

REQUIREMENTS and SPECIFICATIONS TO CONSTRUCT

**HCDA KAUAHALE KAKAAKO PARKING GARAGE-
MODERNIZE TWO PASSENGER ELEVATORS
860 HALEKAUWILA STREET, KAKAAKO
HONOLULU, HAWAII
TAX MAP KEY: 2-1-050:013
(IFB NO. HCDA-AMT-02-2026)**

FOR AND BY THE

**HAWAII COMMUNITY DEVELOPMENT AUTHORITY
547 QUEEN STREET
HONOLULU, HAWAII 96813**

January 2026

Architect:	RMA Architects Inc.
Elevator Consultant:	Innovative Elevator Consulting
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Electrical Engineer:	InSynergy Engineering Inc.

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DIVISION 1 - GENERAL REQUIREMENTS**SECTION 01100 - PROJECT REQUIREMENTS****PART 1 - GENERAL****1.01 WORK COVERED BY CONTRACT DOCUMENTS**

- A. Project Identification: Project consists of the construction & renovation and improvement to an existing 5 story parking structure.
 - 1. Project Location: HCDA Kauhale Kakaako Parking Garage-
Modernize Two Passenger Elevators
860 Halekauwila Street
Kakaako, Honolulu , HI 96813

- B. Work under this contract includes the provision of all labor, material, equipment and product necessary for the construction renovation and improvement to an existing elevator & lobby area of an existing 5 story parking structure as contained in the construction documents including, but not limited to, the following:
 - 1. Selected window wall demolition of existing window wall for improvements.
 - 2. Removing and replacing the existing elevator cab/car and associated elevator controls.
 - 3. New hydraulic system as required for the improvements and remote heat exchanger.
 - 4. Mechanical & Fire Sprinkler work.
 - 5. Electrical & Fire Alarm systems 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 Contracting Officer.

- 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 Contracting Officer, requested by Contracting Officer, and similar phrases.
 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 Contracting Officer.

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 Contracting Officer 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. General: Contractor shall have full use of construction zone for construction operations, including use of project site, during construction period. Contractor's use of premises is limited only by State's right to perform work or to retain other Contractors on portions of the project site.
- B. Contractor's use of premises is restricted as follows:
1. Site Access and Parking:
 - a. Parking: Parking for the Contractor's employees and Subcontractors will be limited to the available areas within the designated Project Contract Limits or in areas designated by the Contracting Officer. Do not use parking stalls in regularly designated parking zones within the residence grounds. Unauthorized vehicles parked in marked stalls and in any area outside of the designated project construction site will be subject to towing at the Contractor's expense.
 - b. Maintain access to the Loading area through Project Contract Limits.
 2. Sanitation:
 - a. The Contractor will provide their own toilet facilities at no additional cost to the State.
 3. 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 property 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-school hours. Overtime costs for the Contractor's employees and work force are the Contractor's responsibility.
 - d. The Contracting Officer will require any construction activity that produces excessiveness of noise and dust to be performed during non-school hours. The Contracting Officer shall make the final determination. Overtime costs for the Contractor's employees and work force are the Contractor's responsibility.
4. 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 Contracting Officer. 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 roads, driveways and walkways to protect pedestrians and moped/bicycle riders. Obey traffic and safety regulations.
 - e. All smoking and vaping activities within construction limits on all Public Works construction sites, indoor or outdoor, are prohibited. Violations will be considered a contractual noncompliance by the general contractor.

- C. Drug Free System: Comply with the ban on smoking and other use of tobacco products, alcoholic beverages and other illegal substances at all times on premises during operational control.

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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PROJECT SCHEDULE is presented for information and planning purposes. Dates and activities are subject to adjustments.

NO	EVENT OR DESCRIPTION	Reference or Date
1	Pre-Bid Meeting and Site Visit	Notice to Bidders
2	Clarifications or Questions Due	14 days before Offers are opened
3	Bid Opening	Notice to Bidders
4	Project Start Date	Section 01100
5	Jobsite Start Date	Section 01100
6	Project Completion Date	Section 01100

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 Contracting Officer.
- 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 Contracting Officer, 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 will 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 Contracting Officer in writing.
- C. Subject to approval by the Contracting Officer, 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 Contracting Officer. This does not relieve the Contractor of the responsibility of proper coordination of the work. If directed by the Contracting Officer, 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 percent complete with continuity of all materials, systems and finishes.
 3. When directed by the Contracting Officer, 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 Contracting Officer provide a combined Contractor's construction schedule.
- D. Other Contracts: If known, they are listed in SECTION 01100 - PROJECT REQUIREMENTS.

1.05 SUBMITTALS

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

1.06 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences as directed by the Contracting Officer, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Contracting Officer of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Contractor record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Contracting Officer, within 7 days of the meeting.
- B. Preconstruction Conference: Contracting Officer shall schedule a preconstruction conference before the start of construction, at a time convenient to the Contracting Officer, but no later than 7 days before the Project start date or jobsite start date whichever is later. The conference will be held at the Project site or another convenient location. The Contracting Officer shall conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Contracting Officer, 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 the 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. Progress cleaning.
- m. Working hours.

- C. Progress Meetings: Conduct progress meetings at monthly or other intervals as determined by the Contracting Officer. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to Contracting Officer, 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:
 - 1. SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION for preparing a combined Contractor's Construction Schedule.
 - 2. SECTION 01322 - WEB BASED CONSTRUCTION MANAGEMENT for use of the StateWebCM for electronic submittals.
 - 3. 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 Contracting Officer. 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 Contracting Officer.
- 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 Contracting Officer.
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 Contracting Officer.
 - 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 25 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 Contracting Officer at monthly intervals or as directed by the Contracting Officer. The listing shall reflect all approvals received since the last update.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE - PERT CHART CRITICAL PATH METHOD (CPM)

- A. The construction schedule shall address the entire project, to the extent required by the Contract Documents, and shall show an expedient and practical execution of work. If requested by the Contracting Officer, the Contractor shall participate in a preliminary meeting to discuss the proposed schedule and requirements prior to submitting the schedule.
- B. The Construction Schedule shall indicate the following:
 - 1. Elements of the Project in detail time scaled by month or by week, and a project summary.
 - 2. The order and interdependence of activities and the sequence in which the work is to be accomplished.
 - 3. How the start of a given activity is dependent upon the completion of preceding activities and how its completion restricts the start of following activities.
 - 4. The submittal and approval of shop drawings, samples, procurement of critical materials and equipment, receipt of materials with estimated costs of

major items for which payment will be requested in advance of installation, fabrication of special materials and equipment, and their installation and testing.

5. Activities of the State that have an effect on the progress schedule, such as the required delivery dates for State furnished materials and equipment and other similar items.
6. Provide a separate report with the following:
 - a. The description of the activity.
 - b. The duration of time in calendar days.
 - c. For each activity indicate the early start date.
 - d. For each activity indicate the early finish date.
 - e. For each activity indicate the late start date.
 - f. For each activity indicate the late finish date.
 - g. Total float time.
 - h. Cost of event.
 - i. Contract-required dates for completion of all or parts of the Work.
 - j. Events are to be used on "Monthly Progress Report" for monthly payment request.
- C. Upon completion of the Contracting Officer's review, the Contractor shall amend the schedule to reflect the comments. If necessary, the Contractor shall participate in a meeting with the Contracting Officer to discuss the proposed schedule and changes required. Submit the revised schedule for review within 7 calendar days after receipt of the comments.
- D. 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 Contracting Officer's approval.
- E. Should changes to the schedule be desired, submit a request in writing to the Contracting Officer and indicate the reasons for the proposed change. If the changes are major, the Contracting Officer may require the Contractor to revise and resubmit the schedule at no additional cost to the State. Contractor shall mitigate the impact of all changes by readjusting the sequence of activities, duration of time, or resources utilizing available float.
 1. A change is major if, in the opinion of the Contracting Officer, the change affects the substantial completion date or other contractual and milestone dates.
 2. Minor changes are those that only affect activities with adequate float time.
- F. Once the schedule is reviewed by the Contracting Officer, the Contractor shall submit 6 sets of the revised schedule within 14 calendar days.

- G. Throughout the duration of the project, the Contracting Officer may require more detailed breakdowns of activities, logic, and schedule submittals from the Contractor.
- H. Updated Schedules: Submit at monthly intervals or as directed by the Contracting Officer. The schedule shall reflect all changes occurring since the last update including the following:
1. Activities started and completed during the previous period.
 2. The estimated duration to complete each activity that was started but not completed.
 3. Percentage of cost payable for each activity.
 4. Modifications and pending proposed changes.
 5. Narrative report describing current and anticipated problem areas or delaying factors with their impact together with an explanation of corrective actions taken or proposed.
- I. Failure on the part of the Contractor to submit updated schedules may be grounds for the Contracting Officer to withhold progress payments for items noted on the schedule.
- J. Contractor shall prosecute the work according to the CPM Schedule. The Contracting Officer shall rely on the reviewed Contractor's CPM Schedule and regular updates for planning and coordination. The Contracting Officer's review of the Contractor's CPM Construction Schedule does not relieve the Contractor of its obligation to complete the work within the allotted contract time. Nor does the review grant, reject or in any other way act on the Contractor's request for adjustments to complete remaining contract work, or for claims of additional compensation. These requests shall be processed in accordance with other relevant provisions of the contract.
- K. If the Contracting Officer issues a field order or change order or other directive that affects the sequence or duration of work activities noted on the construction progress schedule, the Contractor shall promptly update the schedule. To accomplish this update, add, delete or revise the work activities noted or change the logic in the schedule to show the Contractor's plan to incorporate the change into the flow of work. All change orders and time extension requests that affect the construction schedule shall be evaluated based on their impact on the approved Construction Schedule.
- L. If the current work is behind schedule or projected to be behind schedule, such as negative float on a critical activity or inability to meet the Contract Completion Date, the Contracting Officer may require the Contractor, at the Contractor's cost, to take remedial measures to get the project back on schedule. This may require increasing the work force, working overtime and weekends, air freighting materials, or other similar actions.
- M. If at any time the Contracting Officer determines that any critical activity has fallen behind the CPM schedule by 15 calendar days or more, the Contractor shall submit a remedial plan to recapture the lost scheduled time. Include a

revised schedule. Furnish the remedial plan no later than 7 calendar days from Contracting Officer's notification.

- N. If an accelerated schedule is proposed, refer to GENERAL CONDITIONS Section 7.22 "CONSTRUCTION SCHEDULE".

