

State of Hawaii
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
ENGINEERING OFFICE
Honolulu, Hawai'i

DEPARTMENT OF DEFENSE

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Major General
Hawaii National Guard
Adjutant General

CONTRACT SPECIFICATIONS AND PLANS

Job No. CA-1121-C / PN15110016
Install Solar Renewable Energy System at Building 001
Puunene Armory, Hawaii Army National Guard
Kihei, Maui, Hawai'i

Prime Architect:	Bowers & Kubota Consulting
Civil:	Bowers & Kubota Consulting
Architect:	Pacific Architects, Inc.
Electrical Engineer:	Itano & Associates, Inc.

May 2017

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SECTION 01100 - PROJECT REQUIREMENTS

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification:
 - 1. Project Location: Puunene Armory, Hawaii Army National Guard
Street Address: 2701 Mokulele Highway
Kihei, Maui, HI 96732
- B. The Work consists of construction of new photovoltaic solar energy system, new electric vehicle charging station, and other incidental work.
- C. Perform operations and furnish equipment, fixtures, appliances, tools, materials, related items and labor necessary to execute, complete and deliver the Work as required by the Contract Documents.
- D. The Division 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 work specified within each section.
- E. Contractor shall not alter the Drawings and Specification. If an error or discrepancy is found, notify the Project Manager.
- F. Specifying of interface and coordination in the various specification sections is provided for information and convenience only. These requirements in the various sections shall complement the requirements of this Section.

1.02 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated 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. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred, as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates. 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.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall", "shall be", or "shall comply with", depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 3. Abbreviations and Acronyms for Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean

the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Terms

1. **Directed:** Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean directed by Project Manager, requested by Project Manager, and similar phrases. Note: The Project Manager be the primary contact person for this project.
2. **Indicated:** The term "indicated" refers to graphic representations, notes, or schedules on drawings or to other paragraphs or schedules in specifications and similar requirements in the Contract Documents. Terms such as "shown", "noted", "scheduled", and "specified" are used to help the user locate the reference.
3. **Furnish:** The term "furnish" means to supply and deliver to project site, ready for unloading, unpacking, assembly, and similar operations.
4. **Install:** The term "install" describes operations at project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
5. **Provide:** The terms "provide" or "provides" means to furnish and install, complete and ready for the intended use.
6. **Installer:** An installer is the Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-Subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
7. **Submit:** Terms such as "submit", "furnish", "provide", and "prepare" and similar phrases in the context of a submittal, means to submit to the Project Manager.

C. Industry Standards

1. **Applicability of Standards:** Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
2. **Publication Dates:** Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
3. **Conflicting Requirements:** If compliance with 2 or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Project Manager for a decision before proceeding.

1.03 CONTRACT

- A. Refer to Section 00800 - SPECIAL CONDITIONS for other contract conditions.

1.04 WORK SEQUENCE

- A. The Work will be conducted in a single construction phase.

1.05 USE OF PREMISES AND WORK RESTRICTIONS

- A. The Contractor is notified that the building will be operational and shall remain accessible to the building's occupants and users during the entire duration of the project. This continuing operation of the building will restrict the Contractor's work. No additional compensation or time will be made to the Contractor for failure to acknowledge and account for the requirements of this section in his bid.
1. The Contractor shall consult with the Project Manager to review site conditions and other factors which in turn may be affected by the Contractor's execution of work.
 2. Contractor shall schedule and perform his work and operations to conform to the requirements of the building and in such a manner as to minimize inconvenience, hazards and disturbance upon the building's occupants and to ensure their safety, including maintaining safe egress, in conformance with the governing Building Codes, from the facility at all times.
 3. As the building will remain operational throughout the entire duration of the project, safe access and egress around the project site shall be maintained at all times. Disruptions of access, etc. shall be coordinated in writing with Project Manager. Disruptions shall also be identified in the work schedule.
 4. The Contractor shall provide construction aids as necessary to maintain normal operations of the building and to protect the public and the staff.
 5. All utility outages shall be coordinated and approved by the Project Manager. The Contractor shall submit requests for utility outages in writing a minimum of 14 calendar days prior to the requested outage date.
- B. As the building will be operational during the duration of the project and due to the secure nature of the facility, on-site parking will be limited. In addition, on-site storage and staging, etc. will be limited. The Project Manager will designate an area(s) for the Contractor to park and stage/store materials. Restricted and/or limited on-site areas may require the Contractor to provide off-site storage and parking.

No additional compensation or time shall be made to the Contractor for failure to acknowledge and account for the requirements of this section in the bid price.

- C. Contractor's use of premises is restricted as follows:
1. Construction Times and Schedule:
 - a. The normal operational hours for Puunene Armory are from Monday through Friday, from 8:00 a.m. to 4:00 p.m., excluding weekends, Federal and State Holidays.
 - b. The Contractor's normal working hours are from 7:45 a.m. to 4:30 p.m. Monday through Friday. Night, weekend and overtime work will not be permitted.
 - c. Due to the secure nature of the facility, no work shall be performed outside of the Contractor's normal working hours, unless otherwise directed by the Project Manager.
 - d. Any disruptions to the facilities' operations shall be reviewed during the construction based on the construction schedule.
 2. Site Access and Parking:
 - a. Parking: Limited and restrictive on-site parking, and access to the site shall be coordinated with the Project Manager.

- b. Maintain access for facility operations through Project Contract Limits as required.
3. Sanitation:
- a. Contractor shall provide temporary, portable toilet facility for its own use. Locate as directed by the Project Manager. Contractor shall have portable toilet facility serviced and cleaned on a weekly basis or as directed by the Project Manager. Remove from premise at the completion of the project and restore area around facility.
4. Noise and Dust Control:
- a. In adjacent locations surrounding the project site, noise, dust and other disrupting activities, resulting from construction operations, are detrimental to the conduct of the Facility activities. Therefore, Contractor shall monitor its construction activities. Exercise precaution when using equipment and machinery to keep the noise and dust levels to a minimum.
 - b. To reduce loud disruptive noise levels, ensure mufflers and other devices are provided on equipment, internal combustion engines and compressors.
 - c. Schedule construction activities that create excessive noise and dust problems, such as concrete coring, drilling, hammering, trenching, and demolition, for the weekends, holidays or non-business hours. Overtime costs for the Contractor's employees and work force are the Contractor's responsibility.
 - d. The Project Manager may require any construction activity that produces excessiveness of noise and dust to be performed during non-business hours. The Project Manager shall make the final determination. Overtime costs for the Contractor's employees and work force are the Contractor's responsibility.
5. Other Conditions:
- a. Arrange for construction debris and trash to be removed from project site weekly.
 - b. Operate machinery and equipment with discretion and with minimum interference to driveways and walkways. Do not leave machinery and equipment unattended on roads and driveways.
 - c. Store materials in the areas as designated by the Project Manager. Locate construction equipment, machinery, equipment and supplies within the Project Contract Limits.
 - d. Keep access roads to the project site free of dirt and debris. Provide, erect and maintain lights, barriers, signs, etc. when working on facility roads, driveways and walkways to protect pedestrians and moped/bicycle riders. Obey facility traffic and safety regulations.
- D. Comply with the ban on smoking and other use of tobacco products, alcoholic beverages and other illegal substances at all times.

1.06 WORK UNDER OTHER CONTRACTS

- A. Separate Contract: The State may execute a separate contract for certain construction at the project site that was not known at the time Offers were submitted.
- B. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

1.07 FUTURE WORK

- A. It is not anticipated the State will award a future contract that depends on the Work under this contract.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Project meetings.

1.02. PERFORMANCE AND COORDINATION

- A. Contractor is in charge of the Work within the Project Contract Limits, and shall direct and schedule the Work. Include general supervision, management and control of the Work of this project, in addition to other areas more specifically noted throughout the Specifications. Final responsibility for performance, interface, and completion of the Work and the Project is the Contractor's.
- B. The Contractor is responsible for jobsite Administration. Provide a competent superintendent on the job and provide an adequate staff to execute the Work. In addition, all workers shall dress appropriately and conduct themselves properly at all times. Loud abusive behavior, sexual harassment and misconduct will not be tolerated. Workers found in violation of the above shall be removed from the job site as directed by the Project Manager.
- C. 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.
- D. Coordination: Provide project interface and coordination to properly and accurately bring together the several parts, components, systems, and assemblies as required to complete the Work pursuant to the GENERAL CONDITIONS and SPECIAL CONDITIONS.
 - 1. Provide interface and coordination of all trades, crafts and subcontracts. Ensure and make correct and accurate connections of abutting, adjoining, overlapping, and related work. Provide anchors, fasteners, accessories, appurtenances, and incidental items needed to complete the Work, fully, and correctly in accordance with the Contract Documents.
 - 2. Provide additional structural components, bracing, blocking, miscellaneous metal, backing, anchors, fasteners, and installation accessories required to properly anchor, fasten, or attach material, equipment, hardware, systems and assemblies to the structure.
 - 3. Provide excavation, backfilling, trenching and drilling for trades to install their work.
 - 4. Provide concrete foundations, pads, supports, bases, and grouting for trades as needed to install their work.
 - 5. Provide caulking, sealing, and flashing as required to waterproof the building complete and as required to insulate the building thermally and acoustically. Include sealing, flashing, and related work as required to prevent moisture intrusion, air infiltration, and light leakage.

6. Equipment, appliances, fixtures, and systems requiring plumbing and mechanical services, rough-in, and connections, or other utilities and services shall be provided with such services, rough-in, and final connections.
7. Equipment, appliances, fixtures, hardware, and systems requiring electrical services shall be provided with such electrical services, including outlets, switches, overload protection, interlocks, panelboard space, disconnects, circuit breakers, and connections.
8. Materials, equipment, component parts, accessories, incidental items, connections, and services required to complete the Work which are not provided by subcontractors shall be provided by the Contractor.
9. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1.03 COOPERATION WITH OTHER CONTRACTORS

- A. The State reserves the right at any time to contract for or otherwise perform other or additional work within the Project Contract Limits. The Contractor of this project shall to the extent ordered by the Project Manager, conduct its work so as not to interfere with or hinder the progress or completion of the work performed by the State or other contractors.

1.04 COORDINATION WITH OTHER PRIME CONTRACTORS

- A. Multiple prime contractors performing work under separate agreements with the State may be present near the project location, adjacent to and abutting the Project Contract Limits. This Contractor shall coordinate activities, sequence of work, protective barriers and any and all areas of work interfacing with other Prime Contractor's work. Contractor shall provide a continuity of finishes, walks, landscape, etc. at abutting Contract Limits so no additional work will be required. Any damage to other Prime Contractor's Work committed by this Contractor (or its subcontractor) shall be repaired promptly at no additional cost to the State.
- B. Coordinate subcontractors and keep them informed of any work from the other Projects that may affect the site or the subcontractor's work. If the Contractor has any questions regarding its coordination responsibilities or needs clarification as to the impact in scheduling of its work and the work of other projects, this Contractor shall notify the Project Manager in writing.
- C. Subject to approval by the Project Manager, this Contractor shall amend and schedule its work and operations to minimize disruptions to the work and operations of other projects.
 1. Relocate or remove and replace temporary barriers, fencing supports or bracing to allow work by others to proceed unimpeded. Do not remove required barriers supporting work until specified time or as approved by the Project Manager. This does not relieve the Contractor of the responsibility of proper coordination of the work. If directed by the Project Manager, leave in place any temporary barriers.
 2. Coordinate work that abuts or overlaps work of the other projects with the Contracting Officer and other Prime Contractors to mutual agreement so that work is 100% complete with continuity of all materials, systems and finishes.
 3. When directed by the Project Manager, provide access into the construction zone to allow the other project's Contractor(s) to perform their Work and work that must be interfaced.

4. Contractor shall adjust and coordinate its Work and operations as required by the other projects as part of the Work of this contract without additional cost or delay to the State.
 5. When directed by the Project Manager provide a combined contractor's construction schedule.
- D. Other contracts, if know, they will be listed in Section 01100 – PROJECT REQUIREMENTS.

1.05 SUBMITTALS

- A. Photo Documentation
1. Prior to the start of jobsite work, the Contractor shall photo document the existing conditions at the site and file with the Project Manager one complete set of documents.

1.06 PROJECT MEETINGS AND TRAINING

- A. General: Schedule and conduct meetings and conferences at the project site as directed by the Project Manager.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Project Manager of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Project Manager, within 3 days of the meeting.
- B. Preconstruction Conference: Project Manager shall schedule a preconstruction conference before the start of construction, at a time convenient to the Project Manager, but no later than 7 days before the Project start date or jobsite start date whichever is later. Conference will be held at the Project site or another convenient location. The Project Manager shall conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Project Manager and design consultants; Facility Users; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and coordination.
 - d. Designation of responsible personnel.
 - e. Use of the premises.
 - f. Responsibility for temporary facilities and controls.
 - g. Parking availability.

- h. Office, work, and storage areas.
 - i. Equipment deliveries and priorities.
 - j. First aid.
 - k. Security.
 - l. Construction waste management and recycling.
 - m. Progress cleaning.
 - n. Working hours.
- C. Progress Meetings: Conduct progress meetings at weekly or other intervals as determined by the Project Manager. Coordinate dates of meetings with preparation of payment requests.
- 1. Attendees: In addition to Project Manager each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Outstanding Requests for information (clarification).
 - 2) Interface requirements.
 - 3) Sequence of operations.
 - 4) Status of outstanding submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Work hours.
 - 11) Hazards and risks.

- 12) Progress cleaning.
 - 13) Quality and work standards.
 - 14) Force Account work.
 - 15) Change Orders and Change Proposals.
 - 16) Documentation of information for payment requests.
- c. Corrective Action Plan: Contractor shall provide a plan of corrective action for any item which is delayed or expected to be delayed, then that item impacts the contractual dates.
3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
- a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Submittals Schedule.
 - 3. Schedule of Prices.
 - 4. Payment Application.
- B. Related Sections include the following: Subparagraphs below include submittals usually specified in other Sections.
 - 1. Section 01310 - "Project Management and Coordination" for preparing a combined Contractor's Construction Schedule.
 - 2. Section 01330 - "Submittal Procedures" for submitting schedules and reports.

1.02 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path and control the total length of the project. They must start and finish on the planned early start and finish times.
 - 2. Predecessor activity is an activity that must be completed before a given activity can be started.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of project.
- C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either the Department or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

- F. Schedule of Prices: A statement furnished by Contractor allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Payment Applications.

1.03 SUBMITTALS

- A. Required Submittals: Submit 8 sets of the list of the required submittals, by Specification Section, within 15 days after award of the contract or upon earlier written instructions from the Project Manager. A general listing is provided under SECTION 01330 - SUBMITTAL PROCEDURES.
 - 1. The listing shall indicate and include the following:
 - a. The number of copies required for submittal.
 - b. Planned submittal date.
 - c. Approval date required by the Contractor.
 - d. A space where the "date of submittal" can be inserted.
 - e. A space where the "date of approval" can be inserted.
 - f. A space where an "action code" can be inserted.
- B. Construction Schedule: Submit 7 sets of the Construction Schedule for review within 15 days after the award of the contract or upon earlier written instructions from the Project Manager.
- C. Schedule of Prices: Submit 3 sets of the Schedule of Prices integrated with the Construction Schedule for review within 15 days after the award of the contract or upon earlier written instructions from the Project Manager.
 - 1. Use the Department's forms for Payment applications.
- D. Payment Application: Submit the payment application at earliest possible date and no sooner than the last day of the month after all payroll affidavits, updated submittal registers, and schedules have been submitted.

1.04 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate Contractors.
- B. Construction Schedule: Coordinate Contractor's Construction Schedule with the Schedule of Prices, Submittals Schedule, loaded monthly event activity, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
- C. Schedule of Prices: Coordinate preparation of the schedule with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Prices with other required administrative forms and schedules, including the following:
 - a. The Department's Payment Application form and the Construction Progress Report continuation sheet for the event cost estimate per time period.
 - b. Submittals Schedule.

PART 2 – PRODUCTS

2.01 SUBMITTALS SCHEDULE

- A. Comply with the GENERAL CONDITIONS "SHOP DRAWINGS AND OTHER SUBMITTALS" Article. Furnish required submittals specified in this Section and in the Technical Sections. Submittals include one or more of the following: shop drawings, color samples, material samples, technical data, material safety data information, schedules of materials, schedules of operations, guarantees, certifications, operating and maintenance manuals, and field posted as-built drawings.
- B. Preparation: Furnish a schedule of submittals per Project Manager.
 - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Prices, and Contractor's Construction Schedule.
 - 2. The schedule shall accommodate a minimum of 21 calendar days for the State's review, as applicable for the Island the project is located.
 - 3. Prepare and submit an updated list to the Project Manager at monthly intervals or as directed by the Project Manager. The listing shall reflect all approvals received since the last update.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE - GANTT CHART METHOD

- A. The construction schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. The progress chart shall indicate the order in which the Contractor contemplates starting and completing the several salient features of the work (including acquiring materials, plant, and equipment).
- B. Upon completion of the Project Manager's review, the Contractor shall amend the schedule as necessary to reflect the comments. If necessary, the Contractor shall participate in a meeting with the Project Manager to discuss the proposed schedule and changes required. Submit the revised schedule for review within 7 calendar days after receipt of the comments.
- C. Use the reviewed schedule for planning, organizing and directing the work, for reporting progress, and for requesting payment for the work completed. Unless providing an update, do not make changes to the reviewed schedule without the Project Manager's approval.
- D. If, in the opinion of the Project Manager, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve progress, including those that may be required by the Project Manager, without additional cost to the State. The Project Manager may require the Contractor to increase the number of shifts, overtime operations, days of work, or amount of construction plant, and to submit for approval any supplemental schedule or schedules in chart form as the Project Manager deems necessary to demonstrate how the approved rate of progress will be regained.
- E. Update the construction schedule at monthly intervals or when directed by the Project Manager to revise the schedule. Reflect any changes occurring since the last update with each invoice for progress payment. Submit copies of the purchase orders and confirmation of the delivery dates as directed. The Project Manager's review of the updated schedule is to check that the updated schedule does not alter the construction performance period unless the period was revised through a change order or contract modification.
- F. At Contractor's option a PERT chart may be used.

2.03 SCHEDULE OF PRICES

- A. Furnish a schedule of prices per Project Manager.
- B. Provide a breakdown of the Contract Sum in enough detail to facilitate developing and the continued evaluation of Payment Applications. Provide several line items for principal subcontract amounts, or for materials or equipment purchased or fabricated and stored, but not yet installed, where appropriate. Round amounts to nearest whole dollar; total shall equal the Contract Price.
- C. Each item in the Schedule of Prices and Payment Application shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

2.04 PAYMENT APPLICATION

- A. Use the Schedule of Prices as the Monthly Construction Progress Report. Each Payment Application shall be consistent with previous applications and payments. The Project Manager shall determine the appropriateness of each payment application item.
- B. Payment Application Times: The date for each progress payment is the last day of each month. The period covered by each Payment Application starts on the first day of the month or following the end of the preceding period and ends on the last day of the month.
- C. Updating: Update the schedule of prices listed in the Payment application when Change Orders or Contract Modifications result in a change in the Contract Price.
- D. Provide a separate line item for each part of the Work where Payment Application may include materials or equipment purchased or fabricated and stored, but not yet installed.
- E. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
- F. Provide separate line items for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- G. Payment Application Forms: Use and submit copies of the Payment Application and Construction Progress forms provided by Department. Forms are available at the Department's Public Works Division office or District office. Furnish 7 copies.
- H. Application Preparation: Complete every entry on form. Execute by a person authorized to sign legal documents on behalf of the Contractor.
 - 1. Entries shall match data on the Schedule of Prices and Contractor's Construction Schedule. Use updated schedules if revisions were made. Include amounts of Change Orders and Contract Modifications issued before last day of construction period covered by application.
- I. No payment will be made until the following are submitted each month:
 - 1. Monthly Estimate, 7 copies.
 - 2. Monthly Progress Report, 7 copies.
 - 3. Statement of Contract Time, 7 copies.
 - 4. Updated Submittal Register, 1 copy.
 - 5. Updated Progress Schedule, 1 copy.
 - 6. All Daily Reports, 1 copy.
 - 7. All Payroll Affidavits for work done, 1 copy.
- J. Retainage: The Department will withhold retainage in compliance with the GENERAL CONDITIONS.

