other installations.
- I. Contractor shall review Civil, Structural, and Architectural drawings prior to bid.
- J. Final connections to equipment shall be per manufacturer's approved wiring diagrams, details and instructions. It shall be the Contractor's responsibility to provide materials and equipment compatible with equipment actually supplied.
- K. It is the intent of these drawings and specifications to establish a standard of quality.
- L. Work shall be performed in a workmanlike manner to the satisfaction of the Architect.
- M. Contractor shall verify and coordinate exact location of equipment to be furnished by others prior to rough-in.
- N. Contractor shall be responsible for replacing equipment which is damaged due to incorrect field wiring provided under this section or factory wiring in equipment provided under this division.
- O. Contractors shall visit site prior to bid and verify that conditions are as indicated. Contractor shall include in his bid, costs required to make his work meet existing conditions.
- P. Proposed substitutions of electrical equipment or request for "or equal" or approved equal" listing shall be submitted to architect not less than ten (10) working days prior to bid. Refer to specifications for additional information.
- Q. Wire termination provisions for all electrical apparatus shall be listed as suitable for 75 degree C.
- R. Provide all electrical equipment such as switchboards, panel boards, industrial control panels, meter socket enclosures, and motor control centers, with warning labels to warn qualified persons of potential electric arc flash hazards.

1.05 ELECTRICAL SUBMITTALS

- A. Refer to the Conditions of the Contract (General and Supplementary) and Division 1 Section: SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES for submittal definitions, requirements, and procedures.
- B. Data shall be submitted at one time in three ring binders and indexed as scheduled below. Partial submittals will not be accepted.
 - 1. 16060 – Grounding & Bonding
 - 2. 16073 – Hangers & supports for Electrical Systems
 - 3. 16075 – Electrical Identification
 - 4. 16120 – Conductors & Cables
 - 5. 16130 – Raceways & Boxes
 - 6. 16140 – Wiring Devices
 - 7. 16442 – Panelboards
 - 8. 16511 – Interior Lighting
 - 9. 16521 – Exterior Lighting
- C. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.
- D. Identify products requiring color selections.
- E. Identify products for use on project.

1.06 PRODUCT LISTING

- A. Prepare listing of major electrical equipment and materials for the project.
- B. Submit this listing as a part of the submittal requirement specified in the Division 1 Section: "SUBSTITUTION".

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to project properly identified with names, model numbers, types, compliance labels and similar information needed for distinct identification; adequately packaged and protected to prevent damage during shipment, storage and handling.
- B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Contractor shall protect stored equipment and materials from damage and theft.
- C. Coordinate deliveries of electrical materials and equipment to minimize construction congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.08 RECORD DOCUMENTS

- A. Refer to the Division 1 Section: "CONTRACT CLOSEOUT" for requirements. The following paragraphs supplement the requirements of Division 1.
- B. Mark drawings to indicate revisions to conduit size and location both exterior and interior, actual equipment locations, dimensioned to column lines; concealed equipment, dimensioned to column lines; distribution and branch electrical circuitry; fuse and circuit breaker size and arrangement support and hanger details; Change Orders; Addendums; concealed control system devices.
- C. Mark specifications to indicate approved substitutions; Change Orders; Addendums and equipment and materials used.

1.09 OPERATION AND MAINTENANCE DATA

- A. Refer to Division 1 Section: "CONTRACT CLOSEOUT" for procedures and requirements for preparation and submittal of maintenance manuals.
- B. In addition to the information required by Division 1 for Maintenance Data, include the following information in English.
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data tests, and complete nomenclature and commercial numbers of all replaceable parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down and emergency instructions and summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting, disassembly, repair and reassembly; aligning and adjusting instructions.
 - 4. Servicing instructions and lubrication charts and schedules.
- C. Contractor installed labels/equipment marking and instruction shall be in English.

1.10 WARRANTIES

- A. Refer to the Division 1 Section: WARRANTIES and BONDS for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.
- B. Compile and assemble the warranties specified in Division 16, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.
- C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses and telephone numbers and procedures for filing a claim and obtaining warranty services.

1.11 CLEANING

Refer to the Division 1 Section: "CONTRACT CLOSEOUT" or "CLEANING" for general requirements for final cleaning.

END OF SECTION

SECTION 16047

ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and DIVISION 1 Specification Sections, apply to work specified in this section.

1.02 SUMMARY

- A. The extent of general building demolition work is shown on the drawings. Coordinate the required electrical work with the general demolition.
- B. Demolition includes removal of existing electrical devices, equipment and accessories as identified on electrical drawings or otherwise associated with work listed on drawings under other Divisions. Contractor shall include costs for removal of electrical components associated with all aspects of project whether or not specifically listed on electrical drawings.
- C. The County shall have the option of retaining any items removed. The Contractor shall deliver these items to the County's designated storage area. Any items not retained by the County shall be disposed of off-site by the Contractor.