2.03 SCHEDULE OF PRICES

- A. Furnish a schedule of prices per Contracting Officer.
- 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 Contracting Officer 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 GENERAL CONTRACTOR AND SUBCONTRACTORS DAILY PROGRESS REPORTS

- A. The General Contractor is responsible for submitting the General Contractor and Subcontractor Daily Progress Reports (Daily Reports) for the General Contractor, all subcontractors, and any lower-tier subcontractors.
- B. The form of the Daily Reports shall be as directed by the Contracting Officer. A separate report shall be made and submitted for the General Contractor (each calendar day) and each subcontractor (each day worked). The report shall include the following information for each employer: Name of General Contractor or Subcontractor, Report Number, Contract Day (consecutive calendar day from Notice to Proceed (NTP) Date), Date worked, work location and description, number of workers, trade/labor classification, and work hours. For General Contractor, only the Contract Day is required because the Report Number will be the same number.
- C. The Daily Reports shall be prepared from the project NTP Date. Daily Reports shall continue to be prepared and submitted up to the Project Acceptance Date. After the Project Acceptance Date, Daily Reports will be submitted for days worked only, and continue to date of Contract Completion Notice. Running Contract Day will stop at Project Acceptance Date.
- D. Submit/upload copies of the previous day's reports to the appropriate online folder(s) within the State's web-based construction management system as directed by the Contracting Officer by 10:00 a.m. of the next working day.
- E. Daily Reports can be handwritten in the field and shall be uploaded by the General Contractor to the State's web-based construction management system. The reports shall use the following file naming convention:

CN R# CD# YYMMDD

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CN: Company Name of General Contractor or Subcontractor (2 capital letters)
R#: Daily Report number (3 digits, used only by Subcontractor)
CD#: Contract Day (consecutive calendar day from NTP Date, 3 digits)
YYMMDD: Report Date in numerals (year, month, day, 6 digits)
Examples: HS 011 015 170314, for Honolulu Subcontractor, Inc.
HG 015 170314, for Honolulu General Contractor, Inc.

F. A sample Daily Progress Report Form can be found at the end of this Section.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01322 - WEB BASED CONSTRUCTION MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

1. The State, Consultants, and Contractor shall utilize the HCDA web-based system, hereto referred to as StateWebCM for electronic submittal of all data and documents (unless specified otherwise by the Construction Management Branch) throughout the duration of the Contract. The use of a web-based collaborative system; such as Autodesk Buzzsaw, Constructware, Meridian Project Talk, Primavera P3e/c, etc. will be made available only to key Prime Contractor personnel and the Design Consultant. The joint use of this system is to facilitate; electronic exchange of information, key processes, and overall management of the contract. StateWebCM shall be the primary means of project information submission, communications and management between Contractor, Consultant and the State. When required by the Contracting Officer, paper documents will also be provided (i.e.; e.g. the signature of Contract Modifications and submission of Contract Claims). In the event of discrepancy between the electronic version and paper documents, the paper documents will govern.
2. Autodesk Buzzsaw, Constructware, Meridian Project Talk are trademarked items. Primavera Project Planner, P3e/c, etc. are registered trademarks of Primavera Systems, Inc. Microsoft, Internet Explorer, Outlook, Word, and Excel are registered trademarks of Microsoft Corporation in the U.S.A. Adobe and Acrobat are registered trademarks of Adobe Systems Incorporated.

1.02 USER ACCESS LIMITATIONS

3. The Contracting Officer will control the Consultant and Contractor's access to StateWebCM by allowing access and assigning user profiles to accepted personnel. User profiles will define levels of access into the system; determine assigned function-based authorizations (determines what can be seen) and user privileges (determines what they can do). Sub-contractors and suppliers will not have direct access to StateWebCM. Entry of information exchanged and transferred between the Contractor and Design Consultant, sub-contractors and suppliers on StateWebCM shall be the responsibility of the Contractor.
 1. Joint Ownership of Data: Data entered in a collaborative mode (entered with the intent to share as determined by permissions and workflows within the StateWebCM system) by the Contracting Officer, Consultant, and the Contractor will be jointly owned.

1.03 AUTOMATED SYSTEM NOTIFICATION AND AUDIT LOG TRACKING

4. Review comments made (or lack thereof) by the State or the Design Consultant on Contractor submitted documentation shall not relieve the Contractor from compliance with requirements of the contract documents. The Contractor is responsible for managing, tracking, and documenting the Work to comply with the requirements of the contract documents. State acceptance via automated system notifications or audit logs extends only to the face value of the submitted documentation and does not constitute validation of the Contractor's submitted information.

1.04 SUBMITTALS

The following shall be submitted in accordance with SECTION 01330 - SUBMITTAL PROCEDURES:

1. Pre-construction Submittals
2. List of Contractor's key StateWebCM personnel.

1.05 INSTRUCTIONS ON USING THE STATEWEBCM

- A. The Contractor shall receive StateWebCM user guides containing instructions on how to use the StateWebCM.

1.06 COMPUTER REQUIREMENTS

- D. The Contractor shall use computer hardware and software that meets the requirements of the StateWebCM system as recommended by the system the State uses to access and utilize StateWebCM. As recommendations are modified by the used system, the Contractor will upgrade their system(s) to meet the recommendations or better. Upgrading of the Contractor's computer systems will not be justification for a cost or time modification to the Contract.

1.07 CONTRACTOR RESPONSIBILITY

A. The Contractor shall be responsible for the validity of their information placed in StateWebCM and for the abilities of their personnel. Accepted users shall be knowledgeable in the use of computers, including Internet Explorer, word processing programs such as Word, spreadsheet programs such as Excel, Project management programs such as Project, and Adobe Portable Document Format (PDF) document distribution program. The Contractor shall utilize the existing forms supplied by the Contracting Officer or located in StateWebCM or located on the State's website, <http://pwd.hawaii.gov/construction-management-branch/construction-administration-forms/>, to the maximum extent possible. After receiving StateWebCM user guides from the State, the Contractor is responsible for distributing the user guides to their personnel in the use of StateWebCM and the other programs indicated above as needed. All costs associated with the use of this system will be evenly distributed in the project overheads and spread across the duration of the contract; a separate added cost will not be allowed.

1. User Access Administration: Provide a list of Contractor's key StateWebCM personnel for the Contracting Officer's acceptance. Notify the Contracting Officer immediately of any users that are to have access removed. Resubmit the personnel list whenever modified. User changes will take effect within one working day of accepting the requested change. The Contractor will be allocated 3 or as needed key personnel with access to StateWebCM. Access will include up to 2 key personnel from the Design Consultant. Access by any other stakeholder will be according to need or within public areas within the StateWebCM project web page.

1.08 CONNECTICITY PROBLEMS

StateWebCM is a web-based environment and therefore subject to the inherent speed and connectivity issues of the internet service provider. The Design Consultant, and Contractor are responsible for their own connectivity to the internet. StateWebCM response time is dependent on all user's equipment,

including processor speed, network interface equipment speed, internet service provider access speed, etc. and current traffic on the internet. The State will not be liable for any delays associated from the usage of StateWebCM including, but not limited to: slow response time, down time periods, connectivity problems, or loss of information. Under no circumstances shall the usage of the StateWebCM be grounds for a time extension or cost adjustment to the contract.

PART 2 - PRODUCTS

2.01 STATE WEBCM SYSTEM

Web-based construction management system as provided by the State.

PART 3 - EXECUTION

3.01 STATE WEBCM UTILIZATION

1. The following shall be submitted utilizing the HCDA web-based system as directed by the Contracting Officer.

Shop Drawings: Shop drawing and design data documents shall be submitted as PDF attachments to the StateWebCM submittal workflow process. All PDF shop drawing submittal documents shall have the Contractor's review and submittal stamp (including signatures) as specified in SECTION 01330 - SUBMITTAL PROCEDURES, the same as if submitted as hard copy. Generic digital samples of all transmittal sheets and stamps are available for all users. Examples of shop drawings include, but are not limited to:

1. Standard manufacturer installation drawings for all trades, as required.
 2. Drawings prepared to illustrate portions of the work designed or developed by the Contractor.
 3. Steel fabrication, piece, and erection drawings.
2. Product Data: Product catalog data and manufacturers instructions shall be submitted as PDF attachments to the StateWebCM submittal workflow process, except that color charts and similar color oriented pages shall be submitted as hard copy separate from and in addition to the PDF copy. Submittal shall indicate when hard copy color documents are submitted. All PDF product data submittal documents shall have the Contractors review and submittal stamp (including signatures) as specified in SECTION 01330 - SUBMITTAL PROCEDURES the same as if submitted as hard copy. Examples of product data include, but are not limited to:
 1. Manufacturer's printed literature.
 2. Preprinted product specification data and installation instructions.
 - 2 D. Samples: Sample submittals shall be physically submitted as specified in SECTION 01330 - SUBMITTAL PROCEDURES. Contractor shall enter submittal data information into StateWebCM with a copy of the approved transmittal form(s) attached to the submittal. Examples of samples include, but are not limited to:
 1. Product finishes and color selection samples.

2. Product finishes and color verification samples.
 3. Finish/color boards.
 4. Physical samples of materials.
- 3 E. Administrative Submittals: All correspondence and Preconstruction submittals shall be submitted on StateWebCM. Examples of administrative submittals include, but are not limited to:
1. Commencement Requirements.
 2. Digging permits and notices for excavation.
 3. List of Contractor personnel accessing StateWebCM.
 4. List of contact personnel.
 5. Notices for roadway interruption, work outside regular hours, and utility cutovers.
 6. Requests for Information (RFI).
 7. Schedules as specified and associated reports and updates. Each schedule submittal specified in SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION shall be submitted as a native backed-up file of the scheduling program being used. The schedule will also be posted as a PDF file in the format specified in SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION.
 8. Submittal Register: Use the submittal register data provided by SECTION 01330 - SUBMITTAL PROCEDURES of the specifications and other individual sections as needed. Contractor shall input data for dates as specified and upon acceptance of the register, load the register up to StateWebCM and update as required by the Contract documents or Contracting Officer.
 9. Plans for safety, demolition, environmental protection, and similar activities.
 10. Payroll affidavits.
 11. All reports such as daily activity, materials received, inspections, punch lists, and any testing or special observations by parties connected to the contract.
 12. Other information as required and agreed on by all parties.
 13. Meeting minutes for Preconstruction Meeting, progress meetings, pre-installation meetings, etc.
 14. Any general correspondence submitted.
- F. Compliance Submittals: Test report, certificate, and manufacture field report submittals shall be submitted on StateWebCM as PDF attachments. Examples of compliance submittals include, but are not limited to:
1. Manufacturers documentation and certifications for quality of products and materials provided.
 2. Shop drawings.
 3. Quality Control certifications.
 4. Field test reports.
- 4 G. Record and Closeout Submittals: Operation and

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maintenance data, test and balance data, equipment test data, and other closeout submittals shall be submitted on StateWebCM as PDF documents during the approval and review stage as specified in SECTION 01770 - CLOSEOUT PROCEDURES. Examples of record submittals include, but are not limited to:

1. Operation and Maintenance Manuals: Final documents shall be submitted as specified.
 2. As-built Drawings: Final documents shall be submitted as specified.
 3. Extra Materials, Spare Stock, etc.: Submittal forms shall indicate when actual materials are submitted.
- H. Exceptions: Documents with legal consequences, contract modifications, contract claims, security implications, and those required by other agencies may require an additional submittal as original hard copy with original signatures and seals. Hard copies of these documents shall be submitted as specified or as directed by the Contracting Officer.