- K. Transmittal: Submit the signed original and 6 copies of each Payment Application for processing.

2.05 CONTRACTOR DAILY PROGRESS REPORTS

- A. The General Contractor and all Subcontractors shall keep a daily report of report events.
- B. The form of the Contractor Daily Progress Report shall be as directed by the Project Manager.
- C. Submit copies of the previous week's reports on Monday morning at 10:00 a.m.
- D. Submit copies of the reports with the monthly payment request for the whole period since the last payment request submittal.
- E. Deliver the reports in hard copy, by e-mail, or web based construction management as directed by the Project Manager.

PART 3 - EXECUTION (Not Used)

END SECTION

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Comply with the GENERAL CONDITIONS "Shop Drawings and Other Submittals" section and "Material Samples" section.
- B. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- C. Related Sections include the following:
 - 1. SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
 - 2. SECTION 01770 - CLOSEOUT PROCEDURES for submitting warranties, project record documents and operation and maintenance manuals.

1.02 SUBMITTAL PROCEDURES

- A. Coordinate Work and Submittals: Contractor shall certify the submittals were reviewed and coordinated.
- B. Submittal Certification: Provide in MS Word when submitting electronically. Project Manager will provide an electronic copy of the Submittal Certification. Provide a reproduction (or stamp) of the "Submittal Certification" and furnish the required information with all submittals. Include the certification on:
 - 1. The title sheet of each shop drawing, or on
 - 2. The cover sheet of submittals in 8-1/2 inch x 11-inch format, or on
 - 3. One face of a cardstock tag (minimum size 3-inch x 6-inch) tied to each sample. On the sample tag, identify the sample to ensure sample can be matched to the tag if accidentally separated. The opposite face of the tag will be used by the Project Manager to receive, review, log stamp and include comments.
- C. Variances: The Contractor shall request approval for a variance. Clearly note any proposed deviations or variances from the Specifications, Drawings, and other Contract Documents on the submittal and also in a separately written letter accompanying the submittal.

D. Submittal Certification Form (stamp or digital)

CONTRACTOR'S NAME: _____
PROJECT: _____
JOB NO: _____

As the General Contractor, we checked this submittal and we certify it is 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.

SUBMITTAL NUMBER _____ DATE RECEIVED _____
REVISION NUMBER _____ DATE RECEIVED _____
SPECIFICATION SECTION NUMBER /PARAGRAPH NUMBER _____
DRAWING NUMBER _____
SUBCONTRACTOR'S NAME _____
SUPPLIER'S NAME _____
MANUFACTURER'S NAME _____

NOTE: DEVIATIONS FROM THE CONTRACT DOCUMENTS ARE PROPOSED AS FOLLOWS (Indicate "NONE" if there are no deviations)

CERTIFIED BY	_____
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Note: Form can be combined with Design Consultant's Review stamp. This is available from the Project Manager.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 SUBMITTAL REGISTER AND TRANSMITTAL FORM

- A. Contractor shall use submittal register and transmittal forms as directed by the Project Manager.
- B. The listing of required submittals within this Section is provided for the Contractor's convenience. Review the specification technical sections and prepare a comprehensive listing of required submittals. Furnish submittals to the Project Manager for review.
- C. Contractor shall separate each submittal item by listing all submittals in the following groups with the items in each group sequentially listed by the specification section they come from:
 - 1. Administrative
 - 2. Data
 - 3. Tests
 - 4. Closing
- D. Contractor shall separate all different types of data as separate line items all with the column requirements.

E. Contractor shall send monthly updates and reconciled copies electronically to the Project Manager and the Design Consultant in MS Word or MS Excel or other format as accepted by the Project Manager.

Section No. - Title	Shop Drawings & Diagrams	Samples	Certificates (Material, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-Built Drawings	Others	Guaranty or Warranty	Manufacturer's Guaranty or Warranty (Greater than one year)
01310 – Project Management and Coordination											<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		
01320 – Construction Progress Documentation											<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		
01330 – Submittal Procedures			<input checked="" type="checkbox"/>											<input checked="" type="checkbox"/>		
01700 – Execution Requirements														<input checked="" type="checkbox"/>		
01770 – Closeout Procedures	<input checked="" type="checkbox"/>								<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
02200 – Site Preparation											<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		
02300 – Earthwork and Grading		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>										<input checked="" type="checkbox"/>		
02775 – Portland Cement Concrete Paving			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>							<input checked="" type="checkbox"/>		
02780- Pavement Markings			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>												
02785 – Miscellaneous Signs	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>												

Section No. - Title	Shop Drawings & Diagrams	Samples	Certificates (Material, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-Built Drawings	Others	Guaranty or Warranty	Manufacturer's Guaranty or Warranty (Greater than one year)
05500 – Metal Fabrications	■		■													
07560 – Fluid Applied Roofing System	■		■	■										■		
09901 - Painting		■	■	■	■									■	■	
10990- Miscellaneous Specialties	■															
13650 – Photovoltaic Energy Equipment	■			■					■					■		■
16010 – General Electrical Provisions	■		■	■										■	■	

END OF SECTION

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including the following:
 - 1. Construction layout. Field engineering and surveying.
 - 2. General installation of products.
 - 3. Starting and adjusting.
 - 4. Protection of installed construction.
 - 5. Correction of the Work.
- B. Related Sections
 - 1. SECTION 01770 - CLOSEOUT PROCEDURES.

1.02 SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.03 NOTIFICATION

- A. Contact the Project Manager at least 3 working days prior to starting any onsite work.

1.04 PROJECT AND SITE CONDITIONS

- A. Project Contract Limits (Contract Zone Limits) indicate only in general the limits of the work involved. Perform necessary and incidental work, which may fall outside of these demarcation lines. Confine construction activities within the Project Contract Limits and do not spread equipment and materials indiscriminately about the area.
- B. Disruption of Utility Services: Prearrange work related to the temporary disconnection of electrical and other utility systems with the Project Manager. Unless a longer notification period is required elsewhere in the Contract Documents, notify the Project Manager at least 15 days in advance of any interruption of existing utility service. Time and duration of interruptions are subject to the Project Manager's approval. Keep the utility interruptions and duration to a minimum so as not to cause inconvenience or hardship to the facility. If temporary electrical or other utility systems hook-up is required, provide the necessary services. Pay for temporary services as part of the contract, unless specifically noted otherwise.
- C. Disruption of Air Conditioning Services: Coordinate and arrange work related to the temporary disconnection of the air conditioning system with the Project Manager. Keep disruptions to a minimum. If temporary power is required, provide services and pay the cost as part of the contract. Schedule any major outage to the air conditioning system that affects the entire building and lasts 2 hours or more, on weekends or during non-regular working hours of the building occupants. Pay for overtime cost as part of the contract.
- D. Contractor's Operations - Provide means and methods to execute the Work and minimize interruption or interference to the facility's operations. Rearrange the construction

schedule when construction activities result in interruptions that hamper the operations of the facilities.

- E. Maintain safe passageway to and from the facility's occupied buildings, rooms and other occupied spaces for the using agency personnel and the public at all times.
- F. Contractor, Subcontractor(s) and their employees will not be allowed to park in zones assigned to Users or facility personnel. Subject to availability, the Project Manager may designate areas outside of the Contract Zone Limits to be used by the Contractor. Restore any lawn area damaged by construction activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EXAMINING THE SITE

- A. Contractor and Subcontractors are expected to visit the site and make due allowances for difficulties and contingencies to be encountered. Compare contract documents with work in place. Become familiar, with existing conditions, the conditions to be encountered in performing the Work, and the requirements of the drawings and specifications.
- B. Verify construction lines, grades, dimensions and elevations indicated on the drawings before any clearing, excavation or construction begins. Bring any discrepancy to the attention of the Project Manager and make any change in accordance with the Project Manager's instruction.
- C. Obtain all field measurements required for the accurate fabrication and installation of the Work included in this Contract. Verify governing dimensions and examine adjoining work on which the Contractor or Subcontractor's work is in any way dependent. Submit differences discovered during the verification work to the Project Manager for interpretations before proceeding with the associated work. Exact measurements are the Contractor's responsibility.
- D. Furnish or obtain templates, patterns, and setting instructions as required for the installation of all Work. Verify dimensions in the field.
- E. Contractor shall accept the site and the existing building in the condition that exists at the time access is granted to begin the Work. Verify existing conditions and dimensions shown and other dimensions not indicated but necessary to accomplish the Work.
- F. Locate all general reference points and take action to prevent their destruction. Lay out work and be responsible for lines, elevations and measurements and the work executed. Exercise precautions to verify figures and conditions shown on drawings before layout of work.

3.02 FIELD MEASUREMENTS

- A. Take field measurements to fit and install the Work properly. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress.
- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

- C. Review of Contract Documents and Field Conditions: Submit a Request For Information (RFI) immediately upon discovery of the need for clarification of the Contract Documents. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.03 INSTALLATION

- A. Install materials, items, fixtures required by the various Divisions and Sections of the Specifications in accordance with Contract Documents, by workers specially trained and skilled in performance of the particular type of work, to meet guarantee and regulatory agency requirements. Should the drawings or specifications be void of installation requirements, install the materials, items, and fixtures in accordance with the manufacturer's current specifications, recommendations, instructions and directions.

3.04 CUTTING AND PATCHING

- A. Oversee cutting and patching of concrete, masonry, structural members and other materials where indicated on drawings and as required by job conditions. Unless noted elsewhere in the contract documents, do not cut or patch existing or new structural members without previously notifying the Project Manager.
- B. Provide patch materials and workmanship of equal quality to that indicated on the drawings or specified for new work.

3.05 CLEANING

- A. General: Clean the Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste more than 7 days unless approved otherwise by the Project Manager.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use only cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.06 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.07 PROTECTION OF INSTALLED CONSTRUCTION

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

3.08 CORRECTION OF THE WORK

- A. Repair or replace defective construction. Restore damaged substrates and finishes. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair defective components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including the following:
 - 1. Project Record Documents.
 - 2. Operation and Maintenance Manuals.
 - 3. Warranties.
 - 4. Instruction for the State's personnel.
- B. Related documents include the following:
 - 1. SECTION 01700 - EXECUTION REQUIREMENTS.

1.02 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting a Final Inspection to determine Substantial Completion, complete the following items in addition to requirements of the contract documents.
 - 1. Advise the Project Manager of pending insurance changeover requirements.
 - 2. Submit specific warranties, final certifications, and similar documents.
 - 3. Obtain and submit occupancy permits, operating certificates, and similar releases and access to services and utilities, unless waived by the Project Manager.
 - 4. Arrange to deliver tools, spare parts, extra materials, and similar items to a location designated by the Project Manager. Label with manufacturer's name and model number where applicable.
 - 5. Make final changeover of permanent locks and deliver keys to the Project Manager. Advise the State's personnel of changeover in security provisions.
 - 6. Complete startup testing of systems.
 - 7. Submit test, adjust, and balance records.
 - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 9. Advise the Project Manager of changeover in other utilities.
 - 10. Submit changeover information related to the State's occupancy, use, operation, and maintenance.
 - 11. Complete final cleaning requirements, including touch up painting.
 - 12. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
 - 13. Submit the O&M Manual(s) for review.

1.03 FINAL COMPLETION

- A. Preliminary Procedures: Within 10 days from the Project Acceptance Date, complete the following items in addition to requirements of the contract documents.
 - 1. Instruct the State's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training media materials.

1.04 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit 2 copies of any updated and action taken list. In addition to requirements of the contract documents, include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project Name and Title.
 - b. Job No.
 - c. Date and page number.
 - d. Name of Contractor.

1.05 PROJECT RECORD DOCUMENTS AND REQUIREMENTS

- A. General:
 - 1. Definition: "Project Record Documents", including Record Drawings, shall fulfill the requirements of "Field-Posted As-Built Drawings" listed in the contract documents.
 - 2. Do not use Project Record Documents for daily construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Project Manager's reference during normal working hours. Maintain these documents as specified in paragraph entitled "Record Drawings" hereinafter.
 - 3. The Designer, under contract with the State, will update the drawings to show all addendum, PCD, and sketch changes. The Project Manager will transmit these drawings (mylar or vellum) to the Contractor who will make all "red-line" corrections to these drawings to record the changes depicted on the Contractor's Field Posted Record ("As-Builts") by accepted drafting practices as approved by the Project Manager.
 - 4. Where the recorded changes depicted on the Contractor's Field Posted Record ("As-Builts") are in the form of shop drawings, the Contractor shall provide those shop drawings on mylar or vellum sheets in the same material and size as the drawings transmitted to the Contractor. The new drawing sheets shall be titled and numbered to conform to the construction drawings and clearly indicate what information they supercede in the actual construction drawings. For example a new drawing that replaces drawing M-3, could be numbered M3a.
 - 5. The Contractor shall bring to the attention of the Project Manager any discrepancy between the changes made by the Designer and those depicted on addendum, PCD, and sketch changes. The Project Manager will resolve any conflicts.

6. Submit final Record Documents (Field Posted Record Drawings) within 10 days after the Final Inspection Date but no later than the Contract Completion Date, unless the GENERAL CONDITIONS require an earlier submittal date.
 7. The Contractor shall guarantee the accuracy of its final Record Documents. The State will hold the Contractor liable for costs the State incurs as a result of inaccuracies in the Contractor's Record Documents.
 8. Prepare and submit [construction photographs and electronic files], damage or settlement surveys, property surveys, and similar final record information as required by the Project Manager.
 9. Deliver tools, spare parts, extra materials, and similar items to a location designated by the Project Manager. Label with manufacturer's name and model number where applicable.
 11. Submit Final, corrected O&M Manual(s).
- B. Record Drawings:
1. Maintain a duplicate full-size set of Field Posted Record ("As-Built") Drawings at the job site. Clearly and accurately record all deviations from alignments, elevations and dimensions, which are stipulated on the drawings and for changes directed by the Project Manager that deviate from the drawings.
 2. Record changes immediately after they are constructed in place and where applicable, refer to the authorizing document (Field Order, Change Order, or Contract Modification). Use red pencil to record changes. Make Field Posted Record Drawings available to the Project Manager at any time so that its clarity and accuracy can be monitored.
 - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - d. Mark the contract drawings or the shop drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on contract drawings.
 - e. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - f. Locate concealed building utilities by dimension from bench marks or permanent structures. Locate site utilities by dimensions, azimuth and lengths from bench marks or permanent structures.
 - g. Note field order numbers, Change Order numbers, Contract Modification numbers, Alternate numbers, post-construction drawing numbers (PCD) and similar identification (RFI numbers) where applicable.
 - h. The Contractor shall initial each deviation and each revision marking.
 3. Use the final updated Contract Drawing set plus applicable shop drawings for making the final Field Posted Record Drawings submittal.
 4. Certify drawing accuracy and completeness. Label and sign the record drawings.
 5. Label the title sheet and on all sheets in the margin space to the right of the sheet number, written from the bottom upward, with the title "FIELD POSTED RECORD DRAWINGS" and certification information as shown below. Provide a signature line

and company name line for each subcontractor that will also certify the respective drawing. Adjust size to fit margin space.

FIELD POSTED Certified By: _____ Date: _____
RECORD DRAWINGS [Contractor's Company Name]

6. Revise the Drawing Index and label the set "FIELD POSTED RECORD DRAWINGS". Include the label "A COMPLETE SET CONTAINS [_____] SHEETS" in the margin at the bottom right corner of each sheet. Quantify the total number of sheets comprising the set.
7. If the Contracting Officer determines a drawing does not accurately record a deviation or omits relevant information, the State will correct any FIELD POSTED RECORD DRAWINGS sheet. Contractor will be charged for the State's cost to correct the error or omission.
8. Use the final Field Posted Record Drawings sheets to create one electronic version of the set. The set shall be recorded in Adobe Acrobat PDF (Portable Document Format). Create a single indexed, bookmarked PDF file of the entire set of drawings and record on the CD. Submit one set of the final Field Posted Record Drawings sheets and the complete electronic CD set(s).

1.06 WARRANTIES

- A. Submittal Time: Submit written manufacturer's warranties at request of the Project Manager for designated portions of the Work where commencement of warranties other than Project Acceptance date is indicated.
- B. Partial Occupancy: Submit properly executed manufacturer's warranties within 45 days of completion of designated portions of the Work that are completed and occupied or used by the State during construction period by separate agreement with Contractor.
- C. Organize manufacturer's warranty documents into an orderly sequence based on the table of contents of the Specifications.
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2 inch x 11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer and prime contractor.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES", Project Name and Title, Job Number, and name of Contractor.
 4. Use the final submittal of the warranties to create an electronic Adobe Acrobat PDF (Portable Document Format) version of the bound warranty documents files. Each sheet shall be separately scanned, at 600 DPI or better into a PDF file, indexed and recorded on a recordable compact disc (CD).
- D. Provide 2 sets of manufacturer's warranties that exceed one year and one CD as part of the closing document submittals. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.07 OPERATION AND MAINTENANCE MANUALS

- A. Assemble complete sets of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Operation Data:
 - a. Emergency instructions and procedures.
 - b. System, subsystem, and equipment descriptions, including operating standards.
 - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - d. Description of controls and sequence of operations.
 - e. Piping diagrams.
 2. Maintenance Data:
 - a. Manufacturer's information, Material Safety Data Sheets, and a list of spare parts.
 - b. Name, address, and telephone number of installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.
 - h. Copies of warranties and bonds.
- B. Use the following 3 paragraph headings, "Notes, Cautions and Warnings", to emphasize important and critical instructions and procedures. Place the words "Notes", "Cautions", or "Warnings" immediately before the applicable instructions or procedures. Notes, Cautions and Warnings are defined as follows:
1. Note: highlights an essential operating or maintenance procedure, condition or statement.
 2. Caution: highlights an operating or maintenance procedure, practice, condition or statement which if not strictly observed, could result in damage to or destruction of equipment, loss of designed effectiveness, or health hazards to personnel.
 3. Warning: highlights an operating or maintenance procedure, practice, condition, or statement that if not strictly observed, could result in injury to or death of personnel.
- C. Organize the Operation and Maintenance Manuals into suitable sets of manageable size. Bind and index data in heavy-duty, "D" type 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Binder color shall be maroon, or if not available red. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL", Project Name and Title include building number when appropriate, DAGS Job Number, Prepared For: [User Agency], Prepared By: [Contractor] and Volume Number. Each binder is a single volume.
- D. Electronic Format
1. Provide all information (narratives, drawings and manual) on a Compact Disc (CD). Provide drawings and plans prepared for the O&M Manuals drawn electronically and saved as a PDF file. Name and index the files for ease of identification and updates.
 2. Provide the complete O&M Manual using Adobe Acrobat PDF (Portable Document Format) files. Each sheet shall be separately scanned into a PDF file, indexed, bookmarked, hyperlinked to the table of contents and recorded on a compact disc

(CD). Scanned documents shall be scanned at 600 DPI or better. Indexes and bookmarks may be highlighted or colored text. The final submittal shall include written instructions for installing, accessing and retrieving information from the compact disc.

- E. Pre-Final Submittal: Submit 2 printed sets of Pre-Final Operation and Maintenance Manuals, for review by the Contracting Officer, at least 5 days prior to scheduled final inspection. Manuals shall be marked as Pre-Final. Make any correction noted before submitting the final Operation and Maintenance Manuals.
 - 1. The user and the Department will each keep one copy of the Pre-Final submittal to operate and maintain the facility from the Project Acceptance Date through submission of the final submittal. Therefore, the submittal shall contain all the required information that is available at the time of submission.
 - 2. One set will be returned with comments. Additional review comments may include problems discovered during the O&M Manual's review, site validation, and facility start up and will be provided to the Contractor after facility Project Acceptance Date.
- F. Final Submittal: Use the final submittal of the manuals to create the electronic PDF file version of the bound Operation and Maintenance Manuals documents. Include the Submittal (100 percent) review comments along with a response to each item. Provide 6 Final sets of the printed manuals and 6 Final compact discs, (CDs) as part of the closing document submittal. Final printed manual and disks shall be marked as Final.

PART 2 - PRODUCTS

2.01 MATERIALS

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

PART 3 - EXECUTION

3.01 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct the State's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Provide instructors experienced in operation and maintenance procedures.
 - 2. Provide instruction at mutually accepted times.
 - 3. Schedule training with the State's users, through the Project Manager with at least 7 days advanced notice.
 - 4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
 - 1. System design and operational philosophy.
 - 2. Review of documentation.