1.03 JOB CONDITIONS

- A. Condition of Structures: The County assumes no responsibility for actual condition of structures to be demolished.
- B. Conditions of the structure existing at time of inspection for bidding purposes will be maintained by County in so far as practicable. However, variations within structure may occur by County's removal and salvage operations prior to start of demolition work. The drawings are schematic and provided as an aid in bidding. The Contractor shall visit the site and determine the actual conditions prior to bidding.
- C. Partial Removal: Items of salvageable value to Contractor may be removed from structure as work progresses. Salvaged items must be transported from site as they are removed. Storage or sale of removed items on site will not be permitted.
- D. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, occupied areas, and other adjacent occupied or used facilities.
- E. Protections: Ensure safe passage of persons around or through area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.
- F. Install temporary electrical services, lighting, etc. as required by the County or authorities having jurisdiction.
- G. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no cost to County.

- H. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations. Allow no interruption in service unless coordinated with County at least 72 hours in advance.
- I. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
- J. Contractor will disconnect and seal utilities serving each structure to be demolished, or interior area to be demolished, prior to start of demolition work.
- K. If Contractor is required to disconnect utility services or other services to an occupied area, the Contractor shall provide temporary or alternative service to that area.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 DEMOLITION

- A. Remove all branch and feeder conduit and wire back to panelboards.
- B. Where walls, ceilings, or floors are to remain, remove devices and wire. Provide blank cover plate at outlet box.
- C. All items shown to remain active shall be furnished with necessary accessible junction boxes and all conduit and wire as required to maintain circuit continuity.
- D. All outlet boxes which must be removed due to demolition but which must remain active in order to maintain circuit continuity shall be relocated into ceilings or walls and shall be accessible.
- E. All material fixtures and equipment to be reused shall be removed and stored on site. Before reinstallation, all items are to be cleaned, tested, and prepared for re-use. Fixtures shall be re-lamped and new ballasts installed.

3.02 DISPOSAL OF DEMOLISHED MATERIAL

- A. General: Remove from site debris, rubbish, and other materials resulting from demolition operations. Apply all fees related to removal and pumping.
- B. Remove and dispose of interior demolition debris only.
- C. Burning of removed materials from demolished structures will not be permitted on site.
- D. Transport materials removed from demolished structures and dispose of offsite.

END OF SECTION

SECTION 16060

GROUNDING AND BONDING

PART 1 – GENERAL

1.01 GENERAL CONDITIONS

As specified in Section 00700

1.02 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

This Section includes methods and materials for grounding systems and equipment grounding requirements specified in this section ay be supplemented by special requirements of section described in other sections.

1.04 QUALITY ASSURANCE

- A. 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.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Grounding Conductors, Cables, Connectors, and Rods:
 - a. Apache Grounding/Erico Inc.
 - b. Boggs, Inc.
 - c. Chance/Hubbell
 - d. Copperweld Corp.
 - e. Dossert Corp.
 - f. Erico, Inc.; Electrical Products Group
 - g. Framatome Connectors/Burndy Electrical
 - h. Galvan Industries, Inc.
 - i. Harger Lightning Protection, Inc.

- j. Hastings Fiber Glass Products, Inc.
- k. Heary Brothers Lightning Protection Co.
- l. Ideal Industries, Inc.
- m. ILSCO.
- n. Kearney/Cooper Power Systems.
- o. Korns: C.C. Korns Co.; Division of Robroy Industries
- p. Lightning Master Corp.
- q. Lyncole XIT Grounding.
- r. O-Z/Gedney Co.; a business of the EGS Electrical Group.
- s. Raco, Inc.; Division of Hubbell
- t. Robbins Lightning, Inc.
- u. Salisbury: W.H. Salisbury & Co.
- v. Superior Grounding Systems, Inc.
- w. Thomas & Betts, Electrical.

2.02 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Grounding Electrode Conductors: Stranded cable.
- D. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

2.03 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.04 GROUNDING ELECTRODES

Ground Rods: Copper-clad/steel 5/8 inches in diameter by 120 inches (16 by 3000 mm) in length.

PART 3 - EXECUTION

3.01 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.

3.02 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Duct Banks: Install a grounding conductor with at least 50 percent ampacity of the largest phase conductor in the duct bank.
- C. Grounding Handholes: Install a driven ground rod through handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before handhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into handhole through a waterproof sleeve in handhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

3.03 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase appliance branch circuits.
 - 5. Flexible raceway runs.
 - 6. Armored and metal-clad cable runs.

- C. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.04 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are a minimum of 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 - 1. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 - 2. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- D. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.05 FIELD QUALITY CONTROL

- A. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System 5 ohms.
 - 2. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
- B. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.06 GRADING AND PLANTING

Restore surface features, including vegetation, at areas disturbed by Work of this Section. Re-establish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig and mulch. Restore disturbed paving as indicated.

END OF SECTION

SECTION 16073

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

As specified in Section 00700

1.02 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.04 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.05 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.

1.07 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7.

PART 2 – PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 5. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway Supports: As described in NECA 1 and NECA 101.
- C. Conduit Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 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) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
- 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) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 – EXECUTION

3.01 APPLICATION

- A. Comply with NECA 1, NECA 101 and manufacturer's instructions for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

- D. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports. Do not attach raceway to ceiling support wires or other piping systems.