END OF 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 01322 – WEB BASED CONSTRUCTION MANAGEMENT for use of the StateWebCM for electronic submittals.
 - 3. 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. Contracting Officer 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 Contracting Officer 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: _____
HCDA 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 Contracting Officer.

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 Contracting Officer.

- 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 Contracting Officer 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 Contracting Officer and the Design Consultant in MS Word or MS Excel or other format as accepted by the Contracting Officer.

Section No. – Title	Shop Drawings & Diagrams	Samples	Certificates (Material, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature and Brochures	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-Built Drawings	Others	Guaranty or Warranty	Manufacturer's Guaranty or Warranty (Greater than one year)
01310 – Project Management and Coordination											■			■		
01320 – Construction Progress Documentation											■			■		
01322 – Web Based Construction Management														■		
01330 – Submittal Procedures			■											■		
01500 – Temporary Facilities and Controls							■							■		
01700 – Execution Requirements														■		
01770 – Closeout Procedures	■								■				■	■	■	
02027 – Minor Demolition for Remodeling														■		
03740 – Concrete Repairs	■		■	■										■		
05120 – Structural Steel	■		■	■												
05400 – Cold Formed Steel Framing	■		■	■		■										
05500 – Miscellaneous Metals	■		■	■			■								■	
05530 – Metal Ladder				■										■		

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Section No. – Title	Shop Drawings & Diagrams	Samples	Certificates (Material, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature and Brochures	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-Built Drawings	Others	Guaranty or Warranty	Manufacturer's Guaranty or Warranty (Greater than one year)
06100 – Rough Carpentry				■												
07210 – Therma Insulation				■										■		
07240 – Exterior Insulation and Finish System	■	■	■	■					■					■	■	■
07270 – Building Air Barrier System	■	■	■	■			■									
07620 – Sheet Metal Flashing and Trim	■			■											■	■
07840 – Penetration Firestopping			■	■											■	
07920 – Sealants		■		■											■	■
09110 – Non-Structural Metal Framing	■		■	■												
09290 – Gypsum Board	■	■	■	■												
09310 – Ceramic Tiles		■	■	■					■						■	■
09651 – Resilient Tile Flooring	■	■	■	■	■				■						■	■
09900 – Painting		■	■	■			■				■				■	■
13851 – Addressable Fire Alarm System	■		■	■			■		■						■	
13930 – Fire Sprinkler System	■		■	■		■			■				■		■	
16011 – General Electrical Requirements	■			■											■	
16100 – Electrical Work				■			■						■		■	
16510 – Interior Lighting	■	■	■	■			■		■						■	

END OF SECTION

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and for Contractor's Quality Control responsibilities and duties.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements of this section or by the Department or authorities having jurisdiction, do not limit the Contractor's responsibility to provide quality-control services.

1.02 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Contracting Officer.
- C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- D. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

1.03 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Contracting Officer.

1.04 SUBMITTALS

- A. **Qualification Data:** For QC Manager (alternate QC Manager), inspection and testing agencies, furnish evidence to demonstrate their capabilities and experience. Include proof of qualifications in the form of education, certifications, and license. For the testing agencies, include a recent report on the inspection of the testing agency by a recognized authority.
1. The Contracting Officer may disapprove any QC Manager (alternate QC Manager), inspection or testing agency or individual employed by the agency when the Contracting Officer determines it is in the best interest of the State. The Contractor is not entitled to any claim or cost increase or time extension due to the Contracting Officer's disapproval of an agency or individual.
- B. **Delegated-Design Submittal:** In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional. Indicate that the products and systems are in compliance with performance and design criteria required. Include list of codes, loads, and other factors used in performing these services.
- C. **Reports:** Prepare and submit certified written reports that include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Ambient conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
 14. Combined Contractor Production and Contractor Quality Control Report, (one sheet): By 10:00 AM the next working day after each day that work is performed.

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

1.05 SCHEDULE FOR SUBMITTING INFORMATION AND REPORTS

- A. Deliver the original and two copies each of the following to the Department:
 - 1. Contractor Quality Control Report (1 sheet) and Contractor Production Report (one sheet): By 10:00 AM the next working day after each day that work is performed.
 - 2. Field Test Reports: Within two working days after the test is performed, attached to the Contractor Quality Control Report;
 - 3. Monthly Summary Report of Tests: 2 copies attached to the Contractor Quality Control Report;
 - 4. Testing Plan and Log: 2 copies, at the end of each month;
 - 5. Rework Items List: 2 copies, by the last working day of the month;
 - 6. Quality Control meeting minutes: 2 copies, within 2 working days after the meeting and;
 - 7. Quality Control Certifications: As required by the paragraph titled "Quality Control Certifications.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- C. Professional Architect or Engineer Qualifications: A professional architect or engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing architect or engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- D. Inspection and Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E-548, and that specializes in types of tests and inspections to be performed.
- E. Pre-construction Testing: Testing agency shall perform pre-construction testing for compliance with specified requirements for performance and test methods.

1. Contractor responsibilities include the following:
 - a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
 - b. Submit specimens with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
 - d. Remove assemblies when testing is complete. Do not reuse materials on Project.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to the Department with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- F. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Contracting Officer.
 2. Notify Contracting Officer seven days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Contracting Officer's approval of mockups before starting work, fabrication, or construction.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.07 QUALITY CONTROL

- A. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
 1. Engage qualified inspection or testing agencies to perform quality-control services, unless services are indicated as the Department's responsibility.
 2. Notify Contracting Officer and the inspection or testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Submit certified written reports of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. Special Inspections:
1. The **Contractor** will employ independent Special Inspectors to perform inspections on various elements of the work as required by the Building Code as locally adopted. Contractor shall notify the contracting officer in writing a minimum five (5) working days prior to the actual inspection date. During the course of the work under inspection, each Special Inspector shall submit detailed reports relative to progress and conditions of the Work, including deviations from specified requirements and stipulating dates, times and location. Special Inspectors shall submit a final report to the Contracting Officer and local code officials. Cooperate fully with the Special Inspectors.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- D. Retesting and Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with the Department and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify the Contracting Officer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 5. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field-curing of test samples.

5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 6. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.08 QUALITY CONTROL MANAGER

- A. Duties: Provide a Quality Control Manager at the work site to implement and manage the QC Program. In addition to implementing and managing the QC Program, the QC Manager may perform the duties of the Project Superintendent. The QC Manager is required to; conduct the QC meetings, perform submittal review, ensure testing is performed and provide QC certifications and documentation required in this Contact. The QC Manager is responsible for managing and coordinating Testing Laboratory personnel and any other inspection and testing personnel required by this Contract.
- B. Qualifications: An individual with a minimum of **10** years experience as a superintendent, inspector, QC Manager, project manager, or construction manager on similar size and type construction contracts which included the major trades that are part of this Contract. The individual must have experience in the areas of hazard identification and safety compliance. It is desirable that the QC Manager completed the course "Construction Quality Management for Contractors" offered by the Navy or the Army Corps of Engineers or other similar course.
- C. Approval: QC Manager shall be subject to the approval of the Contracting Officer. Unless the Contractor has a QC Manager on staff, the Contractor shall provide the names of at least three individuals, and shall rank the individuals based on the Contractor's preference to work with or hire. The Contracting Officer may approve all or any one of the individuals. If any individual is presently working for the Contractor as a QC Manager, the Contractor may choose to submit only one individual, and that individual is subject to approval.
1. Furnish evidence showing the individual(s) meets the qualifications, experience, training and other criteria required by this section.

1.09 QUALITY CONTROL ORGANIZATION

- A. Quality Control Manager: Meet the qualifications and duties required by this section. 01400.
- B. Alternate QC Manager Duties and Qualification: Designate an alternate for the QC Manager at the work site to serve in the event of the designated QC Manager's absence. Limit the time the QC Manager is absent to a period not exceed a single duration of two consecutive weeks, and in aggregate not more than 45 days during a calendar year. The qualification requirements for the Alternate QC Manager shall be the same as for the QC Manager.

- C. Safety Specialist: Provide a Safety Specialist at the work site to perform safety management, surveillance, inspections and safety enforcement for the contractor. The Safety Specialist shall be at the work site at all times whenever work or testing is being performed, shall conduct daily safety inspections and shall have no other duties other than safety management, inspections, and safety enforcement on this Contract.

1.10 PHASES OF CONTROL

- A. Three Phases are used to ensure quality control measures are provided for each definable feature of work, which includes both on-site and off-site work. Notify the Engineer at least 4 days prior to each phase.
- B. Preparatory Phase – Includes a meeting conducted by the QC Manager and attended by the superintendent, and the foreman responsible for the definable feature. Document the results of the preparatory phase actions in the daily Contractor Quality Control Report. Perform the following prior to beginning work on each definable feature of work:
1. Review the contract drawing and each paragraph of the applicable specification sections.
 2. Verify that shop drawings and submittals for materials and equipment are submitted and approved. Verify receipt of approved factory test results, when required.
 3. Review the testing plan. Ensure that the required quality control testing provisions are made.
 4. Examine the work area. Ensure that the required preliminary work is completed.
 5. Examine and ensure the required materials, equipment, and sample work conforms to the approved shop drawings and submitted data. Ensure that the materials and equipment are available at the jobsite.
 6. Discuss construction methods, construction tolerances, workmanship standards, and the approach that will be used to provide quality construction. Plan ahead and identify potential problems for each definable feature of work.
 7. Review the safety plan and appropriate activity hazard analysis to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted.
- C. Initial Phase – The initial phase starts when construction crews are ready to start work on a definable feature of work. Meet with, the superintendent, and the foreman responsible for that definable feature of work. Observe the initial segment of the definable feature of work to ensure that the work complies with Contract requirements. Document the results of the initial phase in the daily Contractor Quality control Report. Repeat the initial phase for each new crew to work on-site, or when acceptable levels of specified quality are not being met. Perform the following for each definable feature of work:

1. Establish the quality of workmanship required.
 2. Resolve conflicts.
 3. Ensure that testing is performed by the approved laboratory.
 4. Check work procedures for compliance with the Safety Plan and the appropriate activity hazard analysis to ensure that applicable safety requirements are met.
- D. Follow-Up Phase – For on-going work, perform the following activities daily, or more frequently if necessary, until the completion of each definable feature of work. Document the work in the daily Contractor Quality Control Report:
1. Ensure that the work is in compliance with Contract requirements.
 2. Maintain the quality of workmanship required.
 3. Ensure that testing is performed by the approved laboratory.
 4. Ensure that rework items are being corrected.
 5. Perform safety inspections.
- E. Conduct additional Preparatory and Initial Phases on the same definable features of work if the quality of on-going work is unacceptable, or if there are changes in the applicable quality control organization, or if work on a definable feature is resumed after substantial period of inactivity, or if other problems develop.