3. Operations.
4. Adjustments.
5. Troubleshooting.
6. Maintenance.
7. Repair.

3.02 FINAL CLEANING

- A. General: Provide final cleaning. In addition to requirements of Article 7 of the GENERAL CONDITIONS conduct cleaning and waste-removal operations to comply with local laws and ordinances and federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturers written instructions unless noted otherwise. Complete the following cleaning operations before requesting final inspection for entire Project or for a portion of Project:
 1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits resulting from construction activities.
 3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 4. Remove tools, construction equipment, machinery, and surplus material from Project site.
 5. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 6. Remove debris and surface dust from limited access spaces, including: roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 7. Sweep concrete floors broom clean in unoccupied spaces.
 8. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 9. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass surfaces, taking care not to scratch surfaces.
 10. Floor Cleaning and Waxing: Prepare the floor tiles and remove wax finish. Apply 2 coats of sealer and 4 coats of wax to the floor and polish to smooth shiny finish per floor sealer and wax manufacturer's requirements. Use one of these 3 sealer products or preapproved equal; Betco Floor Sealer, Hillyard Seal 341 Sealer, or SC Johnsons Over and Under Sealer and any one of these 3 wax products; Betco Hybrid

25, Hillyard North Star, or SC Johnsons Vectra. Contractor shall submit its proposed sealer and wax products for review and approval.

a. Schedule preparation and waxing operations not more than one week prior to final inspection. Limit floor traffic on waxed floors until acceptance.

11. Remove labels that are not permanent.

12. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

13. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

14. Replace parts subject to unusual operating conditions.

15. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

16. Replace disposable air filters and clean permanent air filters. Clean the exposed surfaces of diffusers, registers, and grills.

17. Clean ducts, blowers, and coils if units were operated without filters during construction.

18. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

19. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the State's property. Do not discharge volatile, harmful, or dangerous materials into drainage and sewer systems or onto State property. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 02200 - SITE PREPARATION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to site preparation, unless otherwise noted. This section applies to:
 - 1. Surface and subsurface demolition.
 - 2. Backfilling of excavations and depressions.
 - 3. Removal of concrete pavement and pavement markings
 - 4. Removal of concrete walkways
 - 5. Clearing:
 - a. This item shall consist of clearing and disposing of all surface vegetation, trees, rubbish, loose boulders, rocks, and other objectionable material within the area shown on the plans. It shall include removing lumber, trash piles, and other obstructions interfering with the proposed work; salvaging and stockpiling designated materials; and disposing of debris.
 - 6. Grubbing:
 - a. This item shall consist of grubbing the areas outlined on the plans or as defined in the special provisions. The work shall include the removal of large roots, buried logs, junk, and other objectionable materials at or below the ground surface not prescribed under the item of "Clearing".
- B. Contractor shall provide labor, material and equipment required for demolishing, cutting, removing and disposing of existing construction as designated and shown on the drawings for the following as required, unless otherwise noted.

1.02 RELATED SECTIONS

- A. Section 02300 - EARTHWORK AND GRADING.

1.03 SUBMITTALS

- A. Comply with requirements of Section 01330 - Submittal Procedures.
- B. Submit all permits and certificates required for the project, for record purposes.
- C. Demolition schedule and proposed methods and operations.
- D. Permit for transport and disposal of debris.
- E. Make arrangements of disposing of waste and excess materials at a legally licensed landfill/disposal facility outside worksite and pay cost thereof.
- F. Photograph existing conditions of existing structure surfaces, equipments, and adjacent improvements that might be misconstrued as damage related to removal operations. File photographs with Project Manager prior to start of work.
- G. Submit proposed dust control measures.
- H. Submit proposed noise control measures.
- I. Work Schedule: Submit a proposed schedule of work items to be performed, and a description of how the work is to be accomplished, for the review by the Project Manager.

- J. Report of inspections conducted with the Project Manager both before and after performing work.

1.04 QUALITY ASSURANCE

- A. Comply with the following Standards:
 - 1. The "Standard Details for Public Works Construction", September 1984 and the "Standard Specifications for Public Works Construction", September 1986, of the Department of Public Works, except as amended in the drawings and specifications herewith, shall govern work covered under this section.
 - 2. American National Standards Institute, Inc. "American National Standard Safety Requirements for Demolition" (ANSI A10.6 and A10.8).
- B. Regulatory Agencies:
 - 1. Comply with applicable local and State agencies having jurisdiction.
 - 2. Comply with governing EPA notification regulations.
- C. Secure all required Permits or Certificates for demolition or discontinuance of utilities, prior to beginning the work.

1.05 PROJECT CONDITIONS

- A. Disposition of Existing Improvements:
 - 1. All materials indicated to be removed shall become the property of the Contractor; dispose of these outside the project site.
 - a. Do not dispose of removed materials to the general public by sale, gift or in any other manner at the Site.
 - b. These provisions shall not be construed as limiting or prohibiting sale or disposal of such materials at the Site to duly licensed Contractors or material suppliers, provided materials are removed from the construction site by the Contractor.
 - 2. All removal of debris from the site, including removal of inventory to site of storage, is part of this Contract and shall be done by Contractor's employees and no others.
- B. Salvage and Reuse:
 - 1. Where units or items of existing work are designated to be removed and reused in the new work or are to become salvage, remove such units or items carefully.
 - a. Use tools and methods that will not damage such units or items.
 - b. Protect underlying or adjoining work from damage.
 - c. Salvaged items shall be cleaned by the Contractor.
- C. Protection:
 - 1. Erect and maintain temporary bracing, shoring, lights, and barricades, except construction barricades for subsequent new construction, warning signs, and guards necessary to protect the public and employees, finishes, improvements to remain and adjoining property from damage, all in accordance with applicable regulations.
 - 2. Wet down areas affected by this work as required preventing dust and dirt from rising.
- D. Scheduling:
 - 1. Coordinate with the Project Manager in scheduling noisy or dirty work.
 - 2. Schedule work at the State's convenience to cause minimal interference with normal operations.
 - 3. Jack hammering will be allowed only during the following time periods: 7:00 AM - 6:00 PM on weekdays. Exact time to be coordinated with the School to minimize

disruption.

- E. Traffic Circulations: Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.
 - 1. Do not close or obstruct public thoroughfares without first obtaining the required permit or permission of the responsible jurisdiction.
 - 2. Where closing of a vehicular or pedestrian traffic circulation route is necessary, provide adequate directional signs to minimize the potential for confusion.

PART 2 – PRODUCTS – (Not used)

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas affected by work of this Section and verify following:
 - 1. Disconnection of utilities as required.
 - 2. That utilities serving occupied portions of buildings on and off the site will not be disturbed.
- B. Where existing conditions conflict with representations of the Contract Documents, notify the Project Manager and obtain clarifications. Do not perform work affecting the conflicting conditions until clarification of the conflict is received.

3.02 PREPARATION

- A. Notification: Notify the Project Manager at least two full working days prior to commencing the work of this section.
- B. Permits: The Contractor shall obtain and pay for all necessary permits prior to the commencement of work.
- C. Site Inspection: Prior to all work, the Contractor shall carefully inspect the entire site and become familiar with the existing conditions and the amount and kind of work to be performed. Verify that the area to be demolished or removed has been vacated, or adequate space made available to perform the work.
- D. Scheduling: Schedule all work in a careful manner with all necessary consideration for teachers, students, neighbors, and the public. Avoid interference with the use of, and passage to and from, adjacent buildings and facilities.
- E. Maintaining Traffic: 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, so as not to interfere with the normal function of traffic.
- F. Termination of Utilities: Arrange for, and verify termination of utility services to include removing meters and capping of lines.

3.03 LAYING-OUT

- A. Lay out cutting work at Job Site and coordinate with related work for which cutting is required.
- B. Licensed Surveyor: The laying-out of base lines, establishment of final grades and staking out of the entire work shall be done by a registered Surveyor licensed in the State of Hawaii. The Contractor shall carefully preserve all data and all monuments existing and

set by the Survey or and, if displaced or lost, immediately replace them to the acceptance of the Project Manager and at no additional cost to the State.

- C. Discrepancies: Should any discrepancies be discovered in the dimensions given in the Plans, the Contractor shall immediately notify the Project Manager before proceeding any further with the work, otherwise he will held responsible for any costs involved in the correction of the construction placed due to such discrepancies.

3.04 PREPARATION FOR NEW FINISH WORK

- A. Where demolished surfaces are scheduled to receive new finishes, Contractor shall restore such substrate to a condition ready to receive the scheduled new finishes, including grinding or leveling.

3.05 EXISTING MATERIALS

- A. Existing Materials: All objectionable materials on the ground surface within the project site shall be removed and disposed of off-site at a dump site accepted by the Project Manager. The Contractor shall be responsible for the protection of existing improvements designated to remain within the site.
- B. Buried Material: All materials below the ground surface such as tree stumps, large roots, logs, junk, boulders, and other objectionable materials shall be removed and disposed as directed by the Project Manager.

3.06 EXISTING MATERIALS

- A. Existing Materials: All objectionable materials on the ground surface within the project site shall be removed and disposed of off-site at a dump site accepted by the Project Manager. The Contractor shall be responsible for the protection of existing improvements designated to remain within the site.
- B. Buried Material: All materials below the ground surface such as tree stumps, large roots, logs, junk, boulders, and other objectionable materials shall be removed and disposed as directed by the Project Manager.

3.07 BACKFILLING

- A. Except in excavation areas, all trenches, holes, depressions, or pits resulting from clearing and grubbing operations shall be backfilled with embankment material acceptable to the Project Manager as required by these specifications or as directed by the Project Manager. The areas shall be left in a neat and finished appearance.

3.08 FIELD QUALITY CONTROL

- A. The Project Manager will accompany the Contractor before and after performance of work to observe physical condition of existing structures or improvements involved.

3.09 CLEAN-UP

- A. Clean-up and remove of debris accumulated from the construction operations from time to time as directed. Remove and transport debris and rubbish in a manner that will prevent spillage into ocean or adjacent areas. The Contractor shall leave the premises clean, neat, and orderly.

END OF SECTION

SECTION 02300 - EARTHWORK AND GRADING

PART 1 - GENERAL

1.01 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to on-site earthwork. Any work within the public right-of-way shall be constructed to the standards of the City and County of Honolulu. Work includes, but is not limited to, the following:
 - 1. Construction of embankments and berms.
 - 2. Excavating, hauling, grading, placing, and compacting suitable material obtained on-site from borrow pits or from designated sites accepted by the Project Manager.
 - 3. Materials.
- B. Provide labor, material and equipment and services necessary to complete the excavations, re-compaction and finish grading as specified and indicated on Drawings.
 - 1. Provide Site Grading.
 - 2. Provide excavation and backfill for filling construction, including trenches within building lines.
 - 3. Preparation for subgrade walks, pavements, and landscaping.
 - 4. Provide sub-base course for walks and pavements.
- C. The work includes removal and legal disposal off the site of debris, rubbish and other materials resulting from clearing and grubbing operations.

1.02 RELATED SECTIONS

- A. Section 02200 – SITE PREPARATION.

1.03 DEFINITIONS

- A. Engineered Fill: Soil or soil-rock material approved by the Project Manager and transported to the site by the Contractor in order to raise grades or to backfill excavations.
- B. On-site Fill Material: Materials excavated from within the project limits but outside of the planned finish cross sections and grades shall be considered as on-site fill material.
- C. Excavation: Consists of the removal of material encountered to subgrade elevations and the re-use or disposal of materials removed.
- D. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, rock base course, or topsoil materials.
- E. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- F. Base Course: The layer placed between the sub-base and surface pavement in a paving system.
- G. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure American Society for Testing and Materials (ASTM) D1557.

1.04 SYSTEM DESCRIPTION

- A. Requirements:
 - 1. Grades and elevations are to be established with reference to bench marks referenced on Drawings.
 - 2. Maintain engineering markers such as monuments, bench marks and location stakes. If disturbed or destroyed, replace.
- B. Criteria:
 - 1. The character of the material to be excavated or used for subgrade is not necessarily as indicated.
 - 2. Blasting will not be permitted. Remove material in an approved manner.

1.05 SUBMITTALS

- A. Comply with provisions of Section 01330 – Submittal Procedures.
- B. Product Data: Manufacturer's literature and data, including, where applicable, capacity, labels, or other markings on equipment made to the specified standards for materials, for the following:
 - 1. Imported materials.
 - 2. Aggregate Base Course.
 - 3. Storm Water Pollution Prevention / Erosion Control Plans.
- C. Test Reports: Submit following reports for import material directly to the Project Manager from the Contractor's testing services:
 - 1. Test reports on borrow material.
 - 2. Density test reports.
 - 3. One optimum moisture-maximum density curve for each type of soil encountered.
 - 4. Report of actual unconfined compressive strength and/or results of bearing test of each strata tested.
 - 5. At least one laboratory optimum moisture - maximum dry density curve for each type of soil encountered.
- D. Submit description of dewatering methods proposed for use.
- E. Submit description of vibratory compactors proposed for use when requesting placement of backfill and fill materials in layers greater than 6 inches thick.
- F. Samples:
 - 1. 20-lb. samples sealed in air-tight containers, of each proposed fill and backfill soil material from on-site or borrow sources.
 - 2. 12-by-12 inch sample of filter fabric.

1.06 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 - 1. The "Standard Details for Public Works Construction" September 1984 and the "Standard Specifications for Public Works Construction", September 1986, of the Department of Public Works, except as amended in the drawings and specifications herewith shall govern work covered in this section.
- B. Soil Testing:
 - 1. The Contractor shall be responsible for providing the Project Manager test results for all compaction, select borrow and granular material to show conformance to the requirements noted in the specifications. All cost for testing as deemed necessary shall be at no additional cost to the State but shall be inclusive in the various related bid proposal item(s).

- C. Codes and Standards:
 - 1. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
 - 2. Storm Water Pollution Prevention and Monitoring Plan to be prepared by others.

- D. Comply with the latest editions of the following Standards and Regulations:
 - 1. American Society for Testing and Materials (ASTM):
 - a. C33: Concrete Aggregates.
 - b. C125: Standard Terminology Relating to Concrete and Concrete Aggregates.
 - c. C136: Sieve Analysis of Fine and Coarse Aggregates.
 - d. C566: Total Evaporable Moisture Content of Aggregate by Drying.
 - e. D421: Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
 - f. D422: Particle Size Analysis of Soil.
 - g. D854: Specific Gravity of Soils.
 - h. D1556: Density of Soil by the Sand Cone Method.
 - i. D1557: Laboratory Compaction Characteristics of Soil Using Modified Effort
 - j. D2216: Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
 - k. D2487: Classification of Soils for Engineering Purposes.

 - l. D2922: Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - m. D2937: Density of Soil in Place by Drive Cylinder Method.
 - n. D3017: Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - o. D4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - 2. City and County of Honolulu Standard Plans and Specifications
 - 3. Other authorities having jurisdiction

- F. Site Information:
 - 1. Additional soil borings and other exploratory operations may be made by Contractor at no cost to State. Submit proposed boring locations for review prior to performing the work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials of this section before, during and after installation; objects designated to be retained; and the installed work of other trades.

- B. In the event of damage to any of these items, immediately make repairs or replacements necessary to the acceptance of the State's Representative and at no additional cost to the State.

- C. Comply with provisions of State of Hawaii, Department of Health, Hawaii Administrative Rules where necessary to control dust and noise on and near the work caused by operations during performance of the Work.

1.08 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. When unfavorable weather conditions necessitate interrupting filling and grading operations, prepare areas by compaction of surface and grading to avoid collection of water.

2. Provide adequate temporary drainage to prevent erosion.
 3. After interruption, reestablish compaction specified in last layer before resuming work.
 4. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to State.
 5. Protect existing streams, ditches and storm drain inlets from water-borne soil by means of straw bale dikes, filter fiber dams, or other methods as approved by the Engineer.
- B. Barricade open excavations and post with warning lights.
1. Comply with requirements of Guidelines for Temporary Traffic Control, Hawaii Department of Transportation.
 2. Operate warning lights as recommended by authorities having jurisdiction.
 3. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout and other hazards.
- C. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.
- D. At Contractor's option, a working pad of granular material may be laid to protect footing and floor subgrade soils from disruption by traffic during wet conditions.
- E. Transport all excess soils materials by legally approved methods to disposal areas.
1. Coordinate with the State's Representative.
 2. Sufficient topsoil and fill material shall be retained from the site to complete project requirements.
 3. Any additional topsoil and fill requirements shall be the responsibility of the Contractor.
- F. Use of explosives will not be permitted.
- G. Dust Control Requirements: At all times during earthwork operations and until final completion and acceptance of the earthwork, the Contractor shall prevent the formation of an airborne dust and dirt nuisance from interfering with the surrounding normal operations. The Contractor shall effectively stabilize the site of work in such a manner that it will confine dust particles to the immediate surface of the work and to obtain a minimum of 40 percent emissions reduction by applying a dust palliative. The dust palliative shall be non-petroleum based. Water alone is not considered to be a dust palliative. The dust palliative shall be applied as specified by the manufacturer. Contractor shall assume liability for all claims related to dust and dirt nuisances.

1.09 EXISTING UTILITIES

- A. Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during excavation operations.
- B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult with Project Manager immediately for directions.
1. Cooperate with the State and public and private utility companies in keeping their respective services and facilities in operation.
 2. Repair damaged utilities to the satisfaction of the utility owner.
- D. Do not interrupt existing utilities serving facilities occupied and used by the State or others, except when permitted in writing by the Project Manager and then only after

acceptable temporary utility services have been provided.

1.10 SEQUENCING AND SCHEDULING

- A. The sequence of operations shall be reviewed by the Project Manager prior to commencement of any work.
- B. Coordinate operations with relocation of existing utilities.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. Fill material will be subject to approval of the Project Manager
 - 2. For approval of imported fill material, notify the Project Manager at least 7 days in advance of intention to import material, designate proposed borrow area, and permit to sample as necessary from borrow area for purpose of making acceptance tests to prove quality of material.
- B. Native Fill Requirements:
 - 1. Approved native materials shall be free of organic matter and other deleterious substances, such as rock or coral fragments greater than 3 inches in maximum dimension and have a plasticity index neither less than 5 nor greater than 15, as determined by ASTM D4318; and expansion index not exceeding 20, as determined by UBC Specification 29-2; and a particle size not exceeding 3 inches as determined by ASTM D422.
- C. Imported Fill Requirements:
 - 1. Definition: Materials outlined from borrow pits outside of the project limits shall be considered as imported borrow. Unless designated otherwise in the special provisions, the Contractor may secure imported borrow from any source if accepted in writing by the Project Manager.
- D. Aggregate Base Course:
 - 1. Aggregate base course shall be in accordance with Section 31.2 of the "Standard Details for Public Works Construction" September 1984 and the "Standard Specifications for Public Works Construction", September 1986, of the Department of Public Works, Counties of Hawaii, except as amended in the drawings and specifications herewith.
- E. Topsoil: See Section 02920 – LAWNS AND GRASS
- F. Sand: Clean, well-graded fine to coarse sand with not more than 2 percent passing the #200 sieve based on wet sieve analysis. Where coarse sand is required, provide sand no finer than No. 40 sieve.
- G. Select Granular Fill: Material consisting of sand, broken rock, crushed coral, basalt, cinder sand, mudrock, or a mixture of sand and gravel containing no size larger than 3 inches. The material shall be well-graded from coarse to fine and not more than 15 percent passing the No. 200 sieve. In addition, the plasticity index (P.I.) of that portion of soil passing the No. 40 sieve shall not be greater than 10. The material shall have a laboratory CBR expansion value of 1 percent or less and a minimum CBR value of 12w percent when tested in accordance with ASTM D 1883.
- H. Filter Fabric: Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D4759 and the referenced standard test

method in parentheses.

1. Grab Tensile Strength (ASTM D4632): 100 lb.
2. Apparent Opening Size (ASTM D4751): #100 U.S. Standard sieve.
3. Permeability (ASTM D4491): 150 gallons per minute per square foot.

- I. Water: Clean and free from deleterious amounts of acids, alkalis, salts and organic matter.