3.02 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to pre-set concrete inserts or expansion anchors.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners or pre-set concrete inserts on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, Beam clamps (MSS Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.
- F. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- G. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.
- H. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- I. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- J. Do not use power-actuated anchors.
- K. Obtain permission from Owner before drilling or cutting structural members.

3.04 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Comply with requirements in Division 9 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.05 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. All abandoned wiring shall be removed in its entirety in accordance with the locally amended National Electrical Code, NFPA 70.
- C. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
- D. Abandoned Work: Cut and remove buried raceway, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- E. Remove demolished material from Project site.
- F. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

END OF SECTION

SECTION 16075

ELECTRICAL IDENTIFICATION

PART 1 – GENERAL

1.01 GENERAL CONDITIONS

As specified in Section 00700

1.02 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

- A. This Section includes the following:
 - 1. Identification for conductors and control cable.
 - 2. Underground-line warning tape Warning labels and signs.
 - 3. Instruction signs.
 - 4. Equipment identification labels.
 - 5. Miscellaneous identification products.

1.04 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.145.

1.05 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 – PRODUCTS

2.01 CONDUCTOR AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- (0.35-mm-) thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.
- D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking nylon tie fastener.

2.02 UNDERGROUND-LINE WARNING TAPE

- A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
 - 1. Not less than 6 inches (150 mm) wide by 4 mils (0.102 mm) thick.
 - 2. Compounded for permanent direct-burial service.
 - 3. Embedded continuous metallic strip or core.
 - 4. Printed legend shall indicate type of underground line.

2.03 WARNING LABELS AND SIGNS

- A. Safety Signs: Comply with NFPA 70 and 29 CFR 1910.145.
- B. Metal-Backed, Butyrate Warning Signs for Exterior Use: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting.
- C. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."
- D. Provide arc flash warning labels for all equipment.

2.04 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
 - 1. Engraved legend with white letters on black face for normal power. White letters on red face for emergency power.
 - 2. Punched or drilled for mechanical fasteners.

2.05 EQUIPMENT IDENTIFICATION LABELS

Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on black face for normal power. Minimum letter height shall be 3/8 inch (10 mm).

2.06 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength: 50 lb (22.6 kg), minimum.
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: According to color-coding.
- B. Paint: Paint materials and application requirements are specified in Division 9 painting Sections. Select primer and finish coats applicable to the materials to be painted.
- C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 – EXECUTION

3.01 APPLICATION

- A. Accessible Raceways, 600 V or Less, for Service and Feeder Circuits: Identify with orange self-adhesive vinyl label, paint, or self-adhesive vinyl tape applied in bands.
- B. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
- C. Power-Circuit Conductor Identification: For primary and secondary conductors in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape and write-on tags. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
- D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.
- E. Warning Labels for Indoor Cabinets, Boxes and Enclosures for Power: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
 - 1. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- F. Instruction Signs:
 - 1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- G. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control,

communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
2. Equipment to Be Labeled:
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Access doors and panels for concealed electrical items.
 - e. Disconnect switches.
 - g. Contactors.

3.02 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 1. Color shall be factory applied or, for sizes larger than No. 10 AWG, field applied.
 2. Colors for 240/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Neutral: White
 - d. Ground: Green
 4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

- G. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
- H. Painted Identification: Prepare surface and apply paint according to Division 9 painting Sections.

END OF SECTION

SECTION 16120
CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

As specified in Section 00700

1.02 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.03 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.
- C. MC Metal Clad Cable

1.04 QUALITY ASSURANCE

- A. 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.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 CONDUCTORS AND CABLES

- A. Conductors shall be annealed copper with conductivity of no less than 98% pure copper or aluminum alloy conductors with compact stranding, Type AA-8000.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN XHHW and SO.
- D. Metal Clad Cable: Solid copper conductor, 600 volt insulation rated 90°C in a galvanized steel interlocking armor.

2.02 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except as indicated below.
 - 1. Use standard conductors for control circuits.
 - 2. Use conductor not smaller than 14 AWG for control circuits.
 - 3. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet (25 m).
 - 4. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet (160 m).
- B. Branch Circuits: Copper. Minimum size #12 AWG; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway Type XHHW, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, below raised floors and Crawlspace: Type THHN-THWN, single conductors in raceway
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway on the MC Cable in sizes #6 AWG and smaller.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN single conductors in raceway or type MC Cable in sizes #6 AWG and smaller.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

- C. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."
- D. Feeders Larger than 6 AWG: Copper, stranded conductor, 600 volt insulation, THHN/THWN, or XHHW. With the exception of motor feeders, 600 volt aluminum wire in sizes 1/0 and larger may be substituted for copper feeders if ampacity is equal or greater than copper and voltage drop is equal to or less than copper.
- E. Use no wire smaller than 12 AWG for power and lighting circuits, and no wire smaller than 16 AWG for control wiring.
- G. Utilize 10 AWG conductor for 20 ampere, 120 volt branch circuit homeruns longer than 75 feet (23m), and for 20 ampere, 277 volt branch circuit homeruns longer than 200 feet (61m).