1.11 TESTING

- A. Perform sampling and testing required in this section and as otherwise required by these specifications.

1.12 COMPLETION INSPECTIONS

- A. Pre-Final Inspection: Near completion of the Work or any increment Work, the QC Manager shall conduct an inspection to identify items which do not conform to the contract requirements. Include any remaining items on the "Rework Items List" which were not corrected. The QC Manager shall make follow-on inspections to ascertain that all deficiencies have been corrected.
- B. Final Inspection: Comply with the General Conditions section titled "SUBSTANTIAL COMPLETION AND FINAL INSPECTION." Verify that the facility is substantially complete and ready for final inspection. The QC Manager shall ensure that all deficient items are corrected prior to notifying the Department for a final inspection.

1.13 DOCUMENTATION

- A. Maintain current and complete records of on-site and off-site activities.
- B. A Contractor Production Report is required for each day that work is performed and shall be attached to the Contractor Quality Control Report prepared for the same day. Account for each calendar day throughout the life of the Contract.

EXHIBIT D

Use terminology consistent with the construction schedule to report the work. The Contractor Production Report is to be prepared, signed and dated by the project superintendent and shall contain the following information:

1. Report date, report number, contractor's name, project title, HCDA job number, project location and superintendent present.
 2. Weather conditions in the morning and in the afternoon including; maximum and minimum temperatures, durations and estimated rainfall, and prevailing wind directions and speed.
 3. Identify work performed by corresponding schedule activity number, post contract number, change order number, and other items.
 4. A list of Contractor and subcontractor personnel on the work site. Include their trades, work location, description of work performed, hours worked by trade, daily total work hours on work site, and total work hours from start of construction.
 5. A list of job safety actions taken and safety inspections conducted. Indicate that safety requirements have been met including the results, and address the following:
 - a. Was a job safety meeting held? If yes, attach a copy of the meeting minutes.
 - b. Were there any lost time accidents? If yes, attach a copy of the completed OSHA report and the Department's "Contractor Significant Incident Report".
 - c. Was any crane, trenching, scaffold, high voltage electrical, or high work done? If yes, attach a statement or checklist showing inspection(s) performed.
 - d. Were there hazardous material(s) or waste released into the environment? If yes, attach descriptions, accident reports, notifications required and made.
 - e. List safety actions taken today and safety inspections conducted.
 6. A list of equipment or material received each day that is incorporated into the job.
 7. Include a "remarks" section in this report. Address pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given and corrective actions taken, delays encountered and a record of visitors to the work site.
- C. A Contractor Quality Control Report is required for each day that work is performed and for every seven consecutive calendar days of no-work period and on the last day of a no-work period. Account for each calendar day throughout the life of the Contract. Use terminology consistent with the construction schedule to report the work. The Contractor Quality Control Report is prepared, signed and dated by the QC Manager and shall contain the following information:
1. Identify the control phase and the definable feature of work.

2. Results of the Preparatory Phase meetings held including the location of the definable feature of work and a list of personnel present at the meeting. Indicate in the report that for this definable feature of work, the drawings and specifications have been reviewed, submittals approved, materials comply with approved submittals, materials are stored properly, preliminary work is done correctly, the testing plan was reviewed, work methods and schedule were discussed, and that safety and hazard analysis were addressed.
 3. Results of the Initial Phase meetings held including the location of the definable feature of work and a list of personnel present at the meeting. Indicate in the report that for this definable feature of work the preliminary work was done correctly, samples were prepared and approved, the workmanship is satisfactory, test results are acceptable, work is in compliance with the Contract, work complies with safety requirements, and the required testing was performed including a list of who performed the tests.
 4. Results of the Follow-Up Phase inspections held including the location of the definable feature of work. Indicate in the report for this definable feature of work that the work complies with the Contract as approved in the Initial Phase, work complies with safety requirements, and that required testing was performed including a list of who performed the tests.
 5. List the rework items identified, but not corrected by close of the day's work.
 6. List the rework items corrected from the rework items list along with the corrective action taken.
 7. Include a "remarks" section in this report. Address pertinent information including directions received, quality control problem areas, construction deficiencies encountered, QC meetings held, acknowledgment that as-built drawings have been updated, corrective direction given by the QC organization and corrective action taken by the Contractor.
- D. Testing Plan and Log: As tests are performed, the QC Manager shall record on the "Testing Plan and Log" the date the test was conducted, the date the test results were forwarded to the Department remarks and acknowledgment that an accredited or approved testing laboratory was used. Attach a copy of the updated "Testing Plan and Log" to the last daily Contractor Quality Control Report of each month.
- E. Rework Items List: The QC Manager shall maintain a list of work that does not comply with the Contract, identifying what items need to be reworked, the date the item was originally discovered, the date the item will be corrected by, and the date the item was corrected. There is no requirement to report rework item that is corrected the same day it is discovered. Attach a copy of the "Rework Items List" to the last daily Contractor Quality Control Report of each month. The Contractor shall be responsible for including on this list items needing rework including those identified by DAGS.
- F. Report Forms: Furnish the proposed forms to be used to the Contracting Officer for review and approval.

1. Contractor Production Report and Contractor Quality Control Report, with separate continuation sheet. These forms may be combined.
2. Testing Plan and Log.
3. Rework Items List.

1.14 RECORD (As-Builts) DRAWINGS

- A. The QC Manager is required to ensure the record drawings and jobsite record sets are kept current on a daily basis in accordance with Section 01770 – Closeout Procedures.

1.15 NOTIFICATION OF NON-COMPLIANCE

- A. Contractor will be notified of any detected non-compliance items. Take immediate corrective action after receipt of such notice.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

- A. General: On completion testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

3.02 DEPARTMENT'S AUTHORITY

- A. Review and removal of Quality Control Personnel:
 1. All Quality Control organization personnel are subject to review by Contracting Officer; and the Contracting Officer may interview any member of the Quality Control organization at any time in order to verify the submitted qualifications.
 2. The Contracting Officer has the authority to have the QC Manager replaced at any time for cause. Justifications may include but are not limited to: not being on site when QC Manager's duties are required, or wrongfully approving substandard and noncompliant work.
 3. The Contractor is not entitled to any claim or cost increase or time extension due to the Contracting Officer's disapproval of an agency or individual.

END OF SECTION

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

- A. Requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
- B. Temporary utilities include but are not limited to, the following:
 - 1. Sewers.
 - 2. Storm drainage.
 - 3. Water service and distribution.
 - 4. Sanitary facilities, including toilets, wash facilities, and drinking water facilities.
 - 5. Ventilation.
 - 6. Electric power service.
 - 7. Lighting.
 - 8. Telephone service.
 - 9. Internet Service.
- C. Support facilities include, but are not limited to, the following:
 - 1. Project Sign
 - 2. Field Offices
 - 3. Storage and fabrication sheds
 - 4. Trash, refuse disposal
 - 5. Erosion controls and site drainage
 - 6. Cranes, lifts, and hoists
 - 7. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities and measures include, but are not limited to, the following:
 - 1. Environmental protection
 - 2. Stormwater control
 - 3. Tree and plant protection
 - 4. Site enclosure fence and lockup

5. Barricades, warning signs, and lights
 6. Pest control
 7. Fire protection
 8. Historical and archaeological protection.
- E. Related Sections: Refer to Divisions 2 through 16 for other temporary requirements including ventilation, humidity requirements and products in those Sections.

1.02 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to the State and shall be included in the Contract Price. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
1. Other Contractors with agreements with the State working within the contract limits.
 2. Testing agencies.
 3. Contracting Officer and personnel of authorities having jurisdiction.

1.03 SUBMITTALS

- A. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.
- B. Landfill Disposal Receipts: Submit copies of receipts issued by a landfill facility. Include receipts with Contractor Daily Progress Report

1.04 QUALITY ASSURANCE

- A. Standards: Comply with IBC Chapter 33, "Safeguards During Construction", ANSI A10.6, NECA's "Standard for Installing and Maintaining Temporary Electric Power at Construction Sites", and NFPA 241, "Standard for Safeguarding Construction, Alteration, and Demolition Operations".
1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
 2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70, "National Electrical Code".
 - a. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.05 PROJECT CONDITIONS

- A. Temporary Utilities: At the earliest feasible time, when acceptable to the Contracting Officer, change over from use of temporary service to use of permanent service.
1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of

each permanent service during its use as a construction facility before Contracting Officer's acceptance, regardless of previously assigned responsibilities.

- B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
 1. Keep temporary services and facilities clean and neat.
 2. Relocate temporary services and facilities as required by progress of the Work.

1.06 PREPARATION AND PROTECTION

- A. Protection of Property: Continually maintain adequate protection of the Work from damage and protect all property, including but not limited to buildings, equipment, furniture, grounds, vegetation, material, utility systems located at and adjoining the job site. Repair, replace or pay the expense to repair damages resulting from Contractor's fault or negligence.
- B. Before starting work to be applied to previously erected constructions, make a thorough and complete investigation of the recipient surfaces and determine their suitability to receive required additional construction and finishes. Make any repair that is required to properly prepare surfaces and coordinate the Work to provide a suitable surface to receive following Work.
- C. Commencing work by any trade implies acceptance of existing conditions and surfaces as satisfactory for the application of subsequent work, and full responsibility for finished results and assumption of warranty obligations under the Contract.
- D. Protect existing (including interiors) work to prevent damage by vandals or the elements. Provide temporary protection. Use curtains, barricades, or other appropriate methods. Take positive measures to prevent breakage of glass and damage to plastic, aluminum, and other finishes.
- E. Repairs and Replacements: Promptly replace and repair damages to the approval of the Contracting Officer. Additional time required to secure replacements and to make repairs does not justify a time extension.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by the Contracting Officer. Provide materials suitable for use intended.
- B. Wood Enclosure Fence: Plywood, 8-feet high, framed with four 2 by 4 inch rails, with preservative treated wood posts spaced not more than 8-feet apart.
 1. Lumber and Plywood: Comply with requirements in SECTION 06100 - ROUGH CARPENTRY.
- C. Paint: Comply with requirements in SECTION 09901 - PAINTING.
- D. Water: Potable.