PART 3 - EXECUTION

3.01 GENERAL

- A. All grading work shall conform to the County of Maui code requirements and all applicable provisions of the Hawaii Administrative Rules, Title 11, Chapter 55, Water Pollution Control, and Chapter 54, Water Quality Standards.
- B. Prior to commencement of earthwork, become thoroughly familiar with the site, site conditions, and all portions of the work falling within this section.
- C. If event discrepancies are found, immediately notify the Project Manager in writing, indicating the nature and extent of differing conditions.
- D. Notify the Project Manager at least 48 hours prior to commencing any phase of earthwork.
 1. Work shall not be covered up or continued until acceptance of the Project Manager shall give written notice of conformance with the specifications upon completion of grading.
- E. Hazardous Materials
 1. If any materials are encountered that may be hazardous, inform the Project Manager verbally within 24 hours and in writing within 2 business days. Upon discovery, material is to remain undisturbed until investigation by State's representative is complete. The removal and disposal of hazardous materials, if discovered, is not part of the scope of work of this Division for this project.

3.02 TECHNICAL DEFINITIONS

- A. Relative Compaction: Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil established in accordance with ASTM 1557 test procedures.
- B. Optimum Moisture: Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

3.03 EXISTING UTILITIES

- A. Protect existing utilities that are to remain in operation as specified.
- B. Demolish and completely remove from the site existing underground utilities indicated to be removed.
- C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at contractor's risk.
- D. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.
 1. Use hand or light equipment for excavating immediately adjacent to or for excavations exposing a utility or buried structure.

2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
3. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.
4. Report damage of utility line or subsurface structures immediately to State's Representative

3.04 SITE PREPARATION

- A. Unsuitable Materials: Unsuitable materials, rocks, and boulders greater than 3 inches in greatest dimension encountered during the course of the grading operations shall be crushed or disposed of properly off-site in accordance with these specifications.
- B. Clearing: The natural ground surface within the contract grading limits shall be thoroughly cleared and grubbed of vegetation, junk, and other organic matter in accordance with the requirements of Section 02200 – SITE PREPARATION.
- C. Soft and Yielding Areas: Soft and yielding areas encountered below any areas designated to receive fill shall be over-excavated to expose firm material. The Contractor shall remove and properly dispose of the excavated soils and backfill the resulting excavation with well compacted engineered fill material to the satisfaction of the Geotechnical Engineer.
- D. Sloped Areas: When the fill or embankment is to be constructed on a slope greater than five horizontal units to one vertical, the existing slope shall be keyed and benched to receive the new fills. The excavated material, if acceptable, shall be recompacted along with the new material at the Contractor's expense. Ground with flatter slopes shall be terraced when directed by the Project Manager or when specified in the special provisions.
- E. Scarify building pad, exterior flatwork and pavement subgrade to a depth of at least 6 inches and work until uniform and free from large clods.
 1. Bring expansive subgrades to 2 to 5 percentage points above the optimum moisture content and compact to 90 percent of the maximum laboratory dry density, in accordance with ASTM D1557.
 2. Bring non-expansive subgrades to or slightly above the optimum moisture content and compact to 90 percent of the maximum laboratory dry density in accordance with ASTM D1557.
 3. Increase compaction of the upper 12 - 18 inches of pavement subgrades to 95 percent of the maximum laboratory dry density per ASTM D1557 for non-expansive subgrades.

3.05 DEWATERING

- A. Do not allow water from surface drainage or underground sources to accumulate in excavations, unfinished fills, or other low areas.
- B. Provide and maintain ample means and devices to remove water promptly and dispose properly of water entering excavations or other parts of the work to prevent softening of exposed surfaces.
- C. Dewater by methods which will ensure dry excavation and preservation of finish lines and grades of excavation bottoms.

- D. Prior to excavating below ground water level, place dewatering system in operation.
 - 1. Lower the ground water level a minimum of 1 foot below the bottom of the excavation.
 - 2. Relieve the hydrostatic pressure in pervious zones below the subgrade elevation to prevent uplift.
 - 3. Use screens and gravel packs as necessary to prevent removal of fines from the soil.
- F. Dispose of water away from the work in suitable manner without damage to adjacent property or menace to public health.
- G. Do not drain water into work being built or under construction without prior acceptance of the Project Manager.
- H. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the State.
- I. The Contractor is responsible for procuring all required permits and approvals for any dewatering activities.

3.06 SITE EXCAVATION

- A. General
 - 1. All supports, shoring, and sheet piling required for the sides of excavations or for protection of adjacent existing improvements shall be provided and maintained by the Contractor. The adequacy of such systems shall be the complete responsibility of the Contractor.
- B. Excavate subgrade as required to allow for finish grades shown on drawings, as required for structural fill or otherwise required for proper completion of the work.

3.07 FILL AND COMPACTING

- A. General Requirements:
 - 1. Backfill excavations as promptly as work permits.
 - 2. Do not place engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the Project Manager.
 - 3. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.
 - 4. In excavations, use satisfactory excavated or borrow material.
 - 5. Fill material shall be compacted with compacting equipment satisfactory to the Project Manager. The use of hauling equipment to achieve partial compaction will be allowed, but the Contractor will be required to compact the full width and depth of each layer to the required density before placing the next lift. In locations where it would be impracticable to use rollers or heavy compacting equipment, the material shall be compacted in 6-inch lifts with any method that will produce the required density.
 - 6. Repeat compaction procedure until proper grade is attained.

7. Rocks generated during site earthwork may be used in fill when conforming to material specifications.
- B. Placing General Fill:
1. Suitable Materials: Imported borrow or native conforming to these specifications shall be used in construction of fills in all areas except for the subbase course under paved areas, and select granular fill material under building foundations and slab areas. The better material shall be used in the surface or upper layers. No vegetation, debris, junk, or other extraneous matter shall be mixed with the embankment material nor placed within the fill.
 2. Select Granular Fill: Select granular fill under building foundations and slabs-on-grade should be placed in horizontal lifts restricted to 8 inches in loose thickness and compacted to a minimum 95 percent relative compaction as determined by ASTM D 1557.
 3. Fill material shall be placed in successive layers of uniform thickness. Each layer shall be approximately level with the center constructed slightly higher than the sides for storm water runoff.
 - a. Layer Thickness: All layers of fill shall be constructed in horizontal lifts not to exceed 6 inches in compacted thickness. The percent compaction shall be specified herein.
- B. Compacting:
1. Compact by power tamping, rolling or combinations thereof as accepted by the Project Manager.
 2. Where impractical to use rollers in close proximity to walls, stairs, etc., compact by mechanical tamping.
 3. Scarify and re-compact any layer not attaining compaction until required density is obtained.
 4. Compaction by flooding, ponding or jetting will not be permitted, unless specifically accepted by the Project Manager.

3.08 GRADING

- A. General: Uniformly grade areas of work including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
1. All areas covered by the project, including excavated and filled areas and adjacent transition areas, shall be uniformly graded so that finished surfaces are at the elevations established by the plans. Planter areas to receive future topsoil shall be graded below finished grade to allow for such material.
 2. Finished surfaces and surfaces to receive paving and aggregate base shall be smooth, compacted, and free from irregular surface drainage.

3.09 PROTECTION

- A. Protect newly graded areas from traffic and erosion. In unpaved areas without landscaping, cover with straw erosion control blanket. Follow manufacturer's recommendations for installation. Provide and place straw wattles or biodegradable fiber logs across the slope at the midpoint and along the downhill edge of site. No soil is to be left uncovered at the completion of construction. Keep free of trash and debris.

- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

3.13 CLEAN-UP

- A. Clean-up and remove of debris accumulated from the construction operations from time to time as directed. Remove and transport debris and rubbish in a manner that will prevent spillage into ocean or adjacent areas. The Contractor shall leave the premises clean, neat, and orderly.

END OF SECTION

SECTION 02513 - ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

- A. This work shall include furnishing and mixing mineral aggregate and asphalt binder at a central mixing plant, and hauling, spreading, and compacting the mixture on the approved prepared base course.

1.02 SUBMITTALS

- A. Comply with provisions of Section 01330 – Submittal Procedures
- B. Submit product data for materials, items, and others.
- C. Submit design mixes for pavement mix. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- D. Submit laboratory test reports for evaluation of pavement materials and mix design tests.
- E. Provide material certificates in lieu of material laboratory test reports when permitted by Engineer.
 - 1. Provide material certificates signed by manufacturer and Contractor certifying that each material item complies with or exceeds requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials for roads and parking areas shall be in accordance with the below-listed sections of the State of Hawaii Department of Transportation HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION dated 2005 and the Counties STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION dated September 1986 as revised, 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. HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION
 - a. Excavation & Embankment (Subgrade)Section 203
 - b. Aggregate Base CourseSection 304
 - c. Asphalt Concrete Pavement.....Section 401
Mix shall be No. IV
 - d. Slurry SealSection 404
 - e. Tack CoatSection 407

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The Contractor shall layout the areas to be paved. All such layout shall be approved by the Project Manager before any work is done.
- B. Road and parking areas. Installation shall be in accordance with the applicable sections noted hereinbefore.
- C. Installation for roads and parking areas shall be in accordance with the below-listed sections of the State of Hawaii Department of Transportation HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION dated 2005 as revised, 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. HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION
 - a. Excavation & Embankment (Subgrade)Section 203
 - b. Aggregate Base CourseSection 304
 - c. Asphalt Concrete PavementSection 401
Mix shall be No. IV
 - d. Slurry SealSection 404
 - e. Tack CoatSection 407

3.02 REPAIR OF EXISTING PAVEMENT:

Any existing pavement areas including roads and walkways that have been damaged by construction activities shall be repaired to the original condition and to the satisfaction of the Project Manager. Damage done by heavy equipment, especially on roads not stable for such equipment, shall be repaired to the original condition and to the satisfaction of the Project Manager.

END OF SECTION

SECTION 02775 - PORTLAND CEMENT CONCRETE PAVING, SIDEWALKS, CURBS, AND GUTTERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide requirements for materials, fabrications and installation of:
 - 1. Concrete mix design.
 - 2. Formwork for paving walks, curbs and gutters.
 - 3. Reinforcement.

1.02 REFERENCES

- A. "Standard Details for Public Works Construction" September 1984 of the Department of Public Works, State of Hawaii, and its amendments, except as amended in the drawings and specifications herewith.
- B. "Standard Specifications for Public Works Construction", September 1986, of the Department of Public Works, State of Hawaii, except as amended in the drawings and specifications herewith.

1.03 SUBMITTALS

- A. Comply with provisions of Section 01330 – Submittal Procedures
- B. Submit product data for proprietary materials and items, admixtures, joint systems, curing compounds, dry-shake finish materials, and others.
- C. Submit design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- D. Submit laboratory test reports for evaluation of concrete materials and mix design tests.
- E. Provide material certificates in lieu of material laboratory test reports when permitted by Engineer.
 - 1. Provide material certificates signed by manufacturer and Contractor certifying that each material item complies with or exceeds requirements.
 - 2. Provide certification from admixture manufacturers that chloride content complies with requirements.

1.04 QUALITY ASSURANCE

- A. Comply with latest edition of the following standards and regulations:
 - 1. American Society for Testing and Materials (ASTM).
- B. Prevent damage to adjacent concrete curbs, walks, etc, during installation.
 - 1. Repair any damage to concrete edges or breaks in concrete at no cost to the Engineer, by removal and replacement of complete sections.
 - 2. Patching will not be acceptable.

1.05 SITE CONDITIONS

- A. Submit to the Project Manager in writing any discrepancy between existing conditions and the Contract Documents.
- B. Commencement of any part of the work shall constitute acceptance of existing site conditions as satisfactory.
- C. Traffic Control: Maintain access for vehicular and pedestrian traffic as required by Engineer or as shown on the plans.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide materials in accordance with "City Standard Specifications".
- B. Provide other materials not specified herein as specified in references.

2.02 SIDEWALK FORMS

- A. General: Provide forms of wood or steel, straight and of sufficient strength to resist springing during depositing and consolidating concrete, and of a height equal to the full depth of the finished sidewalk.
- B. Wood forms:
 - 1. Provide surfaced planks, 2-inch nominal thickness, and straight and free from warp, twist, loose knots, splits or other defects.
 - 2. Wood forms shall have a nominal length of 10 feet, with a minimum of 3 stakes per form, at maximum spacing of 4 feet.
 - 3. Corners, deep sections, and radius bends shall have additional stakes and braces, as required.
 - 4. Radius bends may be formed with 3/4-inch boards, laminated to the required thickness.
- C. Steel forms:
 - 1. Provide channel-formed sections with a flat top surface and with welded braces at each end and at not less than 2 intermediate points.
 - 2. Form ends shall be interlocked and self-aligning.
 - 3. Forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers.
 - 4. Forms shall have a nominal length of 10 feet, with a minimum of 2 welded stake pockets per form.
 - 5. Stake pins shall be solid steel rods with chamfered heads and pointed tips, designed for use with steel forms.

2.03 CURB AND GUTTER FORMS

- A. Conform to the requirements specified for sidewalk forms.
- B. Provide rigid forms for curb returns.
 - 1. Benders of thin plank forms may be used as follows:
 - a. For curb or curb returns with a radius of 10 feet or more.
 - b. Where grade changes occur in the return.
 - c. Where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used.
 - 2. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces and areas to receive sidewalks, curbs and gutters to establish acceptable conditions.
- B. Do not begin installation until defects have been corrected.

3.02 SUBGRADE PREPARATION

- A. Prepare and install subgrade in accordance with "City Standard Specifications" and as noted on drawings.
- B. Sidewalk Subgrade:
 - 1. Exterior slab-on-grade pedestrian walkways, entrance areas, and concrete curbs surrounding the building shall be underlain by at least 8 inches of select granular fill and concrete curbs shall be underlain by at least 6 inches of select granular fill placed on a compacted subgrade surface. Any existing fill in areas to receive slabs-on-grade shall be removed and recompact in accordance with the recommendations contained in the Compaction section of Section 02300 – Earthwork and Grading. In general, slabs should be provided with control joint at spacing of not more than 10 feet. The Structural Engineer shall determine slab reinforcement based on anticipated use and loading.
- B. Curb and Gutter Subgrade:
 - 1. Exterior slab-on-grade pedestrian walkways, entrance areas, and concrete curbs surrounding the building shall be underlain by at least 8 inches of select granular fill and concrete curbs shall be underlain by at least 6 inches of select granular fill placed on a compacted subgrade surface. Any existing fill in areas to receive slabs-on-grade shall be removed and recompact in accordance with the recommendations contained in the Compaction section of Section 02300 – Earthwork and Grading. In general, slabs should be provided with control joint at spacing of not more than 10 feet. The Structural Engineer shall determine slab reinforcement based on anticipated use and loading.
 - 2. Test subgrade for grade and cross section by means of a template extending the full width of the curb and gutter.
- C. Maintenance of Subgrade:

1. Maintain subgrade in a smooth, compacted condition, in conformity with the required section and established grade until the concrete is placed.
2. Prepare and protect subgrade so as to produce a subgrade free from frost and excessive moisture when the concrete is deposited.

3.03 FORM SETTING OF SIDEWALKS

- A. Set forms for sidewalks with the upper edge true to line and grade and held rigidly in place by stakes.
 1. After forms are set, check grade and alignment with a 10-foot straightedge.
 2. Forms shall conform to line and grade with an allowable tolerance of 1/4 inch in any 10-foot long section.
 3. Forms shall have a transverse slope with the low side adjacent to the roadway unless otherwise indicated on Drawings.
- B. Coat forms with form oil prior to each time concrete is placed. Wood forms may be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

3.04 FORM SETTING OF CURBS

- A. Set forms for curbs to alignment and grade conforming to the dimensions of the curb.
 1. Hold forms rigidly in place by the use of stakes; use clamps, spreaders, and braces where required to ensure rigidity.
 2. Retain forms on the front face of the curb for at least 2 hours but not more than 6 hours after the concrete has been placed.
 3. Forms at the back of curb shall remain in place until the face and top of the curb have been finished.
- B. Do not remove gutter forms while the concrete is sufficiently plastic to slump in any direction.
- C. Forms shall be cleaned and coated with form oil each time before concrete is placed.
- D. Wood forms may be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

3.05 PLACEMENT OF REINFORCING

- A. General: Comply with CSS Section 52 - Reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths long as practicable. Lap adjoining pieces at least 1 full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.06 CONCRETE PLACEMENT AND FINISHING OF SIDEWALKS

- A. Placement: Place concrete in forms in 1 layer or thickness to provide a compacted and finished

sidewalk of thickness indicated.

1. After concrete has been placed in forms, strike off using side forms to bring the surface to proper section to be compacted.
2. Tamp and consolidate concrete with a suitable wood or metal tamping bar.
3. Finished surface of the walk shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Irregularities exceeding the above shall be satisfactorily corrected.
4. The surface shall be divided into rectangular areas by means of contraction joints spaced at intervals equal to the width of the sidewalk or 5 feet, whichever is less.

B. Contraction Joints:

1. Form contraction joints in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness.
2. As an option, saw-cut a groove in the hardened concrete with a power-driven saw.
 - a. Sawn joints shall be constructed by sawing a groove in the concrete with a 1/8-inch blade to the depth indicated.
 - b. Provide an ample supply of saw blades on the job before concrete placement is started.
 - c. Have at least 2 standby sawing units in good working order available at the jobsite at all times during the sawing operation.

C. Surface Uniformity: Provide a completed surface uniform in color and free of surface blemishes and tool marks.

3.07 PLACEMENT AND FINISHING OF CURBS AND GUTTERS

- A. Place and thoroughly consolidate concrete by tamping and spading with approved mechanical vibrators.
- B. Concrete Finishing:
 1. Tool edges of the gutter and top of the curb with an edging tool to a radius of 1/2-inch.
 2. Float and finish surfaces with a smooth wood float until true to grade, section and uniform in texture.
 3. Brush floated surfaces with a fine-hair brush using longitudinal strokes.
- C. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. While still wet, brush the surface in the same manner as the gutter and curb top. Finish the top surface of gutter and entrance drive to grade with a wood float.
- D. Except at grade changes or curves, finished surfaces shall not vary more than 1/4 inch from the testing edge of 10-foot straightedge. Irregularities exceeding the above shall be satisfactorily corrected.
- E. Joints:
 1. Construct expansion joints and contraction joints at right angles to the line of curb and gutter.

2. Construct contraction joints by means of 1/8-inch thick separators, of a section conforming to the cross section of the curb and gutter.
 - a. Construct contraction joints directly opposite contraction joints in abutting concrete pavement.
 - b. Where curb and gutter do not abut concrete pavements, place contraction joints so that monolithic sections between curb returns will not be less than 5 feet or greater than 15 feet in length.
 - c. Remove separators as soon as practicable after concrete has set; preserve the width and shape of the joint.
3. Expansion Joints:
 - a. Form expansion joints by means of preformed expansion-joint filler material cut and shaped to the cross section of curb and gutter.
 - b. Provide expansion joints in curb at the end of each return.
 - c. Provide expansion joints in curb and gutter directly opposite expansion joints of abutting concrete pavement.
 - d. Provide expansion joints of the same type and thickness as joints in the pavement.
 - e. Where curb and gutter do not abut concrete pavement, provide expansion joints at least 1/2-inch in width at intervals not exceeding 120 feet.
 - f. Provide expansion joints in non-reinforced concrete gutter at location indicated.
 - g. Drainage Inlets: Construct curbs and gutters at drainage inlets in coordination with site drainage work.

3.08 CURB-FORMING MACHINES

- A. Curb-forming machines for constructing curb and gutter will be approved based on trial use on the job.
- B. Discontinue use of the equipment at any time during construction the equipment produces unsatisfactory results; the work shall continue as specified above.
- C. Remove unsatisfactory work and reconstruct for the full length between regularly scheduled joints.
- D. Removed portions shall be disposed of as directed.

3.9 CURING AND PROTECTION

- A. Cure exposed concrete surfaces by one of the following methods.
- B. Mat Method:
 1. Cover the entire exposed surface with 2 or more layers of burlap; mats shall overlap each other at least 6 inches.
 2. Prior to placing mats on concrete surface, thoroughly wet with water.
 3. Continuously keep mats in a saturated condition and in intimate contact with concrete for not less than 7 days.