3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.05 FIELD QUALITY CONTROLS

- A. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 16130

RACEWAYS AND BOXES

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

As specified in Section 00700

1.02 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.04 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RGSC: Rigid galvanized steel conduit.
- F. RNC: Rigid nonmetallic conduit.

1.05 QUALITY ASSURANCE

- A. 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.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 METAL CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Alflex Inc.
 - 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 5. Electri-Flex Co.

6. Manhattan/CDT/Cole-Flex.
 7. Maverick Tube Corporation.
 8. O-Z Gedney; a unit of General Signal.
 9. Wheatland Tube Company.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.
- D. EMT: ANSI C80.3.
- E. FMC: Zinc-coated steel.
- F. LFMC: Flexible steel conduit with PVC jacket.
- G. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 2. Fittings for EMT: Steel compression type.
- H. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.02 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 3. Arco Corporation.
 4. CANTEX Inc.
 5. CertainTeed Corp.; Pipe & Plastics Group.
 6. Condux International, Inc.
 7. ElecSYS, Inc.
 8. Electri-Flex Co.
 9. Lamson & Sessions; Carlon Electrical Products.
 10. Manhattan/CDT/Cole-Flex.
 11. RACO; a Hubbell Company.

12. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- C. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

2.03 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 2. EGS/Appleton Electric.
 3. Erickson Electrical Equipment Company.
 4. Hoffman.
 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 6. O-Z/Gedney; a unit of General Signal.
 7. RACO; a Hubbell Company.
 8. Robroy Industries, Inc.; Enclosure Division.
 9. Scott Fetzer Co.; Adalet Division.
 10. Spring City Electrical Manufacturing Company.
 11. Thomas & Betts Corporation.
 12. Walker Systems, Inc.; Wiremold Company (The).
 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- B. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- C. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

2.05 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Description: Comply with SCTE 77.
 1. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.
 2. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
 3. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 4. Cover Legend: Molded lettering, for each service.

5. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 6. Handholes 24 inches wide by 36 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Jensen Precast or a comparable product by one of the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. CDR Systems Corporation.
 - d. NewBasis.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
1. Exposed Conduit: Schedule 40 PVC or IMC.
 2. Underground Conduit: RNC, Type EPC-40 PVC, direct buried.
 3. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X 316 stainless steel.
 4. Application of Handholes and Boxes for Underground Wiring:
 - a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
 - b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units SCTE 77, Tier 8 structural load rating.
 - c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.
- B. Minimum Raceway Size: 3/4-inch (24-mm) trade size for homeruns and conduits below grade or slab on grade.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

- D. All conduits larger than 1" shall be furnished with grounding type busing with equipment grounding conductor solidly connected at both ends.

3.02 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter. Raceway and boxes located as shown on Drawings, and at other locations where required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway as required to complete wiring system. Sizes shall meet or exceed NEC requirements. Raceway routing is shown for reference only. Route as required for a complete raceway system.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 16 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of four 90-degree bends in any conduit run between boxes except for communications conduits. Provide no more than the equivalent of two (2) 90 degree bends between boxes.
- G. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- H. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- I. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- J. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where required by NFPA 70.
- K. Route raceways, concealed or exposed parallel and perpendicular to walls and building structural components.
- L. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures, maximum 36 inches (915 mm) for connection to equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations.
- M. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- N. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.

- O. Cut conduit square using saw or pipecutter; de-burr cut ends.
- P. Bring conduit to shoulder of fittings; fasten securely.
- Q. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- R. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate bends in metal conduit larger than 2-inch (50mm) trade size.

3.02 BOX APPLICATIONS

- A. Set wall mounted boxes at elevations to accommodate mounting heights indicated. Comply with ADA where required.
- B. Adjust box location up to 10 feet (3m) prior to rough-in if required to accommodate intended purpose.
- C. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- D. Use adjustable steel channel fasteners for hung ceiling outlet box.
- E. Do not fasten boxes to ceiling support wires or other piping systems.
- F. Support boxes independently of conduit.
- G. Use gang box where more than one device is mounted together. Do not use sectional box.
- H. Do not use boxes smaller than 4-inches square.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 2 Section "Earthwork" for pipe less than 6 inches (150 mm) in nominal diameter.
 - 2. Install backfill as specified in Division 2 Section "Earthwork."
 - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 2 Section "Earthwork."
 - 4. Install manufactured Schedule 80 PVC conduit elbows and risers for transitions from below grade or slab on grade to above grade.

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.
- E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.05 FIRESTOPPING

Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7.

3.06 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.
- B. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

As specified in Section 00700.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Wall-switch.

1.03 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. 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.
- C. Comply with NFPA 70.

1.05 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc.
 - 2. Hubbell Incorporated; Wiring Device-Kellems.

3. Leviton Mfg. Company Inc.
4. Pass & Seymour/Legrand; Wiring Devices & Accessories.

2.02 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 6350 (single), 6352 (duplex).
 - b. Hubbell; HBL2162 (duplex).
 - c. Leviton; 16341 (single), 16362 (duplex).
 - d. Pass & Seymour; 26361 (single), 26362 (duplex).