2.02 EQUIPMENT

- A. Field Offices:
1. Prefabricated or job-built construction with lockable entrances, operable windows, and serviceable finishes; air conditioned; insulated; 90-inch minimum height to ceiling; and on foundations adequate for normal office loading.
 2. Provide the following for job-built construction:
 - a. Light gage steel or wood stud grade framing and fire treated plywood or non-combustible composite panels.
 - b. Interior painting required; exterior painting not required.
 - c. Roofs: Metal sheet, asphalt shingles or roll roofing and insulated or with radiant barriers.
 - d. Door Hardware: Same as provided elsewhere on the construction project.
- B. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA recommended classes for exposures. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- C. Self Contained Combination Toilet and Urinal Units: Single occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material. One quarter of, or at least one unit(s) shall contain a handwash sink with potable water storage.
- D. Drinking Water Fixtures: Drinking water fountains or containerized, tap dispenser, bottled water drinking water units, or water cooler dispensing water at 45 - 55 degree F available at Field Office including paper cup supply.
- E. Electrical Outlets: Properly configured, NEMA polarized outlets to prevent insertion of 110 to 120V plugs into higher voltage outlets; equipped with ground fault circuit interrupters, reset button, and pilot light.
- F. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125V ac, 20 A rating, and lighting circuits may be nonmetallic sheathed cable.
- G. Data and Communication: Provide service and equipment throughout construction period.
1. Computer Internet Connection: Provide a high-speed connection (landline satellite or wireless), capable to connect to multiple users at the Department's Field Office. Connection shall be separate from the telephone service.

PART 3 - EXECUTION**3.01 INSTALLATION, GENERAL**

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

3.02 TEMPORARY UTILITY INSTALLATION

- A. General: No utilities are existing or available. Engage appropriate local utility company to install temporary service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
 - 1. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked in services.
- B. Storm Drainage: Drainage due to construction related activities into any storm drain and any major water runoff from the project site is generally prohibited. Drainage ditches, ponds or similar facilities capable of holding drainage water is recommended if possible. NPDES (National Pollutant Discharge Elimination System) permit is required for a project site one acre or more of land area (depending on configuration of a project site, it is possible that land area assumed to be less than one acre could be determined to be one acre or more and require a NPDES permit). Supporting documents such as Storm Water Pollution Control Plan, Spill Prevention and Response Plan, Storm Water Monitoring Plan, Best Management Practices Plan and other possible documents may be required for the permit application. The State Department of Health, Clean Water Branch should be contacted to determine all submission requirements for the permit application.
- C. Sewer Drainage: The respective environmental departments regulating wastewater for each County should be contacted to obtain a wastewater discharge permit if there is any intention to discharge effluents into any existing sewer manhole or to make a piping connection into any existing sewer line, if allowed by the County. A construction permit application may also be required if the intent is to make a temporary piping connection into the existing sewer line if the initial permit application for the project and associated design documents submitted did not include these details. There are regulations to determine what effluents may or may not be allowed to be discharged into the existing sewer system with temporary filtration, separators or other devices determined to be acceptable.
- D. Water Service: Make arrangements with the utility company for temporary use of water and pay for all expenses.
- E. Sanitary Facilities:
 - 1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
- F. Ventilation Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations. Select equipment that will not have a harmful effect on completed installations or elements being installed.

Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

- G. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnecting means, automatic ground fault interrupters, and main distribution switchgear. Make arrangements with the utility company for temporary use of electrical power and pay for all expenses.
- H. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment. Protect wiring, in conduits or other, measures when exposed to possible damage or traffic areas.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
- J. Telephone Service: Provide temporary telephone service throughout construction period for common use facilities used by all personnel engaged in construction activities. Install separate telephone line for the Department's field office and each Contractor's field office and first aid station.
 - 1. At field office, provide land-line telephone service or if approved by the Contracting Officer, wireless (digital or cellular) telephone service. Provide internet service with ISP with unlimited access. Provide broadband where available.
 - 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments,
 - b. Ambulance service,
 - c. Contractor's home office,
 - d. Contract contacts,
 - e. Subcontractors
 - f. Suppliers
 - g. Department Staff contacts,
 - h. Construction Coordinator
 - i. Inspector
 - j. State's Emergency contacts,
 - k. Construction Coordinator after hours
 - l. Inspector after hours
 - m. Principal Subcontractors' field and home offices,

- n. User's office and emergency.
- 3. Provide a portable wireless telephone with voicemail or messaging service for superintendent's use in making and receiving telephone calls when away from field office.

3.03 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Locate storage sheds, and other temporary construction and support facilities for easy access as coordinated with the Contracting Officer.
 - 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion.
- B. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.
- C. Site Drainage:
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
 - 2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
- D. Project Sign and Temporary Sign(s):
 - 1. Provide and install project identification sign and other signs as listed. Sign designs are attached to Part 3 of this Section:
 - a. Project Sign
 - b. Warning Signs
 - 2. Install signs where directed by the Contracting Officer or where indicated to inform public and persons seeking entrance to the Project. Do not permit installation of unauthorized signs.
 - 3. Provide temporary signs to provide directional information to constructional personnel and visitors.
 - 4. Construct signs with durable materials, properly supported or mounted, and visible.
- E. Trash, Refuse Disposal:
 - 1. Department of Health – Illegal Dumping Notice. See attachment to Part 3 of this section.
 - a. This Notice to be printed out on 8.5x11" paper.

- b. This Notice to be posted at the job site field office and/or in locations visible to all contractors, subcontractors, suppliers, vendors, etc. throughout the duration of the project.
2. Illegal Dumping of solid waste could subject the Contractor to fines and could lead to felony prosecution in accordance with Chapter 342H, HRS. For more information, see the following web site:
<http://www.hawaii.gov/health/environmental/waste/sw/pdf/llldump.pdf>
3. Provide waste collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste.
4. Do not burn debris or waste materials on the project site.
5. Do not bury debris or waste material on the project site unless specifically allowed elsewhere in these specifications as backfill material.
6. Haul unusable debris and waste material to an appropriate off site dump area.
 - a. Water down debris and waste materials during loading operations or provide other measures to prevent dust or other airborne contaminants.
 - b. Vacuum, wet mop, or damp sweep when cleaning rubbish and fines which can become airborne from floors or other paved areas. Do not dry sweep.
 - c. Use enclosed chutes or containers to conveying debris from above the ground floor level.
7. Clean up shall include the collection of all waste paper and wrapping materials, cans, bottles, construction waste materials and other objectionable materials, and removal as required. Frequency of clean up shall coincide with rubbish producing events.

3.04 ENVIRONMENTAL CONTROLS

- A. General: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Dust Control:
 1. Prevent dust from becoming airborne at all times including non working hours, weekends and holidays in conformance with the State Department of Health, Administrative Rules, Title 11, Chapter 60.1 Air Pollution Control.
 2. Contractor is responsible for and shall determine the method of dust control. Subject to the Contractor's choice, the use of water or environmentally friendly chemicals may be used over surfaces that create airborne dust.
 3. Contractor is responsible for all damage claims due to their negligence to control dust.

C. Noise Control:

1. Keep noise within acceptable levels at all times in conformance with the State Department of Health, Administrative Rules, Title 11, Chapter 46 Community Noise Control. Obtain and pay for the Community Noise Permit when construction equipment or other devices emit noise at levels exceeding the allowable limits.
2. Ensure mufflers and other devices are provided on equipment, internal combustion engines and compressors to reduce loud disruptive noise levels and maintain equipment to reduce noise to acceptable levels.
3. Unless specified elsewhere, do not start construction equipment that meet allowable noise limits prior to 6:45 A.M. or equipment exceeding allowable noise levels prior to 7:00 A.M.

D. Erosion Control:

1. During grading operations, maintain the grade to prevent damage to adjoining property from water and eroding soil.
2. Install temporary berms, cut off ditches and other provisions needed for construction methods and operations. Should there be a question if the temporary measures are insufficient to prevent erosion, the Contracting Officer shall make the final determination.
3. Construct and maintain drainage outlets and silting basins where shown on the Drawings and when required to minimize erosion and pollution of waterways during construction.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect existing landscaping and tree root systems from damage, flooding, and erosion due to construction activity.

F. Pest Control: Before demolition and excavation work begins, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest control service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

3.05 VIOLATION OF ENVIRONMENTAL PROVISIONS

A. Violations of any of the above environmental control requirements or any other pollution control requirements; which may also be specified in the other Specifications sections, shall be resolved under the SUSPENSION and CORRECTIVE WORK Section of the GENERAL CONDITIONS.

3.06 BARRICADES AND ENCLOSURES

- A. Barricades: Before construction operations begin, erect temporary construction barricade(s) to prevent unauthorized persons from entering the project area and to the extent required by the Contracting Officer.
 - 1. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Contracting Officer with 2 sets of keys.
 - 3. Maintain temporary construction barricade(s) throughout the duration of the Work. During the course of the project, the Contracting Officer may require additional barricades be provided for the safety of the public. Contractor shall erect the additional barricade(s) at its own expense.
 - 4. Construction
 - a. Wood
- B. Opening Protection:
 - 1. Vertical Openings: Close openings with plywood or similar materials.
 - 2. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load bearing, wood framed construction.
 - 3. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire retardant treated material for framing and main sheathing.

3.07 TEMPORARY FIRE PROTECTION

- A. Until fire protection needs are supplied by permanent facilities, install, and maintain temporary fire protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
 - a. Field Offices: Class A stored pressure water type extinguishers.
 - b. Other Locations: Class ABC dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for exposures.
 - c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
 - 2. Store combustible materials in containers in fire safe locations.
 - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire exposure areas.
 - 4. Supervise welding operations, combustion type temporary heating units, and similar sources of fire ignition.
 - 5. Develop and supervise an overall fire prevention and first aid fire protection program for personnel at Project site. Review needs with local fire

department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

6. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
7. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.08 OPERATION, TERMINATION, AND REMOVAL

- A. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by heat temperatures and similar elements.
- B. Termination and Removal: Remove each temporary facility when need for its service has ended, or when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are the property of Contractor. The Department reserves the right to take possession of Project identification signs.