C. Impervious Sheeting Method:

1. Wet the entire exposed surface with a fine spray of water and then cover with impervious sheeting material.
2. Lay sheets directly on the concrete surface and overlap 12 inches when a continuous sheet is not used.
3. Provide impervious sheeting at least 18 inches wider than the concrete surface to be cured.
4. Securely weight sheeting down with heavy wood planks, or by placing a bank of moist earth along edges and laps in the sheets.
5. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during curing.
6. The curing sheet shall remain on the concrete surface to be cured for not less than 7 days.

D. Membrane-Curing Method:

1. Cover the entire exposed surface with a membrane-forming curing compound.
2. Apply curing compounds in 2 coats by hand-operated pressure sprayers as recommended by manufacturer.
3. Apply an additional coat to all surfaces showing discontinuity, pinholes or other defects.
4. Concrete surfaces that are subjected to heavy rainfall within 3 hours after curing compound has been applied shall be resprayed.
5. Protect concrete surfaces to which membrane-curing compounds have been applied.
6. Any area covered with curing compound and damaged by subsequent construction operations within the 7-day curing period shall be resprayed.

3.10 BACKFILL

- A. After curing, remove debris; backfill, grade and compact the area adjoining the concrete to conform to the surrounding area in accordance with lines and grades indicated.

3.11 CLEANING AND PROTECTION:

- A. Protect completed concrete from damage until accepted.
- B. Repair damaged concrete and clean concrete discolored during construction.
 1. Concrete that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints.
 2. Refinishing the damaged portion will not be acceptable.
 3. Remove damaged portions and dispose of as directed.

END OF SECTION

SECTION 02780 – PAVEMENT MARKINGS

PART 1 – GENERAL

1.01 SUMMARY

- A. This section covers the requirements for furnishing and installing pavement striping and markings as shown on the drawings and as specified herein.
- B. Related Sections include the following:
 - 1. SECTION 01330 – Submittal Procedures.

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

- A. American National Standards Institute (ANSI)

ANSI D6.1 – Manual on Uniform Traffic Control Devices for Streets and Highways, 2009
- B. State of Hawaii, Department of Transportation, Highways Division (HDOT)

HDOT – Standard Specifications for Road, Bridge and Public Works Construction, 2005
- C. 2010 ADA Standard for Accessibility Design

ADAAG 502 Parking Spaces

1.03 SUBMITTALS

- A. Comply with provisions of Section 01330 – Submittal Procedures.
- B. Submit product data for materials, items, and others.
- C. Provide material certificates signed by manufacturer and Contractor certifying that each material item complies with or exceeds requirements.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Materials for Pavement Markings shall be in accordance with the below-listed sections of the State of Hawaii Department of Transportation HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION dated 2005 as revised, 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. HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION

- a. Pavement MarkingsSection 629
- b. Pavement Markings Materials.....Section 755

PART 3 – EXECUTION

3.01 INSTALLATION AND WORKMANSHIP

A. Installation for Pavement Markings shall be in accordance with the below-listed sections of the State of Hawaii Department of Transportation HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION dated 2005 as revised, 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. HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION

- a. Pavement MarkingsSection 629
- b. Pavement Markings Materials.....Section 755

END OF SECTION

SECTION 02785 – MISCELLANEOUS SIGNS

PART 1 – GENERAL

1.01 SUMMARY

- A. This section covers the requirements for furnishing and installing miscellaneous signs as shown on the drawings and as specified herein.
- B. Related Sections include the following:
 - 1. SECTION 01330 – Submittal Procedures.

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

- A. American National Standards Institute (ANSI)

ANSI D6.1 – Manual on Uniform Traffic Control Devices for Streets and Highways, 2009
- B. State of Hawaii, Department of Transportation, Highways Division (HDOT)

HDOT – Standard Specifications for Road, Bridge and Public Works Construction, 2005 as amended
- C. 2010 ADA Standard for Accessibility Design

ADAAG 502 Parking Spaces

1.03 SUBMITTALS

- A. Comply with provisions of Section 01330 – Submittal Procedures.
- B. Submit product data for materials, items, and others.
- C. Provide material certificates signed by manufacturer and Contractor certifying that each material item complies with or exceeds requirements.
- D. Shop Drawings: Submit shop drawings to be used for the fabrication and erection of the signs. Include plans, elevations, and large scale details of sign wording and lettering layout. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Materials for Miscellaneous Signs shall be in accordance with the below-listed sections of the State of Hawaii Department of Transportation HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION dated 2005 as revised, 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. HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION

- a. Traffic Control Regulatory, Warning, and Misc. SignsSection 631
- b. Traffic Control Sign and Marker Materials.....Section 750

B. Handicap (Physically Disabled) Sign: handicap (Physically disabled) sign, R7-8, shall be sheet aluminum, 1/8 inch thick, 12 by 18 inch size. Tow away sign, R7-20, shall be sheet aluminum, 1/8 inch thick, 12 by 6 inch size. Van accessible sign, R7-8A, shall be sheet aluminum 1/8 inch thick, 9 by 18 inch size. Provide messages and logo as indicated. Use stainless steel bolts, nuts and washers with neoprene gaskets between post and sign, and under bolt head on the sign surface.

PART 3 – EXECUTION

3.01 INSTALLATION AND WORKMANSHIP

A. Installation for Miscellaneous Signs shall be in accordance with the below-listed sections of the State of Hawaii Department of Transportation HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION dated 2005 as revised, 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. HAWAII STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION

- a. Traffic Control Regulatory, Warning, and Misc. SignsSection 631
- b. Traffic Control Sign and Marker Materials.....Section 750

END OF SECTION

SECTION 02920 - LAWNS AND GRASS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. Furnish all labor, materials, equipment and tools for grass planting as specified herein. Grass shall be planted in areas indicated on the plans and as listed below:
1. All existing grassed areas that are damaged by construction operations;
 2. Areas that are dug up for utility trenches;
 3. Areas from which existing structures are to be removed;
 4. Areas with "Contract Zone Limits" that are graded and covered with topsoil except areas designated for other plants; and
 5. All other areas within "Contract Zone Limits" that are indicated on the plans to be graded, whether with the addition of screened soil or not, such as slopes of banks, etc.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Grass shall be Common Bermuda (Cynodon dactylon). At the option of the Contractor, grass planting may be by seeds (plain seeding or by hydro-mulching) or by sprigs.
1. Grass seeds shall be fresh, hulled, and meet the following requirements:
 - Pure Seed 95.0% minimum
 - Crop Seed 1.0% maximum
 - Weed 0.5% maximum
 - Inert Material 5.0% maximum
 - Germination 85.0% minimum
 2. Grass seeds shall be delivered to the site in unopened, sealed containers, labeled with the brand name and per cent purity. Labeling shall indicate that the seeds passed a certified germination test no more than 12 months prior to use.
 3. Grass sprigs shall be healthy living runners and stolons, a minimum of 6 inches long with at least 3 nodes. After they are dug, they shall be covered and kept moist until planted.
- B. Fertilizer shall be pelleted and shall consist of the following percentages by weight of active ingredients:
1. For First Application:
 - Nitrogen 16%
 - Phosphate 16%
 - Potash 16%
 2. For Second Application:
 - Nitrogen 16%
 - Phosphate 16%
 - Potash 16%

C. Mulch Materials

1. Mulch shall be specially-processed fiber containing no growth or germination-inhibiting factors. It shall be such that any addition and agitation in the hydraulic equipment with seed, fertilizer, water and other additives not detrimental to plant growth, the fibers will form a homogeneous slurry. When hydraulically sprayed on the soil, the fibers shall form a blotter-like ground cover which readily absorbs water and allows infiltration to the underlying soil.
2. Stabilizing and water retaining agent for hydro-mulching option only shall be "Verdyol Super", "Ecology Control M-Binder" or approved equal. Rate of application of "Verdyol Super" shall be 50 lbs./acre and that for "Ecology Control M-Binder shall be 60 lbs./acre.

- D. Organic Soil Conditioners: Organic amendments shall be brown, gray, or black in color. It shall be free of live seeds, cuttings, fungus, spores and foul odor. It shall also not contain resins, tannin or other materials in quantities that would be detrimental to plant life.

Soil conditioner shall be one, or a combination of the following:

1. Redwood shavings shall be a nitrogen-stabilized compost of redwood material passing through a 1/2" screen.
 2. Peat Moss.
 3. Shredded hapuu shall be finely shredded hapuu fern.
 4. Macadamia nut husks shall be air-classified fine husk, sifted through a 1/4" screen and free of shells.
 5. Composted green waste shall be stabilized compost of recycled green waste material passing through a 1/2" screen. The material shall not contain any treated or painted woods.
- E. Screened soil for repair work shall be a fertile, friable soil of loamy character, and shall contain organic matter. It shall be obtained from well-drained arable land; be free from weeds, stone and debris; and shall pass a maximum 1/2" screen. Screened soil shall be capable of sustaining healthy plant life. See Paragraph 3.01.D.5. for application.

- F. Water shall be potable.

PART 3 - EXECUTION

3.01 INSTALLATION AND WORKMANSHIP

A. Site Preparation:

1. Placement of screened soil is specified under "Earthwork" Section. The Contractor shall accept the condition of the site prior to starting work.
2. Before soil conditioning and tilling is started, weeds and other obnoxious vegetation shall be removed by manual or chemical methods.
3. Soil Conditioning and Tilling: The Contractor shall notify the Project Manager one day before this work is to be done.
4. A 2" layer of organic soil conditioner shall be placed over all planting areas. The material shall then be roto-tilled a minimum of 2" into the existing soil until the latter is loose and fine textured. All rocks larger than 1" in diameter and all debris such as stumps, roots, wire, grade stakes and other rubbish that are turned up by tilling shall be removed. Tilling shall be omitted on slopes where watering is likely to wash the soil

away.

5. Leveling: Any undulations or irregularities in the surface resulting from tilling or other operations shall be leveled out before planting operations are begun.
- B. Planting: The Contractor shall notify the Project Manager one day before planting of grass.
1. Immediately prior to planting operations, all planting areas shall be cleared of weeds, debris, rocks over 1" in diameter and clumps of earth that will not break up.
 2. Option by Grass Seeding: If grass seeds are used, the following procedure shall be used (NOTE: Contractor should exercise caution in seeding slopes where seeds may be washed away):
 - a. The grass seeds shall be broadcast uniformly by hand or by sowing equipment at the rate of 100 lbs./acre. Half the seeds shall be sown with the sower moving in one direction and the remainder shall be sown at right angles to the first direction.
 - b. The surface shall then be raked to a smooth even plane while the seeds are simultaneously worked into the soil to a depth of about 1/2".
 - c. The surface shall then be smoothed and compacted by means of a culti-packer, roller or other similar equipment weighing 60 to 90 pounds per lineal foot of roller.
 - d. The planted area shall then be watered sufficiently to provide water penetration to a depth of at least 2" and shall then be kept moist until roots are established.
 3. Option by Grass Sprigging
 - a. Furrows shall be placed perpendicular to drainage aisles and parallel to contours on slopes and shall be spaced no more than 4" apart.
 - b. Fresh sprigs shall be planted in each furrow a maximum of 6" apart and covered with soil to a minimum depth of 2".
 - c. The surface shall then be smoothed and compacted by means of a culti-packer, roller or other similar equipment weighing 60 to 90 pounds per lineal foot of roller.
 - d. The planted areas shall be watered immediately after rolling in sufficient quantity to provide water penetration to a depth of at least 2" and shall then be kept moist until roots are established.
 - e. The area shall then be overseeded with annual rye grass seeds at the rate of 25 pounds per acre.
 4. Option by Hydro-Mulching of Grass Seed: This work shall consist of furnishing and applying hulled Bermuda seed, fertilizer, mulch and stabilizing and water retaining agent by hydro-mulching.
 - a. The seeds shall be applied at the rate of 100 lbs./acre minimum. Mulch shall be applied at a rate of 500 lbs./acre minimum (31 lbs. per 900 sq. ft.). In every application, complete and uniform coverage of the soil shall be attained.
 - b. First application of fertilizer shall be included with mulch and seed.
 - c. The hydro-mulch equipment shall be capable of mixing all the necessary ingredients to a uniform mixture and to apply the slurry to provide uniform

coverage. Seed, fertilizer, mulch mix and stabilizing water retaining agent shall be applied in one operation by hydraulic equipment made specifically for this use. The equipment shall have a built-in agitation system with an operating capacity sufficient to keep the mix in uniform distribution until pumped from the tank. Distribution and discharge lines shall be large enough to prevent stoppage and shall be equipped with hydraulic discharge spray nozzles which provide a uniform distribution of the slurry.

- d. Areas inaccessible to hydro-mulching application shall be seeded or hand sown and fertilized by approved hand methods.
 - e. Water shall be applied immediately following mulching and the planted area shall then be kept moist until roots are established.
- C. Application of Fertilizer: The Contractor shall notify the Project Manager one day before application of fertilizer.
- 1. Fertilizer shall be distributed uniformly over the planted area.
 - 2. The first application of fertilizer shall be applied at the rate of 300 pounds per acre about 2 weeks after grassing and shall be followed by watering. (First application of fertilizer if using hydro-mulching option shall be mixed with the seeded mulch.)
 - 3. The second application of fertilizer shall be applied at the rate of 300 pounds per acre about 1 week before the end of the maintenance period and shall be followed by watering.
- D. Maintenance:
- 1. General: The Contractor shall be responsible for the proper care of the grassed areas. Maintenance shall include watering, weeding, mowing, repairing, regrassing and protection, and shall be required until the entire project is accepted, but in any event for a period not less than 60 days after planting of grass.
 - 2. Watering: After planting of seeds or grass sprigs or mulching the ground shall be watered as deemed necessary by the Contractor to establish a healthy growth. Watering shall be done in a manner that will prevent erosion due to the application of excessive quantities of water, and the watering equipment shall be of a type that will prevent damage to the finished surface.
 - 3. Weeding: Weeds shall be uprooted and removed completely and in no case shall they be allowed to grow and propagate more seeds. Large holes caused by weeding shall be filled with screened soil and raked level.
 - 4. Mowing: Grass shall be mowed to a height of 1" whenever the height of grass becomes 1-1/2".
 - 5. Repairing and Regrassing: When any portion of the surface becomes gullied or otherwise damaged and grass has failed to grow, such areas shall be repaired with screened soil and replanted with grass. Any area of one foot square or more in which grass has failed to grow after 30 days of maintenance shall be regrassed.
 - 6. Protection: The grassed areas shall be protected against traffic so that the grass establishes a healthy growth. Grassed areas damaged by traffic shall be replanted.

3.02 ACCEPTANCE OF GRASSING

- A. At the time of acceptance, the grass shall have been well-established and shall be given a final weeding and a final mowing to a height of 1 inch. If the maintenance period has expired before acceptance of the entire project, the Contractor shall continue to maintain

the grass until acceptance of the entire project. If the maintenance period should extend beyond acceptance of the entire project, the Contractor shall continue to maintain the grass until the end of the specified period of time required for maintenance.

- B. At the end of the maintenance period, should there appear areas where grass has failed to grow, such areas shall be replanted with grass, refertilized and maintained beyond the maintenance period until a healthy growth is established.

END OF SECTION

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide all miscellaneous metal fabrication work, including but not limited to, the following:
 - 1. Metal Roof Access Ladder.
 - 2. Miscellaneous metal fabrications as indicated on the drawings or specified herein.
 - 3. Furnish miscellaneous steel attachments, anchors, plates, angles, etc. to be set in concrete.
 - 4. Include all anchors, angles, bolts, expansion shields for items in this section only, and other accessories shown in details and/or required for the complete installation of all work.

1.02 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Welders Certificates: Submit certification that welders employed for the work of this section have received AWS certification within the previous 12 months. All welds shall conform with the AWS D1.1 – Structural Welding Code.

1.03 SUBMITTALS

- A. Shop Drawings: Submit complete shop drawings of all miscellaneous metal work to the Project Manager for review before fabrication. Detail all members and connections not specifically shown but which are required to complete the work.
- B. Indicate welded connections using standard AWS A2.0 welding symbols.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Steel: Conforming to ASTM A 36.
- B. Structural Steel Tubing: ASTM A 500 or ASTM A 501.
- C. Miscellaneous Steel Bars and Shapes: ASTM A 108, A 575, A 663, or A 675 as applicable.
- D. Steel Pipe: ASTM A 53, Type E or S, Grade B.
- E. Bolts, Nuts, and Washers: ASTM A 307, Grade A. Hot-dip galvanize all hardware items in accordance with ASTM A 153.
- F. Expansion Shields: Lead, case hardened steel or non-ferrous metal for application.

- G. Toggle Bolts: Fed. Spec. FF-B-588, Tumble-wing type of class, style, and type as required; hot-dip galvanized in accordance with ASTM A 153, or otherwise treated for corrosion resistance.
- H. Shop Paint:
 - 1. Metal Prime Paint: Shop prime all welds after grounded smooth with rust inhibiting metal primer.
 - 2. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint and assure that primer conforms to all requirements specified in Section 09901 - PAINTING.
- I. Welding Materials: AWS D1.1, type required for materials being welded.

2.02 FABRICATION

- A. Workmanship:
 - 1. Use materials of size and thickness shown, or, if not shown, of required size and thickness to produce strength and durability in finished product. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.
 - 2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
 - 3. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
 - 4. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
- B. Galvanizing: Provide a zinc coating for those items shown or specified to be galvanized, as follows:
 - 1. ASTM A 153 for galvanizing iron and steel hardware.
 - 2. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier, and for galvanizing assembled steel products.
- C. Shop Painting:
 - 1. Shop paint miscellaneous steel metal work and galvanized surfaces, unless otherwise specified.
 - 2. Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions, and at a rate to provide uniform dry film thickness of 2.0 mils for each coat. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.
- D. Miscellaneous Framing and Supports:
 - 1. Provide miscellaneous steel framing and supports as required to complete work.
 - 2. Fabricate miscellaneous units to sizes, shapes and profiles shown or, if not shown, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars. Cut, drill and tap units to receive hardware and similar items.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
- B. Cutting, Fitting and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

3.02 MISCELLANEOUS METAL FABRICATIONS

- A. The following fabricated assemblies are described in brief outline to indicate, in addition to the drawings, the general design and details desired. Standard products of manufacturers specializing in similar work will be considered insofar as they fulfill the requirements and do not violate governing codes for building and standards for good construction work.
 - 1. Roof Access Ladder: Shall consist of steel channel rails, steel brackets, welded steel rungs and steel channel top landing as indicated on the drawings. All intersections shall be full welded and dressed smooth. Hot-dip galvanize after fabrication.
 - 2. Miscellaneous Metal Fabrications: Shall consist of steel components welded similar to metal guardrails, in sizes and arrangements as shown. Hot-dip galvanize after fabrication.

3.03 FABRICATION

- A. Fabrication shall be performed by skilled mechanics of the trade and in accordance with manufacturer's directions. Metal work shall be well formed to shape and size, with sharp lines and angles and true curves. Provide welding and bracing of adequate strength and durability, with tight, flush joints, dressed smooth and clean.
- B. Measurements: Before fabrication, take necessary field measurements and verify all measurements.
- C. Metal surfaces shall be clean and free from mill scale, flake rust and rust pitting; well formed and finished to shape and size, with sharp lines and angles and smooth surfaces. Shearing and punching shall leave clean true lines and surfaces. Welds shall be used and finished flush and smooth on surfaces that will be exposed after installation.
- D. Fastening: Provide the necessary rebates, lugs and brackets so that the work can be assembled in a neat, substantial manner. Holes for bolts shall be drilled.
- E. Welding of structural steel shapes and bar stock shall be in accordance with AWS D1.1.

3.04 ADJUST AND CLEAN

Touch-Up Painting: Immediately after erection, clean bolted connection and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07560 – FLUID APPLIED ROOFING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

Provide fluid applied roofing system where indicated on the drawings and as specified herein.

1.02 REFERENCES

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

A. American Society for Testing and Materials (ASTM)

ASTM B 117- Test Method of Salt Spray(Fog) Testing

ASTM D412 – Standard Test Method for Rubber Properties in Tension

ASTM D638 – Standard Test for Elongation

ASTM D1653 Water Vapor Transmission Materials.

ASTM D6083 – Standard Specification for Liquid Applied Acrylic Coatings used in Roofing.

ASTM D 7281- Test Method for Resistance to Water Migration through the membrane and seams.