2.03 GFCI RECEPTACLES

- A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; GF20.
 - b. Pass & Seymour; 2084.
 - c. Leviton; 8898-HG

2.04 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; DECB120 (single pole), DECB220 (two pole), DECB320 (three way), DECB420 (four way).
 - b. Hubbell; 2121 (single pole), 2122 (two pole), 2123 (three way), 2124 (four way).
 - c. Leviton; 5621 (single pole), 5622 (two pole), 5623 (three way), 5624 (four way).
 - d. Pass & Seymour; 2621 (single pole), 2622 (two pole), 2623 (three way), 2624 (four way).

2.05 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.

2. Material for Finished Spaces: Satin-finished stainless steel, 0.04-inch- (1-mm-) thick,
 3. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant , die-cast aluminum with lockable cover.

2.06 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
10. Mounting heights shall be as follows unless noted:
 - a. Receptacles: 18" A.F.F. measured to bottom.
 - b. Switches: 44" A.F.F. measured to bottom.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.02 IDENTIFICATION

A. Comply with Division 16 Section "Electrical Identification."

1. Receptacles: Identify panelboard and circuit number from which served on back of device plate.

3.03 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
- B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION

SECTION 16442

PANELBOARDS

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

As specified in Section 00700.

1.02 SUMMARY

A. This Section includes the following:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.03 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.

1.04 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. UL listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - f. Wiring Diagrams: Power, signal, and control wiring.
- C. Field quality-control test reports including the following:

1. Test procedures used.
 2. Test results that comply with requirements.
 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Panelboard Schedules: For installation in panelboards.
- E. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1, include the following:
1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.
- B. 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.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
1. Ambient Temperature: Not exceeding 140 deg F (60 deg C).
 2. Altitude: Not exceeding 2500 feet (above sea level).

1.07 COORDINATION

Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.08 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. Keys: Six spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.02 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corporation; Cutler-Hammer Products.
 - b. General Electric Co.; Electrical Distribution & Protection Div.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D.

2.03 MANUFACTURED UNITS

- A. Enclosures: Flush- and surface-mounted cabinets.
1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 4X.
 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 3. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
 4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
 5. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
 6. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.
- B. Phase and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity or aluminum alloy.
 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
- C. Conductor Connectors: Suitable for use with conductor material.
1. Main and Neutral Lugs: Mechanical type.
 2. Ground Lugs and Bus Configured Terminators: Compression type.
- D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

2.04 PANELBOARD SHORT-CIRCUIT RATING

Fully rated to interrupt symmetrical short-circuit current available at terminals. The use of series rated devices is not acceptable unless noted otherwise on the drawings.

2.05 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

PART 3 - EXECUTION

3.02 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Division 16 Section "Hangers and Supports per Electrical Systems".
- C. Mount top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.
- D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Install overcurrent protective devices and controllers.
- F. Set field-adjustable switches and circuit-breaker trip ranges.
- G. Install filler plates in unused spaces.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.03 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."
- B. Create a directory to indicate installed circuit loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.04 CONNECTIONS

- A. Ground equipment according to Division 16 Section "Grounding and Bonding."
- B. Connect wiring according to Division 16 Section "Conductors and Cables."

3.05 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

3.06 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

SECTION 16511
INTERIOR LIGHTING

PART 1 – GENERAL

1.01 GENERAL CONDITIONS

As specified in Section 00700

1.02 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures, lamps, and ballasts.
2. Lighting fixture supports.
3. Lighting fixtures mounted on exterior building surfaces.

1.04 DEFINITIONS

- A. BF: Ballast factor.
- B. CRI: Color-rendering index.
- C. CU: Coefficient of utilization.
- D. HID: High-intensity discharge.
- D. LER: Luminaire efficacy rating.
- F. Luminaire: Complete lighting fixture, including ballast housing if provided.
- G. RCR: Room cavity ratio.

1.05 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 1. Physical description of lighting fixture including dimensions.
 2. Emergency lighting units including battery and charger.
- B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
 1. Wiring Diagrams: Power and control wiring.

- C. Coordination Drawings: Reflected ceiling plan(s) and other details, 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. Lighting fixtures.
 - 2. Suspended ceiling components.
 - 3. Structural members to which suspension systems for lighting fixtures will be attached.
 - 4. Perimeter moldings.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
- F. Warranties: Special warranties specified in this Section.

1.06 QUALITY ASSURANCE

- A. 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.
- B. Comply with NFPA 70.
- C. FMG Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.

1.07 COORDINATION

Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, and partition assemblies.

1.08 WARRANTY

Special Warranty for Drivers: Manufacturer's standard form in which fixture manufacturer agrees to repair or replace drivers that fail in materials or workmanship within specified warranty period.