3.09 ATTACHMENTS

- A. Project Sign Drawings.
 1. Standard Detail for Project Sign Layout - DETAIL A/TG 01500.
 2. Standard Detail for Project Sign Specifications - DETAIL B/TG 01500.
 3. Standard Detail for Project Sign Details - DETAIL C/TG 01500.
- B. Warning Sign: Requirements for Warning Sign.
- C. Department of Health – Illegal Dumping Notice

END OF SECTION

LETTER STYLE

COPY IS CENTERED AND SET IN ADOBE TYPE FUTURA HEAVY. IF THIS SPECIFIC TYPE IS NOT AVAILABLE, FUTURA DEMI BOLD MAY BE SUBSTITUTED. COPY SHOULD BE SET AND SPACED BY A PROFESSIONAL TYPESETTER AND ENLARGED PHOTOGRAPHICALLY FOR PHOTO STENCIL SCREEN PROCESS.

ART WORK

CONSTANT ELEMENTS OF THE SIGN LAYOUT – FRAME, OUTLINE, STRIPE, AND OFFICIAL STATE INFORMATION – MAY BE DUPLICATED FOLLOWING WORKING DRAWING MEASUREMENTS, OR BE REPRODUCED AND ENLARGED PHOTOGRAPHICALLY USING A LAYOUT TEMPLATE IF PROVIDED. THE "STATE OF HAWAII" MASTHEAD SHOULD BE REPRODUCED AND ENLARGED AS SPECIFIED, USING THE ARTWORK AS SHOWN.

TITLES

THE SPECIFIC MAJOR WORK OF THE PROJECT UNDER CONSTRUCTION IS EMPHASIZED BY USING 3 3/4" TYPE, ALL CAPITALS. SECONDARY INFORMATION SUCH AS LOCATIONS OR BUILDINGS USES 2 1/4" TYPE, ALL CAPITALS. OTHER RELATED INFORMATION OF LESSER IMPORTANCE USES 2 1/4" (CAPITAL HEIGHT) IN LOWER CASE LETTERS. ALL LINES OF TYPE SHOULD NOT EXCEED THE WIDTH OF THE 6'-2" STRIPE.

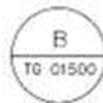
MATERIALS

PANEL IS 3/4" EXTERIOR GRADE HIGH DENSITY OVERLAID PLYWOOD, WITH RESIN BONDED SURFACES ON BOTH SIDES.

PAINTS & INKS

SCREEN PRINT INKS ARE MATTE FINISH. PAINTS ARE SATIN FINISH, EXTERIOR GRADE. REFERENCES TO AMERITONE COLOR KEY PAINT ARE FOR COLOR MATCH ONLY.

COLOR:	1.	1BL10A	BOHEMIAN BLUE
	2.	2H16P	SOFTLY (WHITE)
	3.	2VR2A	HOT TANGO (RED)
	4.	1M52E	TOKAY (GRAY)



PROJECT SIGN SPECIFICATIONS

EXHIBIT D

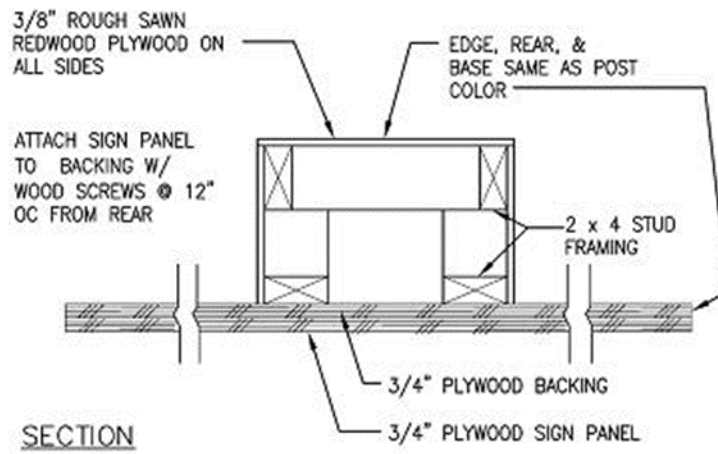
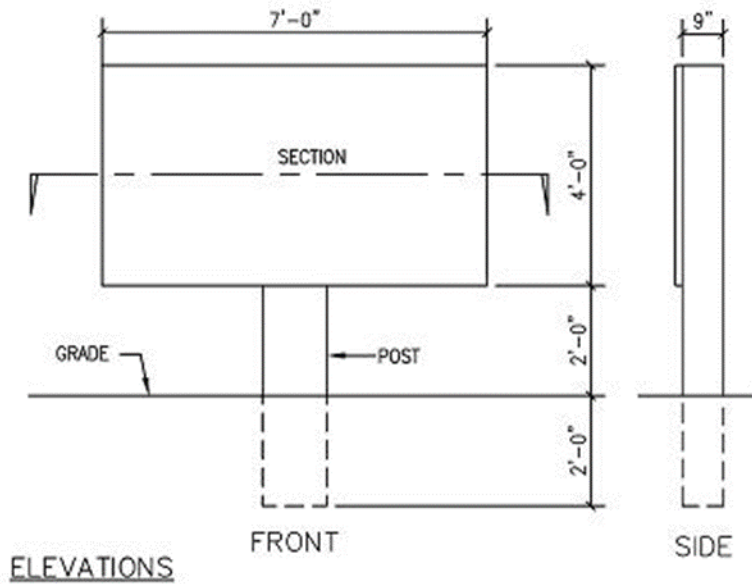
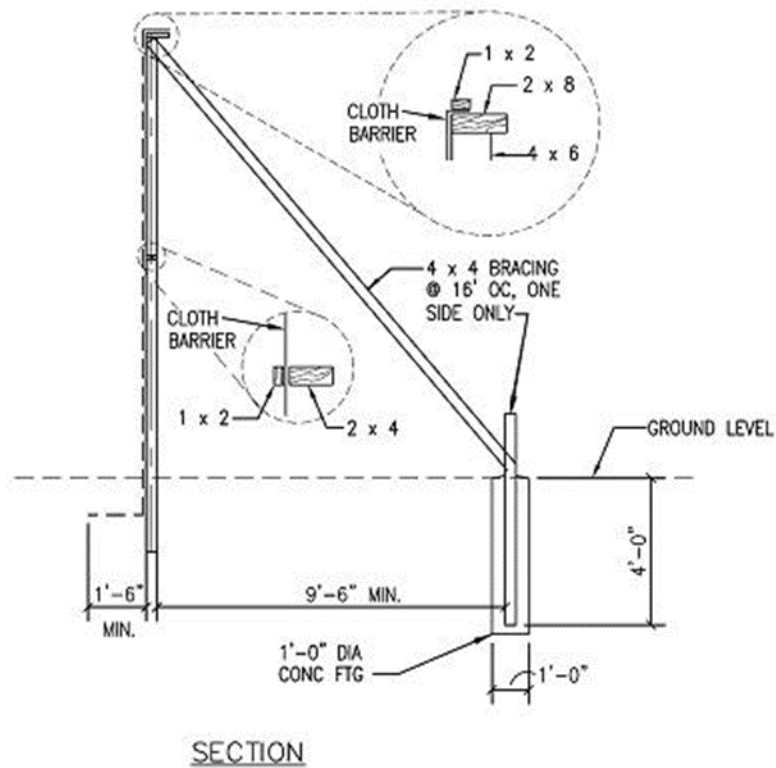
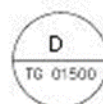


EXHIBIT D



NOTES:

1. CLOTH BARRIER NOT SHOWN IN FRONT VIEW.
2. CLOTH BARRIER TO BE "GEOTEXTILE" OR "NURSERY SHADE".
3. LUMBER SIZES ARE NOMINAL INCHES.
4. AS SHOWN CLOTH TO BE BURIED AT BASE TO INDICATED DIMENSION.
5. 1 x 2 CLOTH BARRIER CAPS TO BE NAILED @ 12" OC.
6. BURLAP IS NOT ACCEPTABLE AS THE CLOTH BARRIER.
7. CLOTH TO HAVE NO HORIZONTAL SEAMS.
8. VERTICAL SEAMS TO BE MADE OVER UPRIGHTS ONLY.
9. ALL SEAMS TO BE CAPPED WITH MINIMUM 1 x 2.
10. ALL JOINTS TO BE SECURELY FASTENED BY MECHANICAL MEANS.



STANDARD DETAIL FOR
DUST CONTROL FENCE

SCALE: NTS

REQUIREMENTS FOR WARNING SIGN

1. **General Requirements:** Furnish all labor, materials and equipments necessary to construct and install warning signs as specified hereinafter.
2. **Materials**
 - a. **Backing:** Backing shall be 6061-T6 aluminum 0.032-inch minimum thickness.
 - b. **Paint:** Paint shall be satin finish, exterior grade or factory baked enamel or a combination thereof.
3. **Colors:** Signs shall have white background. Remaining items shall be similar to Rust-Oleum Federal Safety Red.
4. **Requirements for Warning Sign:** Message configuration and dimensions shall be in accordance with the attached illustration.
5. **Installation**
 - a. Signs shall be located at 50-foot intervals around roped off work area or at all entrances in the case of interior work.
 - b. Signs shall be attached to the rope barrier, rope barrier supports, individual sign supports or buildings. Do not use nails to attach signs to building(s).
6. **Clean-up:** Remove all signs upon completion of project. Repair any damages caused by sign mounting and removal.

DEPARTMENT OF HEALTH ILLEGAL DUMPING NOTICE

***The law requires you to dispose
solid waste only at recycling or
disposal facilities
permitted by the Department of
Health.***

**“Solid waste” includes municipal
refuse, construction and demolition
waste, household waste, tires, car
batteries, derelict vehicles, green
wastes, furniture, and appliances.**

**Illegal dumping of solid waste
or allowing illegal disposal of solid
waste on your property even if
contractual or other arrangements
are made could subject you to fines
from \$10,000 to \$25,000 per
occurrence
and could lead to felony prosecution
in accordance with Chapter 342H,
HRS.**

**Contact the Department of Health,
Solid Waste Section at 586-4226
to report illegal dumping activities
or if you have further questions.**

SECTION 01524 - CONSTRUCTION WASTE MANAGEMENT

PART 4 - GENERAL

4.01 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. The State's goal is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that goal, the Contractor shall:
 - 1. Practice efficient waste management when sizing, cutting, and installing products and materials and
 - 2. Use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

4.02 DEFINITIONS

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

4.03 REFERENCES –

- A. *A Contractor's Waste Management Guide: Best Management Practices and Tools for Job Site Recycling and Waste Reduction in Hawaii*, 1999. Request a copy from the State of Hawaii, Clean Hawaii Center (808) 587-3802 or download from www.hawaii.gov/dbedt/ert/cwmg/index.html.

- B. *Minimizing Construction & Demolition Waste.* State of Hawaii, Department of Health guidance on construction and demolition (C&D) waste management and listing of permitted C&D waste management facilities. Download from www.state.hi.us/health/eh/shwb/sw.