ASTM E108 – Test Method for Fire Test of Roof Coverings.

ASTM E903 – Test Method for Hemispherical Spectral Reflectance.

ASTM E406 – Test Method for Total Emittance

ASTM G26 – Practice for Operating Light- and Water exposure Apparatus (Xenon Arc Type) for Exposure of Non-metallic Materials.

ASTM G29 – Test Methods for Algae Resistance.

FMRC 4470 – Class I Roof System

B. IBC – International Building Code, 2006 edition

1.04 GENERAL REQUIREMENT

A. System Description: Fluid applied flexible acrylic and polyester fabric reinforced waterproof coating system over concrete roof deck, walls, pedestals, etc., as indicated on the drawings and specified herein.

B. Applicator Qualifications: See 1.05, C.

C. The Contractor shall notify the local authorized representative of the manufacturer whose fluid applied flexible acrylic waterproof coating system he proposes to use and shall arrange for the latter to visit the site to inspect the existing concrete surfaces receiving the acrylic system before application, at least once during application and at job completion.

1.05 SUBMITTAL

- A. Shop Drawings: Provide the following details:
 - 1. Conditions of interface with other materials
- B. Manufacturer's Instruction: Submit manufacturer's installation instructions, and special precautions requirements.
- C. Contractors Certification: Submit a signed certificate from the proposed roofing manufacturer showing that the Contractor is an approved installer of the Manufacturer's Fluid Applied Waterproof Coating System and that the installation crew has been trained in the system's proper installation by the Manufacturer or Technical Representative of the Manufacturer.
- D. Technical Representative Certification: Submit a signed certificate from the Manufacturer designating its Technical Representative for the Project and attesting that this person is both qualified and authorized to act on behalf of the Manufacturer to address field decisions.
- E. Certificates: Submit certificates of compliance for materials specified.
- F. Product Data: Provide data for material description, physical properties, recommended storage conditions, shelf life, precautions, and joint crack sealants, with temperature range for application of waterproofing membrane.

1.06 PRODUCT HANDLING

- A. Delivery of Materials: All materials shall be delivered to the site in the original unbroken manufacturer's wrapping material and container's with the original label thereon intact.
 - 1. Name of manufacturer.
 - 2. Name of contents and products code.
 - 3. Net volume of contents.
 - 4. Lot or batch no.
 - 5. Storage temperature limits.
 - 6. Shelf life expiration date.
 - 7. Mixing instructions and proportions contents.
 - 8. Safety information and instructions.
- B. Storage of Materials at Job Site
 - 1. Store and protect materials from damage and weather in accordance with manufacturer's instructions.
 - 2. Storage materials at temperatures between 50 and 90 degrees F. Keep out of direct sunlight.

1.07 PROTECTION AND CLEANING

- A. Protection
 - 1. Any work or materials damaged during roofing installation shall be restored to their original (undamaged) condition or replaced.
 - 2. Protective coverings shall be installed necessary to prevent the marring of existing surfaces.

1.08 ENVIRONMENTAL COMPLIANCE

- A. Construction debris and wastewater (e.g., pressure washing, equipment/tools rinsing/cleaning, cleaning/rinsing of coating system brushes/rollers, etc.) shall not be allowed to enter the campus storm drains. As such, adequate storm drain protection (e.g., sand bags, silt fences, etc.) is required for all those construction projects located near storm drains (including buildings that have rain gutters located near storm drains).

PART 2 – PRODUCTS

2.01 FLUID APPLIED FLEXIBLE ACRYLIC ROOFING SYSTEM

- A. Manufacturer: Hydro-Stop Premium Coat System or pre-approved equal or better.
- B. Materials: Three-stage, fabric-reinforced, flexible acrylic roofing, liquid applied in successive stages to form one continuous, seamless watertight membrane, 40 mil minimums cured total system thickness; comprised of the following:
1. Foundation and Saturation Coats: Highly flexible water based 100% pure acrylic polymer resin coatings as recommended by acrylic coating manufacturer.
 2. Fabric: Polyester, non-woven, stitch bonded, and heat-set fabric.
 3. Finish Coat: Ultraviolet light resistant, blend of highly flexible water based 100% pure acrylic polymer resin coating; color as selected from manufacturer's standard colors.
- C. Reinforcing Fabric: This material shall be non-woven stitch-bonded, and heat-set fabric.
1. Weight: 3 oz. Per square yard
 2. Tensile strength: 57.1 lbs. PSI per ASTM 1682
 3. Elongation: 61.65% per ASTM D1682
 4. Mulein Burst: 176.8 lbs. Per ASTM 3786
 5. Trapezoid: 16.1 lbs. Per ASTM D117
- D. Cured Membrane Characteristic
- | <u>Property</u> | <u>Test</u> | <u>Result</u> |
|------------------------------------|-------------|---|
| Susceptability to Leakage | FM4470 | Passes test including air pressure test |
| Algae Resistance | ASTM G29 | No growth supported |
| Cured System Tensile Strength | ASTM D412 | > 2200 PSI |
| Elongation of Base Coat System | ASTM D638 | > 53% |
| Elongation of Finish Coat | ASTM D638 | > 300% |
| Resistance to Water Migration | ASTM D7281 | Passed test |
| Fire Rating | ASTM E108 | Class A |
| Emittance | ASTM E406 | 94% |
| Hemispherical Spectral Reflectance | ASTM E906 | 78.1% |
| Moisture Vapor | ASTM D1653 | 3 Perms |
| Salt Spray Test | ASTM B117 | No Effect |
| Severe Hail Test | FM 4470 | No Separation or rupture |
| Volume Solids | ASTM G26 | No effect after 300 hrs. |
| Weight Solids | ASTM D6083 | > 65% |
| Foot Traffic | FM 4470 | Passed test |
- E. Waterproof Coating System shall meet or exceed the Standard Factory Mutual Class I 4470 test for roofing membranes with direct application of the reinforced coating and fabric to the concrete structure.
- F. Accessories
1. Surface Primer: Cementitious waterproofing sealer for structural concrete.

2. Mildewcide - Shall be equally integrated in all layers.
3. Pitch Pocket Curb: "Chem Curb", "Weather-Tite", or pre-approved equal.
4. Pourable Sealant: As recommended and approved by the roofing manufacturer.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Coordinate work with that of other trades to ensure that components which are to be incorporated into the roofing system, are available to prevent delays or interruptions as the work progresses. Verify existing conditions in advance.
- B. Examine substrates to which the fluid applied roofing system is to be applied to ensure that their condition is satisfactory for its application. Substrates shall be dry and free of oil, dirt, grease, sharp edges, and debris. Inspect substrate, and correct defects before application.

3.02 SPECIAL PRECAUTIONS

- A. Do not apply waterproofing to surfaces unacceptable to manufacturer.
- B. Do not allow contact between various materials through application equipment. Do not use equipment containing the remains of previous material.
- C. Require workmen and others who walk on the membrane to wear clean, soft-soled shoes to avoid damage to materials.

3.03 PREPARATION

- A. Protect adjacent surfaces not designated to receive Roofing system.
- B. Clean and prepare surfaces to receive roofing system by removing all loose and flaking particles, grease and laitance.
- C. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer.

3.04 APPLICATION

- A. Mix cementitious primer slurry and apply over masonry surface at a coverage rate of 200 sq. ft/gal. Or in accordance with manufacturer's instructions.
- B. Apply foundation and saturation coats at a total coverage rate of 4.0 sq. ft/gal or per manufacturer's instructions.
- C. Apply foundation coat to the prepared area embed fabric directly into the coating while still wet. Overlap adjacent runs of fabric 4 inches minimum. Immediately follow with saturation coat to cover fabric and allow to dry.
- D. Using 12" flashing fabric, continue roofing material up vertical surface 6 inches in each direction.
- E. Apply 2 coats of finish coat at a combined total rate of 70 sq. ft/gal or per manufacturer's instructions over entire horizontal area being treated.
- F. Apply roofing system to a total thickness of 40 mils total cured thickness.

- G. Temporarily remove existing electrical conduits mechanical piping and equipment as necessary to clear the area for roofing system, reinstall upon completion.

3.05 INSTALLATION OF ADJOINING WORK

Unless otherwise shown on the plans, all adjoining work shall be done in accordance with the specifications and details of the manufacturer of the assembly being used. The Contractor shall coordinate the installation and any work that require tying-in with the roofing so that the combined installation is leak proof.

3.06 CLEANING

Immediately clean roofing system from unscheduled surfaces in accordance with the manufacturer's recommendations.

END OF SECTION

SECTION 07900 – SEALANTS

PART 1 – GENERAL

1.01 SUMMARY

Except as otherwise indicated, sealants shall be provided to establish and maintain airtight, soundtight, and weatherproof continuous seals on a permanent basis within recognized limitations of wear and aging for each application and type of sealant material. Provide at all joint locations where weather penetration is possible, where a weather-tight installation is required, and where indicated or required to finish the installation of two or more adjoining materials.

1.02 SUBMITTALS

- A. **Certificates of Compliance:** Submit certificates from the manufacturers attesting that materials meet the specified requirements.
- B. **Manufacturers' Descriptive Data:** Submit complete descriptive data for each type of material. Clearly mark data to indicate the type the Contractor intends to provide. Data shall state conformance to specified requirements. Data for sealant and caulking shall include application instructions, shelf life, mixing instructions for multicomponent sealants, and recommended cleaning solvents.
- C. **Colors:** Submit one sample of each color for each sealant and caulking type to verify that products match the adjacent finish colors. Where colors are not indicated, submit not less than 3 different samples of manufacturers' standard colors for selection.

1.03 DELIVERY AND STORAGE

Deliver materials to the job site in the manufacturers' external shipping containers, unopened, with brand names, date of manufacture, color, and material designation clearly marked thereon. Containers of elastomeric sealant shall be labeled as to type, class, grade, and use. Carefully handle and store all materials to prevent inclusion of foreign materials.

1.04 WARRANTY

The Contractor shall execute to the State of Hawaii a 2-year written warranty after the Project Acceptance Date that the installation will be watertight and that any leaks which develop during that period which are not due to improper use or willful damage will be repaired at no cost to the State. The guaranty shall provide the following at no cost to the State:

1. Repair of sealants as necessary to seal leaks which are attributable to faulty materials and/or workmanship;
2. Repair or replacement of damage to the building and/or its finishes, equipment and/or furniture when occasioned by such leaks.

PART 2 – PRODUCTS

2.01 MATERIALS

Products shall conform to the reference documents listed for each use. Color of sealant and caulking shall match adjacent surface color unless specified otherwise. For ASTM C 920 sealants, use a sealant that has been tested on the type(s) of substrate to which it will be applied.

- A. Interior Sealants: ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT. For use to seal general building construction joints, windows, doors, etc.
- B. Exterior Sealants: For joints in vertical surfaces, provide ASTM C 290, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C 920, Type S or M, Grade P, Class 25, Use T. For use to seal general building construction joints, windows, doors, etc.
- C. Floor Joint Sealant: ASTM C 920, Type S or M, Grade P, Class 25, Use T. Color of sealant shall be as selected.
- D. Acoustical Sealant: ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT. For use in acoustical conditions where sound transmission is critical.
- E. Sanitary Sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT, G and A. For use around plumbing fixtures and areas of high moisture. Single component acetoxy silicone sealant.
- F. Primer for Sealants: Provide non-staining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.
- G. Bond Breakers: Provide type and consistency recommended by the sealant manufacturer for the particular application.
- H. Backstops: Provide glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by the sealant manufacturer. Backstop material shall be compatible with the sealant. Do not use oakum and other types of absorptive materials as backstops.
- J. Cleaning Solvents: Provide types recommended by the sealant manufacturer.

PART 3 – EXECUTION

3.01 SURFACE PREPARATION

Surfaces shall be clean, dry to the touch, and free from moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Where adequate grooves have not been provided, clean out grooves to a depth of ½ inch without damage to the adjoining work. No grinding shall be required on metal surfaces.

3.02 SEALANT PREPARATION

Do not modify the sealant by addition of liquids, solvents, or powders. Mix multicomponent elastomeric sealants in accordance with manufacturer's printed instructions.

3.03 APPLICATION

- A. Elastomeric Sealant Installation Standard: Comply with the requirements of ASTM C 962 for the use of joint sealants as applicable to the materials, applications, and conditions required.
- B. Backstops: Install backstops dry and free from tears or holes. Tightly pack the back or bottom of joint cavities with backstop materials to provide a joint of the depth as recommended by the sealant manufacturer.
- C. 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.

- D. Bond Breaker: Provide bond breakers to the back or bottom of joint cavities, as recommended by the sealant manufacturer for each type of joint and sealant used to prevent sealant from adhering to these surfaces. Carefully apply the bond breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond breaker.
- E. Sealants: Provide sealant compatible with the material to which it is applied. Do not use a compound that has exceeded its shelf life or has become too gelled to be discharged in a continuous flow from the gun. Apply the compound in accordance with the manufacturer's instructions with a gun having a nozzle that fits the joint width. Force sealant into joints to fill the joints solidly without pockets. Sealants shall be uniformly smooth and free from wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply sealant, and tool smooth as specified.
- F. Sealants in Acoustical Application: Comply with the requirements of ASTM C 919 to reduce the sound transmission characteristics of interior walls, ceilings, and floors by proper application of sealants to joints, voids and penetrations.

3.04 **PROTECTION AND CLEANING**

- A. Protection: Protect areas adjacent to joints from compound smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.
- B. Cleaning: Immediately scrape off fresh compound that has been smeared on masonry and rub clean with a solvent as recommended by the compound manufacturer. Upon completion of compound application, remove all remaining smears and stains resulting therefrom and leave the work in a clean and neat condition.

END OF SECTION

DIVISION 9 – FINISHES

SECTION 09901 - PAINTING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes surface preparation and field painting of new and or repaired exterior and interior 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. The Project Manager will select the colors from standard colors and finishes available.
 - 1. Interior and Exterior surfaces scheduled to be finished.

 - 2. Non Ferrous metals, plated or factory finished items specifically noted to be painted or when such items occur as accessories and appurtenance to surfaces required to be painted.

 - 3. Pipes, conduit, ducts, support apparatus and other exposed items in areas to be painted or where painted.

- 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. Stone Masonry and masonry scheduled to receive water repellant coatings.

 - 3. Structural steel and metal elements designated to receive sprayed fireproofing unless such finishes have been UL tested with the designated assembly and are approved by the fireproofing manufacturer.

 - 4. Finish hardware, unless prime coated.

 - 5. Glass, plastic laminate, and ceramic tile.

 - 6. Acoustical ceilings, unless scheduled to be painted.

 - 7. Integrally colored plaster or EIFS systems.

 - 8. Flooring and floor coverings.

 - 9. Plumbing and lighting fixtures, and electrical device plates.

 - 10. Movable furniture such as portable bookshelves, cubicles and cabinets.

- D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:

- a) Metal, phenolic, or plastic toilet enclosures.
 - b) Elevator entrance doors and frames.
 - c) Elevator equipment.
 - d) Light fixtures.
2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
- a) Foundation spaces.
 - b) Furred areas.
 - c) Ceiling plenums.
 - d) Pipe spaces.
 - e) Elevator shafts.
3. Finished metal surfaces include the following:
- a) Anodized aluminum.
 - b) Stainless steel.
 - c) Chromium plate.
 - d) Copper and copper alloys.
 - e) Bronze and brass.
4. Operating parts include moving parts of operating equipment.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.02 RELATED SECTIONS

- A. Section 02580 – PAVEMENT MARKINGS for traffic marking paint.
- B. Section 08100 – METAL DOORS AND FRAMES for factory priming steel doors and frames.

1.03 REFERENCES

- A. ASTM D16 - Definition of terms relating to Paint, Varnish, Lacquer and Related Products.
- B. ASTM D2016 - Test Method for Moisture Content of Wood.
- C. MPI (Master Painter's Institute) - Approved Product List.
- D. PCDA (Painting and Decorating Contractors of America - Painting - Architectural Specification Manual.
- E. PCA (Portland Cement Association) - Painting Concrete.
- F. SSPC (Steel Structures Painting Council - Steel Structures Painting Manual)

1.04 DEFINITIONS

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

1.05 SUBMITTALS

- A. Product Data:
 1. Materials List: Provide an inclusive list of required patching and coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - a. For products with premixed colors, provide manufacturer's standard color chips for selection by Project Manager.

2. Manufacturer's Information: Provide data on all listed materials, including:
 - a. Thinning and mixing instructions
 - b. Application instructions and required mil film thicknesses.
 - c. Manufacturer's Material Safety Data Sheets.

- B. Certifications: Provide a letter certifying paints and coatings are free of asbestos, lead, zinc-chromate, strontium chromate, cadmium, mercury, and other EPA regulated and hazardous materials. Provide a letter certifying the amounts of mildewcide added by both the paint manufacturer and paint supplier.

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

- D. Schedule of Operations: Provide a work schedule showing sequence of operation and installation dates.

- E. Samples:
 1. It is the intent for all painting required in the section to match the existing adjoining painted surfaces as close as possible in color and finish. Therefore, samples shall not be required.

- F. Manufacturer's Instructions: Indicate special surface preparation procedures, and substrate conditions requiring special attention. Refer to Section 3.01.

1.06 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: All block fillers and primers for each coating system shall be from the same manufacturer as the finish coats or as approved by the manufacturer for use with the finish coats.

1.07 REGULATORY REQUIREMENTS

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

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's brand name and lot number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions and coverage.
 7. Color name and number.
 8. VOC content.

B. Storage

1. **Non-flammable Materials:** Store materials not in use in tightly covered containers in a well-ventilated area. Maintain storage containers in a clean condition, free of foreign materials and residue.
2. **Flammable Materials:**
 - a. Store in such a manner as to prevent damage. No paint material, empty cans, paint brushes and rollers may be stored in the building(s). Store these items in separate storage facilities away from the building(s). Contractor may furnish a separate job site storage structure, if the structure complies with the requirements of the local Fire Department. Keep the storage area shall clean. Lock any storage structures when not in use or when no visual supervision is possible.
 - b. All rejected materials shall be removed from the job site immediately.

1.09 PROJECT CONDITIONS

- A. Do not apply materials when surfaces and ambient temperatures are outside the ranges required by the paint product manufacturer. Do not apply exterior coatings during rain or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- B. Protect public and tenants from injury. Provided, erect and maintain safety barricades around scaffolds, hoists and where constriction operations create hazardous conditions.
- C. Completed Work: Provide necessary protection for wet paint surfaces.
- D. Protective Covering and Enclosures: Provide and install clean sanitary drop cloth or plastic sheets to protect furniture, equipment, floor and other areas that are not scheduled for treatment. Remove any paint applied to surfaces not scheduled for treatment.
- E. Fire Safety: Contractor and its employees shall not smoke in the vicinity of the paint storage area. Exercise precautions against fire at all times and remove waste rags, plastic (polyester sheets), empty cans, etc. from the site at the end of each day.
- F. Safeguarding Property: Safeguard the work and also the property of the State and other individuals in the vicinity of Contractor's work. Make good on any damages and for losses to work or property caused by Contractor or its employee's negligence. Where damaged property cannot be cleaned and restored to its original condition (i.e. prior to being damaged) replace it with a new product of equal quality. No prorating or use of "used" products will be permitted.

1.10 WARRANTY

Provide a two year guarantee that the work performed under this section conforms to the contract requirements and is free of any defect of material or workmanship.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS, GENERAL

- A. **Material Compatibility:** Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. **Mildewcide**

1. Except for metal primers, provide primer and finish coats with suitable chemical mildewcide to the maximum amount of mildewcide per gallon of paint permitted by the mildewcide manufacturer without adversely affecting the quality of the paint, but not less than one ounce per gallon.
- C. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
1. Proprietary Names: Use of manufacturer's proprietary product names in the Paint Systems Schedule in Part 3 below to designate colors or materials, is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed products to be used.
 2. Equivalency: Equivalent products to the specified products are listed in the Master Painter's Institute's "Architectural Painting Specification Manual."
 3. Substitution: Requests for substitution of a product or product if a manufacturer is not on the "Approved Product List" will be evaluated for equivalency based on product test results per the test criteria of the Master Painter's Institute.
- D. Colors: Paint colors shall match the existing as close as possible.
- E. EPA Regulated and Hazard Materials: Do not use paint or paint products containing lead, mercury, zinc chromates, strontium-chromate, cadmium, crystalline silica, or the EPA regulated or hazard materials.