1.09 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. Plastic Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Acuity
- B. Phillips

- C. GE
- D. An Approved Equal

2.02 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. LED LIGHT FIXTURES:

1. General:

- a. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
- b. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.
- c. LED drivers shall include the following features unless otherwise indicated:
 - 1) Minimum efficiency: 85% at full load.
 - 2) Minimum Operating Ambient Temperature: -20° C. (-4° F.)
 - 3) Input Voltage: 120 - 277V (±10%) at 60 Hz.
 - 4) Integral short circuit, open circuit, and overload protection.
 - 5) Power Factor: ≥ 0.95 .
 - 6) Total Harmonic Distortion: $\leq 20\%$.
 - 7) Comply with FCC 47 CFR Part 15.
- d. LED modules shall include the following features unless otherwise indicated:
 - 1) Comply with IES LM-79 and LM-80 requirements.
 - 2) Minimum CRI 80 and color temperature 3000° K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
 - 3) Minimum Rated Life: 50,000 hours per IES L70.
 - 4) Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.

B. LED Wall Packs:

- 1. Housing, LED driver, and LED module shall be products of the same manufacturer.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames,

lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

- F. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated.
 - 1. White surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
 - 4. Laminated Silver Metallized Film: 90 percent.
- G. Plastic Diffusers, Covers, and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless different thickness is indicated.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass, unless otherwise indicated.

2.03 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 16 Section "Hangers and Supports for Electrical Equipment" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- C. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- D. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3.02 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Verify normal operation of each fixture after installation.

- C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

SECTION 16521
EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

As specified in Section 00700.

1.02 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. This Section includes the following:

1. Exterior luminaires with lamps and ballasts.
2. Poles and accessories.

B. Related Sections include the following:

1. Division 16 Section "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

1.04 DEFINITIONS

- A. CRI: Color-rendering index.
- B. HID: High-intensity discharge.
- C. Luminaire: Complete lighting fixture, including ballast housing if provided.
- D. Pole: Luminaire support structure, including tower used for large area illumination.
- E. Standard: Same definition as "Pole" above.

1.05 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

- A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4.
- B. Live Load: Single load of 500 lbf (2224 N), distributed as stated in AASHTO LTS4.
- C. Wind Load: Pressure of wind on pole and luminaire, calculated and applied as stated in AASHTO LTS-4.
 1. Wind speed for calculating wind load for poles exceeding 50 feet (15 m) in height is 110 mph (177 km/h)
 2. Wind speed for calculating wind load for poles 50 feet (15 m) or less in height is 110 mph (177 km/h)

1.06 SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
 2. Details of attaching luminaires and accessories.
 3. Details of installation and construction.
 4. Luminaire materials.
 5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
 - a. For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
 - b. Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
 6. Photoelectric relays.
 7. Ballasts, including energy-efficiency data.
 8. Lamps, including life, output, and energy-efficiency data.
 9. Materials, dimensions, and finishes of poles.
 10. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
 11. Anchor bolts for poles.
 12. Manufactured pole foundations.
- B. Shop Drawings:
1. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
 2. Wiring Diagrams: Power and control wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.
- E. Warranty: Special warranty specified in this Section.

1.07 QUALITY ASSURANCE

Comply with NFPA 70.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Package aluminum poles for shipping according to ASTM B 660.
- B. Store poles on decay-resistant-treated skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- C. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.09 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
 - 1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
 - 2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
 - 3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
 - 4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

1.10 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. Glass and Plastic Lenses, Covers, and Other Optical Parts: 5 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Ballasts: 5 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 3. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products as indicated on the drawings or approved equal.

2.02 LUMINAIRES, GENERAL REQUIREMENTS

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Luminaires shall comply with local codes and ordinances, including but not limited to the County of Hawaii Lighting Ordinance.
- C. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- D. Metal Parts: Free of burrs and sharp corners and edges.
- E. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- F. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- H. Exposed Hardware Material: Stainless steel.
- I. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- J. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
- K. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- L. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- M. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- N. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 - 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

- a. Color: As selected from manufacturer's standard catalog of colors or custom color as directed by the architect.

2.03 OUTDOOR LED FIXTURES

Outdoor LED fixtures must meet the requirements of the County of Hawaii Lighting Ordinance requiring less than 2% blue light output.

2.04 POLES AND SUPPORT COMPONENTS, GENERAL REQUIREMENTS

- A. Structural Characteristics: Comply with AASHTO LTS-4.
- B. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in Part 1 "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3.
 - 1. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
- C. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.
- D. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
 - 1. Materials: Shall not cause galvanic action at contact points.
 - 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication, unless stainless-steel items are indicated.
 - 3. Anchor-Bolt Template: Plywood or steel.
- E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 3.

2.05 POLE ACCESSORIES

Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

PART 3 - EXECUTION

3.01 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire.
- B. Fasten luminaire to indicated structural supports.
 - 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources.

3.02 POLE INSTALLATION

- A. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features, unless otherwise indicated on Drawings:
 - 1. Fire Hydrants and Storm Drainage Piping: 60 inches (1520 mm).
 - 2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet (3 m).
 - 3. Trees: 15 feet (5 m)
- C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Division 3.
- D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
 - 1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
 - 2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
 - 3. Install base covers, unless otherwise indicated.
 - 4. Use a short piece of 1/2-inch- (13-mm-) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
- E. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch- (150-mm-) wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch (25 mm) below top of concrete slab.
- F. Raise and set poles using web fabric slings (not chain or cable).