4.04 PERFORMANCE REQUIREMENTS

- A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of [50] [75] <Insert number> percent by weight of total waste generated by the Work.
- B. Salvage/Recycle Requirements: Owner's requirement is to salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:
1. Demolition Waste:
 - a. Concrete.
 - b. Concrete reinforcing steel.
 - c. Structural and miscellaneous steel.
 - d. Windows.
 - e. Glazing.
 - f. Metal studs.
 - g. Equipment.
 - h. Plumbing fixtures.
 - i. Piping.
 - j. Supports and hangers.
 - k. Valves.
 - l. Sprinklers.
 - m. Mechanical equipment.
 - n. Refrigerants.
 - o. Electrical conduit.
 - p. Copper wiring.
 - q. Lighting fixtures.
 - r. Lamps.
 - s. Ballasts.
 - t. Electrical devices.
 - u. <Insert other materials required.>
 2. Construction Waste:
 - a. Site-clearing waste (including Green Waste, Soil, Rock).
 - b. Masonry and CMU.
 - c. Lumber.
 - d. Wood sheet materials.
 - e. Wood trim.
 - f. Metals.
 - g. Roofing.
 - h. Insulation.
 - i. Carpet and pad.
 - j. Gypsum board.

- k. Piping.
- l. Electrical conduit.
- m. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.
- n. <Insert other materials required.>

4.05 SUBMITTALS

- A. Waste Management Plan: Submit 3 copies of plan within 30 days of date established for the Notice to Proceed.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include separate reports for demolition and construction waste. Failure to submit this report may render the Payment Application incomplete and delay payment. Include the following information(the Progress Reports may be submitted in a form similar to Table 2 of Appendix A):
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons.
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
 - 8. Records (Donations, Sales, Recycling/Processing, Landfill/Incinerator) as described in the following paragraph)
- C. Before request for Substantial Completion, submit:
 - 1. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work. Fill out the actual quantities in Appendix A Table 2 WASTE REDUCTION WORK PLAN. Also include an actual Cost/Revenue analysis to be compared with the projected Cost/Revenue analysis of the Waste Management Plan (See Appendix A Table 3).
 - 2. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
 - 3. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

4. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
 5. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- D. Qualification Data: For Waste Management Coordinator and refrigerant recovery technician.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

4.06 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Submit qualifications of individual designated as Waste Management Coordinator, including resume and past related projects.
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
 2. Review requirements for documenting quantities of each type of waste and its disposition.
 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 5. Review waste management requirements for each subcontractor.

4.07 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Use the plan included in Appendix A of this section and fill out the appropriate items. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

EXHIBIT D

- B. Waste Management Coordinator: Indicate name of individual(s) to be responsible for implementing, monitoring, and reporting status of waste management plan.
- C. Waste Identification: Fill out Table 1 of Appendix A. Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- D. Waste Reduction Work Plan: Fill out the estimated quantities in Table 2 of Appendix A. The actual quantities will be filled out at the end of the project. List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.
- E. Cost/Revenue Analysis: Fill out Table 3 of Appendix A. Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
1. Total quantity of waste.
 2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 3. Total cost of disposal (with no waste management).
 4. Revenue from salvaged materials.
 5. Revenue from recycled materials.
 6. Savings from reusing materials versus purchasing new materials.
 7. Savings in hauling and tipping fees by donating materials.
 8. Savings in hauling and tipping fees that are avoided.
 9. Handling and transportation costs. Include cost of collection containers for each type of waste.
 10. Net additional cost or net savings from waste management plan.
- F. Forms: Prepare waste management plan on forms included in Appendix A.

PART 5 - PRODUCTS

- 5.01 MATERIALS – Recycled-content, salvaged, or otherwise resource-efficient products are specified in appropriate sections.

PART 6 - EXECUTION

6.01 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by the Contracting Officer. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
1. Comply with Division 1 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
1. Distribute waste management plan to everyone concerned within three days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
 3. Provide education for all on-site workers on efficient waste reduction and waste management when, sizing, cutting, and installing products and materials.
 4. Use meetings, signage, and subcontractor agreements to communicate the goals of the waste reduction plan. Consider incorporating the meetings with the safety meetings.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.
- E. Provide a central cutting area to facilitate re-use of existing cutoffs and to consolidate scrap for recycling.

6.02 SALVAGING DEMOLITION WASTE

- A. First consideration shall be given to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Sale or donation of waste suitable for reuse shall be considered.
- B. Salvaged Items for Reuse in the Work:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Items shall meet or exceed specification requirements.
 - 6. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- C. Salvaged Items for Sale and Donation: Sale not permitted on Project site. Labor for loading donated items is acceptable to local trade practices; union labor if applicable.
- D. Salvaged Items for Owner's Use:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- E. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- F. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- G. Metals: Separate metals by type.
- H. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- I. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- J. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
 - 1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
- K. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- L. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather. Properly dispose of liquids.
- M. Plumbing Fixtures: Separate by type and size.
- N. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- O. Lighting Fixtures: Separate lamps by type and protect from breakage.
- P. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- Q. Conduit: Reduce conduit to straight lengths and store by type and size.

6.03 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall **[accrue to the State] [accrue to Contractor] [be shared equally by Owner and Contractor]**.
- C. Hazardous Materials:
 1. Materials separated for recycling must be clean: materials must not contain contaminants such as lead-based paint, asbestos, PCB's, or Freon.
 2. Manage hazardous waste materials separately from recyclable materials.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Make sure bins are in convenient locations as close as possible to where material is being generated.
 - b. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 4. Store components off the ground and protect from the weather.

5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

6.04 RECYCLING DEMOLITION WASTE

- A. Asphaltic Concrete Paving: Grind asphalt to maximum [1-1/2-inch (38-mm)] [4-inch (100-mm)] size.
 1. Crush asphaltic concrete paving and screen to comply with requirements in Division 2 Section "Earthwork" for use as base course.
- B. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.
- C. Clean Concrete: Remove reinforcement, other metals, and other contaminants from concrete and sort with other metals.
 1. Pulverize concrete to maximum [1-1/2-inch (38-mm)] [4-inch (100-mm)] size.
 2. Crush concrete and screen to comply with requirements in Division 2 Section "Earthwork" for use as satisfactory soil for fill or subbase.
- D. Clean Masonry: Remove metal reinforcement, anchors, ties, and other contaminants from masonry and sort with other metals.
 1. Pulverize masonry to maximum [3/4-inch (19-mm)] [1-inch (25-mm)] [1-1/2-inch (38-mm)] [4-inch (100-mm)] size.
 - a. Crush masonry and screen to comply with requirements in Division 2 Section "Earthwork" for use as [general fill] [satisfactory soil for fill or subbase].
 - b. Crush masonry and screen to comply with requirements in Division 2 Section "Exterior Plants" for use as mineral mulch.
 2. Clean and stack undamaged, whole masonry units on wood pallets.
- E. Clean untreated, unpainted wood: Send to permitted recycling facility.
- F. Green waste: Send to permitted recycling facility.
- G. Clean Metals: Send to permitted recycling facility.

6.05 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 2. Polystyrene Packaging: Separate and bag materials.
 3. Untreated Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down

- pallets into component wood pieces and comply with requirements for recycling wood.
4. Untreated Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Site-Clearing Wastes: Chip brush, branches, and trees [on-site] [at **permitted recycling facility**].
1. Comply with requirements in Division 2 Section "Landscape Planting" for use of chipped organic waste as organic mulch.
- C. Wood Materials:
1. Untreated Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 2. Untreated Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Division 2 Section "Landscape Plating" for use of clean sawdust as organic mulch.
- D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
 - a. Comply with requirements in Division 2 Section "Landscape Planting" for use of clean ground gypsum board as inorganic soil amendment.

6.06 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator currently permitted to authorities having jurisdiction.
1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them at a permitted landfill.

END OF SECTION 01524

APPENDIX A

WASTE MANAGEMENT PLAN

Project Title: **<Insert Project Title>**

HCDA Job No.: **<Insert Job Number>**

Waste Management Coordinator: **<Insert Name, Title, and contact information>**

Recycling Requirement – To recycle/salvage **<Insert Percentage>** of waste generated on the site.

EXHIBIT D

TABLE 1: WASTE IDENTIFICATION

Material	Est. Qty.	Est. tons *	Point of Generation	Comments/Assumptions

* Avg volume-to-weight conversions are:

- Mixed waste 5.7 yds/ton
- Wood 6.7 yds/ton
- Cardboard 20 yds/ton
- Drywall 4 yds/ton
- Rubble 1.4 yds/ton

EXHIBIT D

TABLE 2: WASTE REDUCTION WORK PLAN

Material	S/R/D *	Est Qty S/R/D (tons)	Actual Qty S/R/D(tons)	Handling and Transport Procedures	Destination (Name, address, phone) **

*S Salvage/Reuse
 R Recycle
 D Dispose

** For materials sent for recycling or disposal, send to facilities currently permitted by the DOH, Solid Waste Section (808) 586-4226.
 No solid waste management permit required for on-site processing of clean waste concrete, provided the processed product meets the “inert fill material” definition in Chapter 342H, HRS.
 Solid Waste Management Permit required if destination site accepts for processing such waste materials (eg. Clean waste concrete) from other sites.

EXHIBIT D

TABLE 3: COST/REVENUE ANALYSIS

Material	Est Cost of Disposal(1)	Est Revenue from Salvage/Recycle(2)	Est Cost of Salvage/Recycle(3)	Est Net Savings/Cost (1)+(2)-(3)

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. Progress cleaning.
 - 4. Starting and adjusting.
 - 5. Protection of installed construction.
 - 6. 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 Contracting Officer and the Project Contact Person 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. Utility Services: No utilities are existing or available to the Contractor. Contractor will provide temporary electrical and other utility services. Pay for temporary services as part of the contract.
- C. 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 school.
- D. Contractor, Subcontractor(s) and their employees will not be allowed to park in the school parking zones or property.

1.05 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A professional engineer with a license to practice in Hawaii.

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 Contracting Officer and make any change in accordance with the Contracting Officer 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 Contracting Officer 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 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 SITE UTILITIES AND TONING

- A. Cooperate, coordinate and schedule work to maintain construction progress, and accommodate the operations and work of the owners of underground or overhead utility lines or other property in removing or altering the lines or providing new services.
- B. Contact all the various utility companies before the start of the work to ascertain any existing utilities and to develop a full understanding of the utility requirements with respect to this Project. Furnish the Contracting Officer with evidence that the utility companies were contacted.
- C. Should the Contractor discover the existence and location of utilities in the contract drawings are not correct, do not disturb the utilities and immediately notify the Contracting Officer.
- D. Do not disturb or modify any utilities encountered, whether shown or not on the Contract Drawings, unless otherwise instructed in the drawings and

specifications or as directed by the Contracting Officer. Repair and restore to pre-damaged condition any utilities or any other property damaged by construction activities.