2.02 MISCELLANEOUS MATERIALS

- A. Provide patching and repair materials. Compatible with paint finishes and substrates. Use weather resistant materials for exterior surfaces and surfaces exposed to moisture.
- B. Accessories
1. General: Provide other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
 2. Thinners: Thinning of paint shall be done using material recommended by the manufacturer. Mix proprietary products according to manufacturer's requirements. Do not use compound thinner, mineral oil, kerosene, refined linseed oil, or gasoline for thinning.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - a) Ensure that concrete and masonry surfaces are cured and dried to meet paint manufacturer's recommendations.
 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify Project Manager about anticipated problems when using the materials specified over substrates primed by others.

3.02 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove dust, oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and re-prime.
- D. Surface Preparation Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - 1. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - 2. Determine alkalinity and moisture content of surfaces by performing appropriate tests. Submit test results to Project Manager.
 - a. Prior to painting, concrete and masonry surfaces shall be allowed to cure and dry in accordance with the paint manufacturer's instructions and recommendations.
 - b. Efflorescence and laitance shall be removed from the surface.
 - c. Prior to paint application, interior and exterior concrete and masonry (including grout joints) scheduled to receive paint shall be tested to determine the alkalinity level of the surface. Testing shall be performed in strict accordance with the test kit manufacturer's instructions. Submit test results to the Project Manager.
 - d. Where the alkalinity level exceeds the pH level limit of the primer take one of the following three remedies at no additional cost to the State:
 - 1) If new concrete or masonry, wait until alkaline level has dropped below the limit.
 - 2) Substitute a primer that is able to resist the measured alkalinity and that is compatible with the paint finish. Alkyd based primers and top-coats or epoxy ester primers shall not be used. Submit the substitute primer to the Project Manager for review.

- 3) Neutralize the surface in accordance with the primer manufacturer's instructions to reduce the alkaline level. However, acid washing is not permitted where the surface has been finished with a cementitious coating.
- E. Surface Preparation Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth, ease all edges, and dust off.
 - F. Surface Preparation Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
 - G. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.
 - H. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.03 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
 1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only unless otherwise noted.
 6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 7. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 8. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.

9. Sand lightly between each succeeding enamel or varnish coat.
 10. 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.
- C. Application Procedures: Apply paints and coatings by brush or roller only.
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.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- 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. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.04 FIELD QUALITY CONTROL TESTING

- A. Inspection and Approvals: If required by the Project Manager, obtain written approval upon completion of each phase of work (phases of work are: surface preparation and spot prime, prime, first finish coat, second finish coat) before proceeding into the next phase or work. For any particular area of work that deviates from the submitted work schedule, notify the Project Manager one day (24 hours minimum) in advance when completing any phase of work. Provide access to areas to be inspected.
1. Failure to obtain approval of any phase of work for a work area may result in redoing the operation at no cost to the State.
 2. Right of Rejection: Non conforming work will be rejected by the Project Manager. Remove rejected material from the job site immediately. Redo rejected work at no cost to the State.
- B. Thickness Testing: The Project Manager may require all paints and their applied thickness tested to determine compliance with the Contract Documents. The State will select a laboratory, and the cost of testing shall be borne by the Contractor.
1. Where the required paint thickness is deficient, provide additional coats to the affected surface(s) to meet the required paint thickness.
- C. Moisture Testing: Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum Wallboard: 12 percent.
 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
- D. Alkalinity Testing: Measure pH Level of surface to be painted. Notify Project Manager if alkalinity level is below the maximum permitted by the paint or primer manufacturer.
1. Tests shall be paid by Contractor.
 2. Test schedule: One test for thickness and one test for adhesion for each exterior Minimum Painting Work area.
 3. Tests shall be paid by Contractor and shall be performed by testing agency selected by Contractor.
- E. Adhesion Testing:
1. Provide adhesion testing per ASTM D3759 Test B (x scratch peel test):
 - a. Test after each scheduled paint coat.
 - b. Should test fail, remove paint, prepare surface, then recoat and test again.
 2. Testing shall be performed by a NACE certified inspector selected by the State. The cost of testing shall be borne by the Contractor.
- F. Manufacturer's Field Services: The Painting Contractor shall be responsible to assure the presence of a qualified Technical Representative (approved by a responsible officer of the Material Manufacturer) at the job site prior to starting of the work and as require while the work is in progress. The Technical Representative shall provide assistance to the Painting Contractor in physical demonstrations on the use of the materials and methods or techniques required to accomplish all of the work as specified herein.
1. A minimum two (2) visits will be required. The Technical Representative shall submit a detailed report simultaneously to the Project Manager and a Responsible Officer of the Painting Contractor and not to the on-site project manager or foremen. This report shall contain in detail the findings, conclusions and recommendations and shall be submitted during each visit. It is the intent of this provision to ensure that the

on-site project manager or foreman does not have supervisory rights over the Technical Representative.

3.05 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.06 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Project Manager.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.07 EXTERIOR PAINT SCHEDULE

- A. Concrete Unit Masonry, Concrete: Provide the following finish systems over exterior concrete unit masonry and concrete:
 - 1. Latex Semigloss Paint, MPI EXT 4.2A-G5
 - a. Block Filler: Concrete unit masonry block filler: MPI #4.
 - b. Intermediate and Topcoats: Exterior latex paint. MPI #11
 - c. Finish Coat Gloss Level: semi-gloss, or to match existing.
- B. Galvanized Steel: Provide the following finish systems over exterior galvanized steel surfaces:
 - 1. Waterborne Light Industrial Coating MPI EXT 5.4G-G5
 - a. Pretreatment: Solvent clean in accordance to SPC SP1
 - b. Primer: MPI #95
 - c. Intermediate and Topcoat: MPI #163
 - d. Finish Coat Gloss Level: semi-gloss

3.08 INTERIOR PAINT SCHEDULE

- A. Concrete Unit Masonry, Concrete: Provide the following finish systems over interior concrete masonry and concrete:
 - 1. High Performance Architectural Latex, MPI INT 4.2D-G5
 - a. Block Filler: Concrete unit masonry block filler MPI #4.
 - b. Intermediate and Topcoats: MPI #141.
 - c. Finish Coat Gloss Level: semi-gloss or to match existing.

- B. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
 - 1. Latex Finish: Two finish coats over a primer.
 - a. Primer: Interior zinc-coated metal primer. MPI #134.
 - b. Intermediate and Finish Coats: Interior latex paint. MPI #54.
 - c. Finish Coat Gloss Level: semi-gloss or to match existing wall finish.
- C. Gypsum Wallboard: Provide the following finish systems over gypsum wallboard:
 - 1. Latex Finish: Two finish coats over a primer.
 - a. Primer: Interior latex primer sealer. MPI #50
 - b. Intermediate and Finish Coats: Interior latex paint. MPI #54.
 - c. Finish Coat Gloss Level: semi-gloss or to match existing.

END OF SECTION

DIVISION 10 - SPECIALTIES

SECTION 10990 - MISCELLANEOUS SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide all labor, materials, equipment, tools, etc. for installation of miscellaneous specialties as indicated on the drawings and/or specified herein.

1.02 GENERAL REQUIREMENTS

Provide all specialty items as shown on the drawings, including, but not limited to, the following:

1. Electric Vehicle Charging Stations.

1.03 SUBMITTALS

- A. Submit six (6) sets of Charging Station product data and shop drawings indicating installation details.

PART 2 - PRODUCTS

2.01 ELECTRIC VEHICLE CHARGING STATIONS

- A. Furnish and install electric vehicle charging station, Model CT4021-GW1 as manufactured by ChargePoint, Inc. or preapprove equal or better. Charging station shall have the following minimum and optional features:
 1. Level 2, commercial, dual bollard, gateway EV charging station.
 2. 8' high bollard with graphics on front and back indicating "EV CHARGING ONLY".
 3. Power management option, CT4000-PMGMT, power share kit.
 4. Bollard Mounting Kit, CT40001-CCM.
 5. Power: Dual Port, AC 208/240VAC, 40A.
 6. Optional ChargePoint Activation and InstallValid.
 7. 5-year Assure Warranty

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install Electric Vehicle Charging Station in strict accordance with manufacturer's printed instructions and/or approved shop drawings. Install complete and fully operational.

END OF SECTION

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13650 - PHOTOVOLTAIC ENERGY EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

- A. Engineer, furnish and install 75kW DC solar renewable energy system, complete, operational and connected to the MECO grid system.
- B. Contractor shall prepare all documentation and submittals to apply for Interconnection Agreement with MECO.
- C. Contractor shall submit and obtain all required County Permits with regards to the work of this PV system.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. A.
- B. Section 16010 - General Electrical Provisions shall also apply. In general, this section describes quality assurance, submittals, testing and guarantees. Special conditions modifying these items, when required, shall be included hereinafter.

1.03 SUMMARY

- A. Section Includes:
 - 1. PV laminates (cells laminated into rigid sheets, with connecting cables).
 - 2. PV modules (laminates in mounting frames).
 - 3. Charge controllers.
 - 4. Inverters.
 - 5. Mounting structures.

1.04 DEFINITIONS

- A. CEC: California Energy Commission.
- B. ETFE: Ethylene tetrafluoroethylene.
- C. FEP: Fluorinated ethylene propylene.
- D. IP Code: Required ingress protection to comply with IEC 60529.
- E. MPPT: Maximum power point tracking.
- F. PTC: USA standard conditions for PV.
- G. PV: Photovoltaic.
- H. STC: Standard Test Conditions defined in IEC 61215.

1.05 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for PV panels.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For PV modules.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Detail fabrication and assembly.
 - 4. Include diagrams for power, signal, and control wiring.

1.06 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample Warranty: For manufacturer's special materials and workmanship warranty and minimum power output warranty.

1.07 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For PV modules to include in operation and maintenance manuals.

1.08 WARRANTY

- A. Manufacturer's Special Materials and Workmanship Warranty: Manufacturer agrees to repair or replace components of PV modules that fail in materials or workmanship within specified warranty period.
 - 1. Manufacturer's materials and workmanship warranties include, but are not limited to, the following:
 - a. Faulty operation of PV modules.
 - 2. Warranty Period: Five (5) years from date of Substantial Completion.
- B. Manufacturer's Special Minimum Power Output Warranty: Manufacturer agrees to repair or replace components of PV modules that fail to exhibit the minimum power output within specified warranty period. Special warranty, applying to modules only, applies to materials only, on a prorated basis, for period specified.
 - 1. Manufacturer's minimum power output warranties include, but are not limited to, the following warranty periods, from date of Substantial Completion:
 - 2. Specified minimum power output to 80 percent or more, for a period of 25 years.

PART 2 – PRODUCTS

2.01 MANUFACTURED UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Project Development Study or comparable product by one of the following:

1. Sanyo North America Corporation.
2. Sharp Electronics Corporation.
3. SunPower Corporation.
4. Coenergy.
5. Approved equals.

2.02 PERFORMANCE REQUIREMENTS

- A. NRTL (Nationally Recognized Testing Laboratory) Listing: Entire assembly shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for electrical and fire safety, according to UL 1703.
- B. FM approved for NFPA 70, Class 1, Division 2, Group C and Group D hazardous locations.

2.03 SYSTEM DESCRIPTION

- A. Grid-Tied PV System:
 1. Connected via a utility meter to the electrical utility.
 2. An array of solar photovoltaic modules to generate a total nominal system size of 75 Kilo-Watts (kW) DC.
 3. System Components:
 - a. Cell materials.
 - b. PV modules.
 - c. Array frame.
 - d. Charge controller.
 - e. Inverter.
 - f. Overcurrent protection/combiner box.
 - g. Mounting structure.
 - h. Utility meter.

2.04 MANUFACTURED UNITS

- A. Cell Materials: Amorphous silicon (a-Si).
- B. Cell Materials: Copper indium (di)selenide (CIS).
- C. Cell Materials: Copper indium gallium (di)selenide (CIGS).
- D. Cell Materials: Cadmium telluride (CdTe).
- E. Cell Materials: Cadmium sulfide.
- F. Cell Materials: Polycrystalline or Monocrystalline.
 1. c-Si.
 2. Gallium arsenide (GaAs).
- G. Module Construction:
 1. Nominal Size: 32 inches (800 mm) wide by 64 inches (1600 mm) long.
 2. Weight: 42.8 lb (19.4 kg).

- H. Encapsulant: Ethyl vinyl acetate.
- I. Front Panel: Fully tempered glass.
- J. Bypass Diode Protection: Internal.
- K. Junction Box:
 - 1. Fully potted, vandal resistant.
 - 2. IP Code: IP65.
 - 3. Flammability Test: UL 1703.
- L. Output Cabling:
 - 1. 12 AWG.
 - 2. Quick, multiconnect, polarized connectors.
- M. Series Fuse Rating: 15 or 20 amperes.

2.05 CAPACITIES AND CHARACTERISTICS

- A. Minimum Electrical Characteristics:
 - 1. Rated Open Circuit Voltage (V_{oc}): 53 V.
 - 2. Maximum System Voltage: 600 V.
 - 3. Maximum Power at Voltage (V_{pm}): 43.3 V.
 - 4. Short-Circuit Temperature Coefficient: 1.98 mA/deg C.
 - 5. Rated Short-Circuit Current (I_{sc}): 5.66 A.
 - 6. Rated Operation Current (I_{mp}): 5.21 A.
 - 7. Maximum Power at STC (P_{max}): 225 W.
- B. Additional Electrical Characteristics:
 - 1. PTC Rating: 209.1 W.
 - 2. Series Fuse Rating: 15 A.
 - 3. Module Efficiency: 17.8%.
- C. Normal Operating Temperature Characteristics (NOTC):
 - 1. Temperature at Nominal Operating Cell Temperature: 46 deg C.
 - 2. Temperature Coefficient (NOTC P_{max}): -0.336%/deg C.
 - 3. Temperature Coefficient (NOTC V_{oc}): -0.147%/deg C.
 - 4. Temperature Coefficient (NOTC I_{sc}): 1.98mA/deg C.

2.06 MODULE FRAMING

- A. PV laminates mounted in anodized extruded-aluminum frames.

1. Entire assembly UL listed for electrical and fire safety, [Class C, according to UL 1703, complying with IEC 61215.
2. Frame strength exceeding requirements of certifying agencies in subparagraph above.
3. Finish: Anodized aluminum.
 - a. Alloy and temper recommended by framing manufacturer for strength, corrosion resistance, and application of required finish.
 - b. Color: As indicated by manufacturer's designations.

2.07 ARRAY CONSTRUCTION

- A. Framing:
 1. Material: Extruded aluminum.
 2. Maximum System Weight: Less than 4 lb/sq. ft. (19.53 kg/sq. m).
 3. Raceway Cover Plates: Aluminum.
- B. Standing Roof Mounting:
 1. No roof penetrations, S-5! brackets fastened to existing standing seams with stainless steel fasteners, or pre-approved equal or better.
 2. Service Life: 25 years.
 3. Freestanding system.

2.08 INVERTER

- A. Inverter Electrical Characteristics:
 1. Input Voltage Range: 315-600 VDC.
 2. Maximum Array Input Voltage: 600 VDC.
 3. Maximum Operating Input Current: 331 ADC.
 4. Combiner Bus Bar Inputs: 6.
 5. Number of Inputs and Fuses: 5 x 110a,; 6 x 100A.
 6. Integrated Transformer.
 7. Efficiency: 96% CEC.
- B. Operating Conditions:
 1. Operating Ambient Temperatures: Minus 4 to plus 122 deg F.
 2. Storage Temperature: Minus 22 to plus 158 deg F.
 3. Relative Humidity: 0 to 90 percent, non-condensing.
 4. Noise Level (Distance of 3 m): <65 dB(A).
- C. Enclosure:
 1. NEMA 250, Type 3R.
 2. Enclosure Material: Galvanized steel.

3. Cooling Methods:
 - a. Fan convection cooling (forced air).
 4. Protective Functions:
 - a. AC over/under voltage.
 - b. AC over/under frequency.
 - c. Ground over current.
 - d. Over temperature.
 - e. AC and dc overcurrent.
 - f. DC over voltage.
 5. Standard liquid crystal display, four lines, 20 characters, with user display and on/off toggle switch.
- D. Regulatory Approvals:
1. IEEE 1547.1.
 2. IEEE 1547.3.
 3. UL 1741.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine substrate areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Do not begin installation until mounting surfaces have been properly prepared.
- C. If preparation of mounting surfaces is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Examine modules and array frame before installation. Reject modules and arrays that are wet, moisture damaged, or mold damaged.
- E. Examine roofs, supports, and supporting structures for suitable conditions where PV system will be installed.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections with the assistance of a factory-authorized service representative.
- C. PV module will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

DIVISION 16 - ELECTRICAL

SECTION 16010 - GENERAL ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.01 INTENT OF SPECIFICATIONS AND DRAWINGS

- A. Specifications and Drawings are prepared in abbreviated form and includes incomplete sentences. Omission of words or phrases such as "the Contractor shall", "as shown on the drawings", "a" and "the" are intentional. Omitted words and phrases shall be provided by inference to form complete sentences.
- B. Specifications and Drawings complement each other and what is specified, scheduled or mentioned by one shall be binding as if called for by both.

1.02 DEFINITIONS

- A. Provide: "furnish and install, test and deliver to the Government in operating and ready to use condition".
- B. Wiring: "Provide all raceways, junction boxes, conductors, devices, protection equipment, installation of motor controller furnished (by others) when required, etc., including testing for a complete, operative and ready to use electrical system".
- C. Equal: "Material, equipment or system, including all necessary labor, modifications and accessories satisfying the requirements of the contract documents to provide features or have operating characteristics equal or better than that specified".
- D. Complete: "Furnish installation that is operative, tested, ready to use and which satisfies the intent of the contract documents, including all necessary accessories and modifications".
- E. Contractor: "General Contractor responsible for all work shall assign work to Subcontractors. Except where noted, work of this section shall be assigned to the Electrical Subcontractor".

1.03 SUMMARY

- A. Electrical Work: Provide all articles, materials, equipment operators, systems and services specified herein or on the Drawings or as normally required by accepted industry standard practices, including all labor taxes, fees, insurance, warranties and incidentals required to complete all electrical work.
- B. In general, the following work is included:
 - 1. Provide power systems, including branch circuits, outlets, electrical apparatus and wiring to support the solar energy system.
 - 2. Provide wiring and connection for all equipment including solar panels, inverters, metering equipment, etc., complete. Furnish disconnects for all equipment as required by the NEC and Maui Electric Company.
 - 3. Verify, coordinate, interface interconnection work with Maui Electric Company.
- C. Wiring and connecting of all electrical equipment supplied for installation and use in this contract and not specifically listed as work by others.

- D. Furnishing of "Contractor Submittals" and "Field Posted As-Built Drawings".
- E. Coordinate utility work with Maui Electric Company for timely completion of this project.
- F. Coordinate work with other trades to avoid omissions and overlapping of responsibilities.
- G. Obtain and pay for all fees, permits, licenses, assessments and inspections required for this work.

1.04 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Materials and methods specified under BASIC MATERIALS AND METHODS Section.
- B. Electric service and utility company metering by Maui Electric Company.
- C. Connect all electrical equipment furnished or provided under other sections of the specifications.

1.05 QUALITY ASSURANCE:

- A. Government and Utility Requirements: Comply with all requirements of the State of Hawaii, County of Maui and utility company rules and regulations.
- B. Specifications are accompanied by architectural, structural and mechanical plans of the building, site plans and diagrammatic electrical plans showing locations on luminaires, outlets, feeder runs, devices and other electrical equipment. Locations are approximate and before installation, Contractor shall study with and coordinate with adjacent construction work and make installation in the most logical manner that meets the intent of the design.
- C. Prior to the start of rough-in work, verify all dimensions and sizes of equipment at the job site. Circuits and raceway routes are diagrammatic and may be altered in any logical manner. However, all changes from the contract documents shall be subject to review and acceptance of the Project Manager and indicated on the "Field Posted As Built" Drawings.
- D. Materials and Equipment: Materials and equipment shall conform to requirements of applicable technical sections, publications specified therein and shall be as shown on the drawings. Materials and equipment shall be new and shall be the product of the manufacturers regularly engaged in the manufacturer of such products. All items shall essentially duplicate materials and equipment that have been in satisfactory use at least two years prior to bid opening and shall be supported by service organization that is reasonably convenient to the site of installation.
- E. Substitutions of another manufacturer's product for equipment specified hereinafter requires written permission by the Project Manager prior to bidding. Brand names, manufacturer's names and catalog numbers indicate standards of design and quality required. List of substitute materials together with qualifying data shall be submitted for review. Failure to submit for review substitute materials prior to bidding shall mean that materials, as specified, will be provided.