3.03 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Division 16 Section "Raceways and Boxes." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.04 GROUNDING

- A. Ground metal poles and support structures according to Division 16 Section "Grounding and Bonding."
 - 1. Install grounding electrode for each pole, unless otherwise indicated.
 - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

- B. Ground nonmetallic poles and support structures according to Division 16 Section "Grounding and Bonding."
 - 1. Install grounding electrode for each pole.
 - 2. Install grounding conductor and conductor protector.
 - 3. Ground metallic components of pole accessories and foundations.
- 3.05 FIELD QUALITY CONTROL
- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
 - B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
 - 1. Verify operation of photoelectric controls.
 - C. Illumination Tests:
 - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards.
 - D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

SECTION 46210

PACKAGED ON-SITE WASTEWATER TREATMENT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing and installing a FujiClean CEN-10 or approved equal packaged on-site wastewater treatment system complete with tank, treatment chambers, aeration components, control/alarm panel, appurtenances, startup, and incidental accessories required for a complete and functional system.
- B. System Description: The FujiClean CEN-10 or approved equal system shall be a compact wastewater treatment system designed to treat up to 1,000 gallons per day of domestic strength wastewater and certified to NSF/ANSI 40/245 standards.
- C. The system is intended for use in domestic wastewater applications where enhanced nitrogen removal is required or desired, including environmentally sensitive locations.

1.2 REFERENCES

- A. NSF/ANSI 40, Wastewater Treatment Systems.
- B. NSF/ANSI 245, Nitrogen Reduction Performance.
- C. Applicable local, state, and federal requirements for onsite wastewater treatment systems.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical literature, specifications, dimensions, capacities, installation requirements, electrical requirements, and certification documentation.
- B. Shop Drawings: Submit layout, plan, section, invert elevations, connection details, control panel location, and coordination information.
- C. Manufacturer Certification: Submit certification that the system complies with NSF/ANSI 40 and NSF/ANSI 245.
- D. Installation Instructions: Submit manufacturer's current installation manual and startup requirements.
- E. O&M Data: Submit operating and maintenance manual, warranty information, and recommended service schedule.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be trained and authorized by FujiClean or an authorized distributor, where required by jurisdiction or manufacturer requirements.
- B. Regulatory Compliance: Install system in accordance with approved plans, manufacturer's published requirements, and all applicable regulatory approvals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened packaging, with labels intact.

- B. Store components in a clean, dry location protected from physical damage, contamination, and weather.
- C. Handle tank, piping, and electrical components to prevent cracking, deformation, or other damage.

1.6 PROJECT CONDITIONS

- A. Verify site conditions, elevations, access, and utility locations before installation.
- B. Do not install system until excavations, bedding, and utility coordination are complete.
- C. Coordinate with civil, mechanical, and electrical trades as required for a complete installation.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. FujiClean USA or approved equal product.

2.2 MATERIALS AND COMPONENTS

- A. Treatment Tank: Fiber-reinforced plastic construction.
- B. Chambers: Sedimentation, anaerobic filtration, aerobic contact filtration, clarification, and disinfection chambers as provided by manufacturer.
- C. Aeration Equipment: Manufacturer's approved blower and air delivery components.
- D. Control Panel: NEMA 4X rated alarm/control panel where provided by manufacturer and required by installation package.
- E. Access Covers: Manufacturer standard access covers and risers, as required.
- F. Piping, fittings, valves, clamps, fasteners, and accessories: Manufacturer approved or manufacturer compatible components.

2.4 PERFORMANCE REQUIREMENTS

- A. System shall be capable of treating domestic strength wastewater flows up to 1,000 gallons per day.
- B. System shall meet NSF/ANSI 40 and NSF/ANSI 245 performance requirements.
- C. System shall be suitable for enhanced nitrogen removal applications in nutrient sensitive areas.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine site conditions, grades, excavation limits, utility locations, and soil conditions prior to installation.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install system in strict accordance with the manufacturer's current installation instructions, approved plans, and applicable governing requirements.
- B. Set tank level, at required elevation, on properly prepared bedding.
- C. Connect influent and effluent piping, electrical service, air lines, and appurtenances as required for complete operation.
- D. Install control/alarm components in accessible locations as directed by manufacturer and approved drawings.
- E. Provide required backfill, compaction, and grading to protect system and prevent surface water intrusion.

3.3 STARTUP AND TRAINING

- A. Perform startup in accordance with manufacturer's instructions.
- B. Demonstrate operation of treatment system, alarm functions, and maintenance requirements to Owner's representative.
- C. Provide manufacturer-required warranty activation and documentation.

3.4 FIELD QUALITY CONTROL

- A. Test all system components for proper operation after installation.
- B. Verify blower operation, alarms, and normal system functions before final acceptance.
- C. Correct defective work and retest until system operates satisfactorily.

3.5 ADJUSTING AND CLEANING

- A. Adjust system components for proper operation.
- B. Clean exposed surfaces and remove debris, packaging, and installation waste from the site.

3.6 CLOSEOUT SUBMITTALS

- A. Submit record documents reflecting final installed conditions.
- B. Submit maintenance schedule, service requirements, and warranty information.
- C. Provide final operation and maintenance instructions to Owner.