EXAMPLE

Item	Manufacturer and Catalog No. Specified	Substitute Manufacturer and Catalog No.
Conduit	Blue - No. 2828	Green - No. 3080

Qualifying data shall include catalog cut sheets, shop drawings and specifications to indicate equality with material specified herein and in the drawings.

Burden of proof of equality of proposed substitutions will be the responsibility of the Contractor. Submittals shall be sufficiently detailed to permit evaluation of the proposed items. Insufficient information on the submittal will be sufficient cause to reject a proposed substitution.

1. Approval shall not in any circumstance be construed as an approval for deviations from the contract documents unless the entity seeking such approval has, in writing, specifically called the Project Manager's or the approval agency's attention to each such deviation at the time of submission. Said entity and/or Contractor shall be responsible for coordination of the work with adjacent and pertinent work, affected materials, equipment and labor to insure proper execution of the work as per the intent of the contract documents.
 2. Installation shall be complete in every detail and ready for use. Any item supplied by Contractor developing defects within one (1) year after final acceptance by the Project Manager shall be replaced by materials, apparatus or parts including installation labor to make such defective portion of complete system conform to the true intent and meaning of the drawings and specifications, without additional cost to the Government.
- F. Design (intent) changes, if required, resulting from substitution of materials or system shall be accompanied by appropriate changes in all affected work of every trade. Such changes shall be at no increase in the contract amount and shall be the responsibility of the Subcontractor or supplier responsible for the departures. Changes proposed by the Contractor shall be based on a system approach and shall be allowed if implemented without decrease in quality in performance or operations, increase in utility costs, or adverse affect on the available physical space to install the equipment. Such departures shall be submitted and noted in shop drawings for review and acceptance by the Project Manager. Design changes required by other trades, requiring changes in the electrical system as well as other systems, shall be accompanied by appropriate changes to all affected work of every trade, at no increase in contract amount.
- G. The General Contractor shall be responsible to coordinate, approve, and select systems that do not impose unaccounted for impact on the electrical work. It shall be understood that after the award of the contract, all departures having electrical impact, unless otherwise noted, have been reviewed and approved by the General Contractor. Therefore all appropriate changes to the electrical system required to accommodate the design changes shall be at no additional cost to the Government.

1.06 SUBMITTALS

- A. Manufacturer's Data Sheets: Submit manufacturer's data sheets in accordance with the General Provisions. Shop drawings shall be submitted for equipment not completely identifiable by information contained in the list of materials and equipment, especially for the following equipment:
1. Circuit breakers and safety switches.
 2. Cabinets and junction boxes.
 3. Wiring devices.
 4. Panelboards.
 5. Any Built-to-Order equipment.

- B. Shop Drawings: Shall be submitted when required by section specifying the equipment and shall be sufficiently comprehensive and detailed to permit evaluations, otherwise it may be rejected, and shall include as applicable the following:
1. Identification of each equipment and component.
 2. Dimension outlines of all enclosures.
 3. Dimension drawings of components such as switchboard and panelboards.
 4. Layouts and general arrangement of equipment.
 5. Operating and electrical characteristics including interrupting ratings and impedances.
 6. Related and adjacent work of other trades shall be shown to ensure constructability and functionality.
- C. Certificate of Compliance: Where required by section specifying the equipment, the Contractor shall submit six copies of certificates of compliance in accordance with the requirements of the General Provisions. The certificates shall include but not be limited to factory test reports.
- D. Installation, Operation and Maintenance Data: Six copies of installation, operation and maintenance data shall be submitted for equipment specified to require such data. The data shall be in the form of manuals and shall present instruction for operating, maintenance, repair, recommended inspection points and periods for inspection in a practical, complete and comprehensive manner. The information shall be arranged in a logical, orderly sequence, including a general description of the equipment and significant technical characteristics. Test, adjustment and calibration information shall be furnished and identified to specific equipment. The installation, operation and maintenance data shall be as required by General Requirements.
- E. Acceptance Requirements: Acceptance for material and equipment will be based on manufacturer's published data. Where materials or equipment are specified to be constructed and tested, or both, in accordance with the standards of the National Electrical Manufacturers Association (NEMA) or the American National Standard Institute (ANSI) the Contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. A certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard by a company listed as a member company of NEMA for the section whose standards cover the item under construction, will be acceptable as sufficient evidence that the item conforms to the requirements of the National Electrical Manufacturers Association. A manufacturer's statement indicating complete compliance of each item with the applicable NEMA, ANSI or other commercial standard specified shall be submitted and will be acceptable proof of compliance. Conformance with the agency requirements does not relieve the item from complying with any other requirements of the specifications.
- F. Nameplates:
1. General: In addition to standard manufacturer's nameplate, corrosion resistant nameplates shall be provided for each circuit breaker, safety switch, junction box, cabinet, panelboard, and each major piece of equipment. Nameplates shall designate the function of the equipment for which they are used. The designation shall be submitted for review and acceptance with the shop drawings.
 2. Material and Lettering: 1/16" thick, laminated plastic, black-white-black. Nameplate lettering shall be 1/4" high upper case.

3. Fastening: Nameplates shall be fastened by means of non-ferrous metal screws.
 4. Hand lettering or stick on embossed marking tape is not acceptable.
- G. Factory Tests and Inspection:
1. The equipment furnished shall be inspected mechanically and electrically, and all manufacturer's routine factory tests shall be performed to verify conformance with the specified requirements. The test equipment and test methods shall conform to the requirements of standards specified. The contract price shall include cost of performing all tests, and no additional compensation will be allowed therefor.
 2. The Contractor shall furnish at time of equipment delivery, six certified copies of all test results.
- H. Equipment Guarantees: Installation shall be complete in every detail and ready for use. Any item supplied by the Contractor developing defects within two (2) years after final acceptance by the Project Manager shall be replaced by materials, apparatus or parts including installation labor to make such defective portion of complete system conform to the true intent and meaning of the drawings and specifications, without additional cost to the Government. The Contractor shall guarantee all equipment specified from the date such equipment is accepted by the Project Manager, against defects in materials, design, performance and workmanship. Guarantees shall be supported by manufacturer's written warranties and shall be signed by an official of the manufacturer's organization. Replacement parts shall be delivered or repairs shall be made promptly upon receipt of notice of failure under normal and proper use and maintenance. All costs of replacement and repair shall be borne by the Contractor provided that a report substantiating such defect or failure to conform to specifications is promptly given to the Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All materials shall be new, except as specifically noted, and shall bear the label of Underwriters' Laboratories, Inc., wherever standards have been established and label service is normally and regularly furnished by the agency.

PART 3 - EXECUTION

3.01 MATERIALS AND EQUIPMENT FURNISHED BY THE CONTRACTOR

- A. The electrical installation shall be complete and operable and shall conform to the requirements of contract drawings. The Contractor shall provide all electrical equipment and materials, wiring, supports, and such additional parts as are necessary to make the installation complete. All Contractor furnished materials and equipment are subject to review and acceptance by the Project Manager.

3.02 PROTECTION DURING STORAGE

- A. All materials and equipment shall be stored in a safe manner; weather and fire protection shall be maintained and all materials shall be stored above the ground of floor level to avoid damage by moisture.

3.03 PROTECTION OF WORK IN PROGRESS

- A. All electrical materials and equipment shall be completely protected during installation. Equipment shall be securely protected against physical or chemical damage. In areas exposed to weather, materials unused at the end of each day's work shall be stored in weather-protected locations. Damage to materials or equipment due to Contractor's neglect shall be repaired or replaced by and at the expense of the Contractor.

3.04 PROGRESS OF WORK AND COORDINATION

- A. The Contractor shall prepare a schedule giving sequence of electrical work. The electrical work shall be coordinated with the work of other Contractors and other trades. The schedule shall be submitted prior to beginning installation and shall be subject to review and acceptance by the Project Manager.

3.05 RULES

- A. The entire electrical installation shall conform to the applicable rules and regulations of the state Model fire Code of the State of Hawaii, Hawaiian Telcom, Maui Electric Company, requirements of the National Electrical Code and other County of Maui standards and publications specified in the technical sections.

3.06 COORDINATION

- A. The contract drawings indicate the extent and general location and arrangement of equipment, conduit and wiring. Luminaires, outlets and electrical equipment shall be located so as to avoid interference with architectural, mechanical or structural work. Any device or equipment may be relocated within 10'-0" of the location shown on the drawings before installation is initiated and without increase in contract amount.

3.08 WORKMANSHIP

- A. All materials and equipment shall be installed in accordance with printed recommendations of the manufacturer, and shall conform to the requirements of the contract drawings. The installation shall be accomplished by workers skilled in this type of work.

3.09 FIELD TESTS

- A. After the installation is completed, and at such time the Project Manager may direct, the Contractor shall conduct field tests for acceptance by the Project Manager. When the tests are specified to be performed under supervision of the equipment manufacturer, the Contractor shall cooperate with the Project Manager during tests and shall place at his disposal all assistance, materials and services required to perform such tests. The tests shall be performed in the presence of the Project Manager. The Contractor shall furnish all necessary electric power instruments and personnel required for the tests.
- B. Operating Tests: The equipment and systems shall be demonstrated to operate in accordance with the requirements of the technical sections in which the equipment or systems are specified.

END OF SECTION

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 THE GENERAL ELECTRICAL PROVISIONS

- A. Section 16010 - General Electrical Provisions shall also apply. In general, this section describes quality assurance, submittals, testing and guarantees. Special conditions modifying these items, when required, shall be included hereinafter.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Galvanized Rigid Conduit (GRC): Hot dipped galvanized inside and out, rigid steel, 3/4" minimum, round bore electrical conduit and for use with threaded fittings.
- B. Electrical Metallic Tubing (EMT): Hot dipped galvanized, 3/4" minimum trade size for use with crimp, compression or set screw connectors.
- C. Flexible Conduit: Flexible steel, zinc-coated. For damp or wet locations, factory-covered with high density polyethylene for use with factory approved fittings.
- D. Plastic Conduit: Polyvinyl chloride plastic, 3/4" minimum, schedule 40,. Use only buried below grade.
- E. Gutters, Pullboxes, Enclosures and Cabinets: For panelboards, breakers and switches, unless otherwise specified, shall be NEMA 1 for interior locations and NEMA 3R for exterior locations exposed to the weather. Fabricate from code gauge galvanized steel, prime painted and enamel finished according to NEMA specifications.
- F. Outlet Boxes:
 - 1. Concealed boxes shall be pressed down NEC gauge steel, galvanized 4-11/16" square x 1-1/2" deep minimum.
 - 2. Exposed boxes and weather exposed recessed boxes, including lighting outlets and exteriors, shall be galvanized cast iron or alloyed aluminum, prime painted, enamel finished with threaded hubs for conduit connections.
 - 3. Extension or raised rings for pressed boxes shall be pressed from NEC gauge steel and galvanized.
- H. Devices and Cover Plates:
 - 1. Plates for interior flush construction shall be one piece, stainless steel, 18% chrome, 8% nickel with suitable hole for device.
 - 2. Plates for exposed exposed boxes shall be cast metal with neoprene gasket for sealing against entry of water or moisture into the box. Switch plates provided with neoprene cover over handle or raintight lever mechanism. Receptacle covers shall be "in use" type" with clear or translucent polycarbonate with stainless steel spring-loaded gasketed weatherproof cover.
- I. Conductors:
 - 1. Conductors shall be copper, 600 volts, No. 12 AWG minimum. Conductors No. 10 and smaller shall be solid. Conductors No. 8 and larger shall be stranded. Unless specified or indicated otherwise, or required to be otherwise by NFPA 70, all power

and lighting wires shall be NEC Type THW, THWN or XHHW, except that grounding wire may be NEC Type TW.

2. Color code: Black - phase "A"; red - phase "B"; blue - phase "C"; white - neutral; green - ground. Except for ground conductor, use different colors for 480 volts system as required by the NEC. Color coding shall be maintained throughout entire wiring system. Use other colors when more wires than above listed are contained in one raceway. Project Manager shall determine whether deviation from color coding will be permitted.
- J. Panelboards: Type and rating as noted with bolted, molded plastic case circuit breaker complement. Enclosures shall be galvanized steel with hinged door, latch, lock, rated for outdoor use (NEMA 3R). Provide 2 keys, typed circuit directory in metal frame with complete circuit assignments. 4" minimum side gutters and 5" minimum top and bottom gutters. All panels shall be keyed alike.
- K. Circuit Breakers: Molded case circuit breaker with toggle operated mechanism and thermal-magnetic overload trips. Toggle positions "ON", "TRIPPED" and "OFF" engraved on body of toggle. Enclosed in NEMA steel box.
- L. Wiring Devices:
1. Switches: Specification grade; single pole or double pole, 3 or 4 way as indicated, non-mercury quiet type, 20 amperes, 120/277 volts, UL labeled AC type, silvered contacts, tumbler switch with endurance of 10,000 make-breaks. Ivory. IL type switches will not be permitted.
 2. Duplex Convenience Receptacle: Specification grade; Tamper-Resistant type; NEMA 5-20R. Duplex, 20 ampere, 125 volts, side-wired, 3 wires, grounding type in plastic body. Ivory.
 3. Ground Fault Receptacle: Specification grade; NEMA 5-20R. Duplex 20 ampere, 125 volts. Device shall be equipped with L.E.D. indicator lamp and TEST/RESET buttons. Ivory.
- M. Disconnect Switches: Heavy duty fusible or non-fusible safety switch. Horsepower rated when used as motor disconnect. Contacts shall be lever operated, spring loaded and enclosed in NEMA 1 enclosure for interior locations and NEMA 3R enclosure for exterior locations. When for use with fuses, blades shall be rejection type. Enclosure shall have provisions for padlocking.
- N. Ground Rods: Copper clad, 3/4" diameter X 10' long.
- O. Hardware, Supports, Backing, etc.: Provide all hardware, supports backing and other accessories necessary to install electrical equipment. Wood material shall be termite treated. Iron and steel materials shall be galvanized for corrosion protection and non-ferrous materials shall be brass or bronze. All wood screws shall be brass or galvanized steel.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS

- A. Comply with local ordinances and regulations of County of Maui. Workmanship shall be subject to Project Manager's review. Project Manager shall be afforded every opportunity to determine the skill and competency of the workmanship. Concealed work reopened at random during formal site visits by Project Manager without additional costs to the State.

- B. Construction shall conform to construction practices as recommended by American Electricians Handbook by Croft (latest edition), National Electrical Code, National Electrical Safety Code and applicable instructions of manufacturers of equipment and material supplied for project.
- C. Raceways:
1. All raceways in damp locations and in hazardous locations shall be galvanized rigid steel conduit. All exposed raceways less than 7 feet above floor where subject to physical damage shall be galvanized rigid steel conduit. Electrical metallic tubing may be used in dry locations and where not subject to physical damage.

PVC plastic conduits may be buried under floor or below grade only. Encase conduits below grade, where indicated, with minimum 3" thick concrete jacket.

Paint metal conduits if used in or underground floor slabs with asphaltic corrosion resistance base paint or compound after installation in place.
 2. Cut raceways square and ream inner edges. Butt together evenly in couplings.
 3. Make bends and offsets with hickey or conduit bending machine. Do not use vise or pipe tee. Bends made so that interior cross-sectional area will not be reduced.

Radius of curve of inner edge of field bend not less than ten times the internal diameter of raceway. Use running threads not permitted. Where conduits cannot be joined by standard threaded couplings, use approved watertight conduit unions.
 4. Cap raceways during construction with plastic or metal-capped bushings to prevent entrance of debris or moisture. Swab all raceways out and dry before wires or cables are pulled in.
 5. Mount raceway free from other piping, valves or other mechanical equipment and ductwork.
 6. Fish wires, cords, strings, conductors or the like shall not be placed or inserted in the raceway system during the installation of raceways.
 7. Install insulating bushings and two locknuts on each end of every run of conduit at enclosures and boxes. Provide grounding bushings as required to ground receptacles and connect raceways to service ground, per NEC Article 250.
 8. Project adequate number of conduit threads through box for bushings.
 9. Run exposed raceways parallel with, or at right angles to structural or architectural elements.
 10. Securely fasten metal raceways with 1 or 2 hole galvanized pipe straps with screws or bolts and spaced not more than 7 feet apart or with approved beam clamps, or approved single or ganged pipe hangers spaced not more than 5 feet apart, as conditions require. Vertical runs supported at intervals not exceeding 5 feet by approved clamp hangers. Raceway runs with one 90-degree bend or equivalent, 150 feet maximum without pullbox. Raceway runs with two 90-degree bends or equivalent, 100 feet maximum without pullbox. Raceways shall be supported from building structure and shall not be supported from suspended ceiling system or mechanical systems.
 11. Provide pullstring in all empty raceways.

D. Outlet Boxes: Provide outlet boxes to suit conditions encountered. Provide outlet boxes in spaces with extension or raised rings of such depth that metal will be flush with surrounding surfaces of opening. When two or more devices are installed at a single location, mount in gang box under single device plate. Boxes in hazardous locations shall be installed in accordance with Article 500 of the National Electrical Code.

E. Conductors:

1. Conductor fill in raceways shall conform to NEC (based on Type RHW conductors).
2. Conductor pulling: Mechanical means of pulling shall be torque-limiting type and shall not be used for #2 AWG and smaller conductors. Pulling tension shall not exceed wire manufacturer's recommendations.

Where necessary, powdered soapstone may be used as a lubricant for drawing conductors through raceways. Other means of lubricating conductors shall be reviewed by Project Manager.

3. Form wires neatly in enclosures and boxes.
4. Splices: Splice in accordance with NEC Article 110. Splice conductors #10 AWG and smaller with wirenuts or Scotchlok connectors. Splice conductors #8 AWG and larger with high pressure compression (indent) copper sleeve connectors. Do not use bolt-on connectors. Reinsulate and weatherproof splices. Reinsulate splices according to manufacturer's instructions and recommendations. Splice insulation shall be 200% in thickness of original conductor insulation and of the same electrical and mechanical characteristics.

F. Equipment Connections: Make power connections to equipment with short section of flexible raceway. Provide liquid-tight flexible connections to motors at exterior locations.

G. Grounding:

1. Equipment, motors, metallic enclosures, raceways and electrical equipment shall be grounded according to the requirements National Electrical Code, Article 250.
2. Ground connection to equipment, raceways, motors, grounding type receptacles and other metallic parts directly exposed to underground electric conductors by continuous metal raceways or no. 14 AWG, minimum, copper, NEC type TW, green.
3. All grounding conductors shall be run together with circuit conductors. Install ground wire in all nonmetallic conduits.
4. Size all ground conductors per NEC Article 250.
5. Install ground conductor in all non-metallic raceways.

3.02 FINISHING

- A. Patch, repair and restore all structural and architectural elements cut, drilled or damaged for the installation of electrical system. Drilling, cutting, patching, repairing and restoring shall be subject to review and acceptance by Project Manager.
- B. Attach electrical equipment to wood with wood screws and attach to concrete by embedded or expansion inserts and bolts. Use powder-driven charge with prior approval only. Powder-driven fasteners shall not be used on precast concrete structures.
- C. Close unused knockouts on all enclosures with metal caps.

- D. Wipe clean all exposed raceways and enclosures. Prime painting and finishing of unfinished raceways and enclosures shall conform to PAINTING Section.
- E. Factory finished enclosures shall not be painted.
- F. Panelboards, disconnect switches and enclosed circuit breakers shall be identified with plastic nameplate engraved with identification designation and ratings.
- G. Connect circuits to circuit assignments shown on the drawings. Provide neatly type written circuit directory for all panelboards.

3.03 TESTING

- A. All wiring and circuits shall be tested to insure proper operation according to the functions specified. All tests shall be made in the presence of the Project Manager.
- B. Proper operation of all electrical devices shall be demonstrated at the request of the Project Manager.
- C. Balance loading on each feeder.

END OF SECTION