END OF SECTION

SECTION 46451

GRINDER PUMP STATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing and installing a complete E/One DH071 grinder pump station or approved system, including grinder pump, HDPE tank, check valve, controls, alarm panel, appurtenances, startup, testing, and all accessories required for a complete and operational installation.
- B. System Description: The E/One DH071 simplex grinder pump station or approved system is a packaged unit intended for residential sanitary wastewater conveyance and is rated for flows of 700 gallons per day. The station includes 70 gallons of capacity and is intended for indoor or outdoor installation.
- C. The DH071 or approved system is a hardwired model in which a cable connects the motor controls to the level controls through watertight penetrations.

1.2 REFERENCES

- A. Applicable local, state, and federal plumbing, electrical, and wastewater regulations.
- B. Manufacturer's current installation instructions and product literature.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical literature, dimensions, capacities, electrical requirements, materials, and installation details.
- B. Shop Drawings: Submit plan view, section view, tank setting depth, piping layout, electrical connection details, alarm panel location, and coordination details.
- C. Installation Instructions: Submit manufacturer's current installation instructions and warranty information.
- D. Operating and Maintenance Data: Submit maintenance requirements, service instructions, and warranty documentation.

1.4 QUALITY ASSURANCE

- A. Manufacturer: E/One Environment One Corporation or authorized distributor.
- B. Installer Qualifications: Installer shall be experienced in the installation of grinder pump stations of the type specified and shall comply with manufacturer requirements and all applicable codes.
- C. Regulatory Compliance: Install system in accordance with manufacturer requirements, approved documents, and governing code requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment in manufacturer's original, unopened packaging.
- B. Store in a clean, dry location protected from damage, sunlight, and contamination.
- C. Handle components carefully to prevent cracking, distortion, or damage to electrical and mechanical parts.

1.6 PROJECT CONDITIONS

- A. Verify site conditions, elevations, utility locations, and access before beginning work.
- B. Coordinate installation with civil, electrical, plumbing, and utility work.
- C. Do not install equipment until excavation, bedding, and associated work are complete and approved.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. E/One Environment One Corporation or approved product manufacturer.

2.2 GRINDER PUMP STATION

- A. Model: DH071 or approved equal station.
- B. Capacity: 70 gallons.
- C. Flow Rating: 700 gallons per day.
- D. Configuration: Simplex grinder pump station.
- E. Installation: Indoor or outdoor installation permitted.

2.3 MATERIALS AND COMPONENTS

- A. Grinder Pump: 1 hp grinder pump assembly with integrated controls and level sensing.
- B. Tank: Corrosion-resistant HDPE wet well tank.
- C. Check Valve: Manufacturer's approved check valve assembly.
- D. Control System: Integrated motor controls and level controls with watertight penetrations for hardwired configuration.
- E. Alarm Panel: NEMA 4X enclosure with circuit breakers and audible and visual alarm functions.
- F. Inlet Connection: 4-inch inlet grommet for DWV pipe, or as required by manufacturer and project design.
- G. Discharge Connection: 1-1/4-inch discharge connection, adaptable to PVC pipe or other approved material.
- H. Appurtenances: Lids, access shroud, cabling, fittings, fasteners, and accessories required for a complete installation.

2.4 PERFORMANCE REQUIREMENTS

- A. System shall collect and pump domestic sanitary wastewater to the central sewer or treatment system through small-diameter pressure sewer piping.
- B. System shall operate as a complete packaged unit ready for installation.
- C. System shall provide reliable operation for a single-family residence and may be used for up to two homes where codes allow and with factory consent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine site conditions, dimensions, excavation, and utility locations before installation.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install the grinder pump station in accordance with manufacturer's current installation instructions, approved drawings, and governing code requirements.
- B. Set tank plumb and level on properly prepared bedding.
- C. Connect inlet piping, discharge piping, electrical service, alarm system, and associated appurtenances.
- D. Seal penetrations and conduit entries in accordance with manufacturer instructions and applicable electrical code requirements.
- E. Install alarm panel in a visible, accessible location as required by manufacturer and code.
- F. Provide backfill, compaction, and grading to protect the system and prevent surface runoff into the tank area.

3.3 FIELD QUALITY CONTROL

- A. Test all pump station components for proper operation after installation.
- B. Verify pump operation, alarm operation, control functions, and leak-free piping connections.
- C. Correct deficiencies and retest until system operates satisfactorily.

3.4 STARTUP

- A. Perform startup in accordance with manufacturer's instructions.
- B. Demonstrate proper operation of the pump station and alarm system to Owner's representative.
- C. Provide documentation confirming successful startup and acceptance.

3.5 ADJUSTING AND CLEANING

- A. Adjust system components as required for proper operation.
- B. Remove debris, excess materials, and packaging from the site.

3.6 CLOSEOUT SUBMITTALS

- A. Submit record documents showing final installed conditions.
- B. Submit operation and maintenance manuals, warranty information, and service requirements.
- C. Deliver final training and operating instructions to Owner.

END OF SECTION