- E. Transfer to "Field Posted As-Built" drawings the location(s) and depth(s) of new and existing utilities that differ from the Contract Drawings. Locate by azimuth and distance and depth(s) from fixed referenced points.
- F. Toning: Prior to the start of grading, or excavation or trenching work verify and confirm the presence, location, and depth of existing underground utility lines in the area affected by the project, by "toning" or by other appropriate means acceptable to the Contracting Officer. The intent of this advanced toning is to afford the Contracting Officer an opportunity to identify utility lines that may or may not be shown on the drawings and issue a directive to address the existing conditions.
 - 1. Perform toning using instruments specifically developed and designed for the detection of underground pipes and cable utilities.
 - 2. Notify the Contracting Officer forty-eight (48) hours in advance before toning operations. Provide information on the proposed toning method and other pertinent information.
- G. Recording Toning Information: Upon completion of the toning operation, submit drawings that show the location and approximate depth of the existing and newly discovered utility lines. Identify the type of utility lines. Also, identify where utility lines indicated on the drawings are not shown in their approximate location or where new utility lines are found or pointed out in the field.
- H. After ascertaining the exact location and depth of utilities within the project area, mark and protect the locations.
 - 1. Acquaint personnel working near utilities with the type, size, location, depth of the utilities, and the consequences that might result from disturbances.
 - 2. Do not start trenching or start similar operations until reasonable and appropriate precautions to protect the utilities are taken.
- I. For newly identified utility lines, if directed by the Contracting Officer, manually excavate within 2-feet of the utility line to avoid damage. Under this directive, manual excavation is considered additional work.
- J. Existing Irrigation System: Where work is located in areas with existing irrigation systems, Contractor shall test the existing systems and document all deficiencies prior to any work that may damage the existing systems.

3.03 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.

3.04 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to existing conditions. If discrepancies are discovered, notify the Contracting Officer promptly.

3.05 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent or temporary benchmarks, control points and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 1. Do not change or relocate existing benchmarks or control points without the Contracting Officer's approval. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to the Contracting Officer before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base all replacements on the original survey control points.

3.06 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.

3.07 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 Contracting Officer.
- B. Provide patch materials and workmanship of equal quality to that indicated on the drawings or specified for new work.

3.09 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 seven (7) days unless approved otherwise by the Contracting Officer.

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.

3.10 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.

3.11 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.

3.12 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 01322 – WEB BASED CONSTRUCTION MANAGEMENT for use of the StateWebCM for electronic submittals.
 - 2. 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 Article 7 of the GENERAL CONDITIONS.
 - 1. Advise the Contracting Officer 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 Contracting Officer.
 - 4. Arrange to deliver tools, spare parts, extra materials, and similar items to a location designated by the Contracting Officer. Label with manufacturer's name and model number where applicable.
 - 5. Make final changeover of permanent locks and deliver keys to the Contracting Officer. 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 Contracting Officer 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.
14. Submit Field-Posted As-Builts electronically per SECTION 1322 – WEB BASED CONSTRUCTION MANAGEMENT

1.03 FINAL COMPLETION

- A. Preliminary Procedures: Within ten (10) days from the Project Acceptance Date, complete the following items in addition to requirements of GENERAL CONDITIONS Article 7 PROSECUTION AND PROGRESS:
 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 two (2) copies of any updated and action taken list. In addition to requirements of GENERAL CONDITIONS Article 7 PROSECUTION AND PROGRESS, 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. HCDA 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 GENERAL CONDITIONS.
 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 Contracting Officer’s reference during normal working hours and electronically per SECTION 1322 – WEB

BASED CONSTRUCTION MANAGEMENT. 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 Contracting Officer 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 Contracting Officer.
 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 electronically on the same sheet 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 supersede 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 Contracting Officer any discrepancy between the changes made by the Designer and those depicted on addendum, PCD, and sketch changes. The Contracting Officer will resolve any conflicts.
 6. Submit final Record Documents (Field Posted Record Drawings) before the Final Inspection Date and no later than the Contract Completion Date, unless the GENERAL CONDITIONS require otherwise.
 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 Contracting Officer.
 9. Deliver tools, spare parts, extra materials, and similar items to a location designated by the Contracting Officer. Label with manufacturer's name and model number where applicable.
 10. Submit Final, corrected O&M Manual(s).
- B. Record Drawings:
1. Maintain a duplicate full-size set as the Field Posted Record ("As-Builts") 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 Contracting Officer 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 Contracting Officer at any time so that its clarity and accuracy can be monitored and can be countersigned for validity.
 - 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 (including all addenda, PCD, and sketches) 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 or use digital electronic signature as approved by the Contracting Officer.
 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: _____
[Company Name]	RECORD DRAWINGS	[Contractor's

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 and 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 upload electronically per SECTION 1322 – WEB BASED CONSTRUCTION MANAGEMENT.

1.06 WARRANTIES

- A. Submittal Time: Submit written manufacturer's warranties at request of the Contracting Officer 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 forty-five (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, **HCDA** 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 uploaded electronically per SECTION 1322 – WEB BASED CONSTRUCTION MANAGEMENT.
- D. Provide two (2) sets of manufacturer's warranties that exceed one year and one CD as part of the closing document submittal. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.07 OPERATION AND MAINTENANCE MANUALS

- A. Assemble complete set 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 three (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, Job Number, Prepared For: Department of Accounting and General Services – Public Works, Prepared By: "Contractor" and Volume Number. Each binder is a single volume.

- D. Electronic Format:
 1. Provide all information (narratives, drawings and manual) in electronic PDF format and upload per SECTION 1322 – WEB BASED CONSTRUCTION MANAGEMENT. Provide Compact Disc (CD) or DVD if files are too large. 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 uploaded per SECTION 1322 – WEB BASED CONSTRUCTION MANAGEMENT. Scanned

documents shall be scanned at 600 DPI or better. Indexes and bookmarks may be highlighted or colored text.

- E. Pre-Final Submittal: Submit one (1) printed set of Final Operation and Maintenance Manual, for review by the Contracting Officer, at least five (5) days prior to scheduled final inspection. Manuals shall be marked as Pre-Final.
 - 1. Make any correction noted before submitting the final Operation and Maintenance Manuals.
 - 2. The 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. Upload Final Submittal per SECTION 1322 – WEB BASED CONSTRUCTION MANAGEMENT. Final printed manual and any disks shall be marked as Final and sent to the Contracting Officer.

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 Contracting Officer with at least seven (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 PROGRESSIVE CLEANING

- A. General: Provide progressive final cleaning <for each phase of work prior to starting the next phase>. 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. Remove labels that are not permanent.
 11. 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.

EXHIBIT D

- a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 12. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 13. Replace parts subject to unusual operating conditions.
 14. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 15. Replace disposable air filters and clean permanent air filters. Clean the exposed surfaces of diffusers, registers, and grills.
 16. Clean ducts, blowers, and coils if units were operated without filters during construction.
 17. 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.
 18. 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

DIVISION 2 - EXISTING CONDITIONS

SECTION 02072 – MINOR DEMOLITION FOR REMODELING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS: The General Terms and Conditions, **HCDA/State of Hawaii** (not specifically attached), the Special Provisions, and all other applicable documents preceding these specifications shall govern all work specified hereinafter in all DIVISIONS AND SECTIONS.

1.02 WORK INCLUDED: Furnish all labor, materials, tools, and equipment necessary to complete all miscellaneous work as required and specified hereinafter.

- A. Demolition work shall include, but not necessarily be limited to the following:
 - 1. Removal of window walls & selected steel beam, flashing, see plan.
 - 2. Removal of existing electrical and mechanical equipment, see plan.
 - 3. Removal of fire sprinkler heads and piping see plan.
- B. The Contractor shall visit the site, examine the areas and note all existing conditions and extent of work involved for the complete removal and surface preparation work required.
- C. All removed materials shall become the property of the Contractor and shall be completely removed, hauled away from the premises and properly disposed of according to State and County regulations at his own expense, except for items as noted on the plans.
- D. Miscellaneous patch work is required as a result of removal work and other damages already existing.
- E. The Contractor shall comply with all pollution control regulations and safety codes.
- F. Clean up.

2.01 MATERIALS

- A. Products shall be as specified and/or the best of their respective trades, matching existing.

3.01 REMOVAL AND DEMOLITION:

EXHIBIT D

- A. All work shall be executed in a safe, neat, orderly, and careful manner with due consideration for the remaining parts of the building.
- B. PATCHING: All areas damaged as a result of demolition work and those already existing shall be patched to match existing.
- C. CLEAN UP: Clean up and remove all debris accumulated from demolition construction operations from time to time, when and as directed by the Officer-in-Charge. Upon completion of the construction work and before final acceptance of work, remove all surplus materials, equipment, etc., and leave entire jobsite clean and neat.

END OF SECTION

DIVISION 3 - CONCRETE

SECTION 03740 - CONCRETE REPAIRS

PART 1 - GENERAL

- 1.01 **GENERAL REQUIREMENTS:** The General Terms and Conditions, City and County of Honolulu (not specifically attached), the Special Provisions, and all other applicable documents preceding these specifications shall govern all work specified hereinafter in all DIVISIONS AND SECTIONS.
- 1.02 **WORK INCLUDED:** To furnish all labor, materials, and equipment necessary to repair concrete cracks, etc., complete as shown on the drawings and herein specified.
- 1.03 **DELIVERY:** Materials shall be delivered to the jobsite in the manufacturer's original unopened containers with the manufacturer's name, brand name, and type description clearly marked thereon. Materials which have passed their shelf life dates shall be rejected.

PART 2 - PRODUCT

- 2.01 **MATERIAL:** Material shall be low viscosity epoxy, Euco 452 LV Epoxy System as manufactured by Euclid Chemical Company, Cleveland, Ohio; or approved equal.

PART 3 - EXECUTION

- 3.01 **PATCHING PROCEDURE:** The Contractor shall follow the manufacturer's recommendations and as specified below.
- A. A neat cut shall be made around all spalled and cracked areas to be patched. Neat cuts shall be made with a saw or other approved mechanical means. Neat cuts shall be made perpendicular to the floor face and be at least one-half inch (1/2") deep.
 - B. After the neat cuts have been made, remove all spalled areas and loose concrete by means of wire brush and blow out with compressed air. Do not damage existing concrete that will remain.
 - C. The surface must be structurally sound and free of contaminants such as oil, grease, dust, dirt, and debris. For best bond, use acid etching, sandblasting, or other mechanical blasting methods.
 - D. Thorough and complete blending is critical. Pour all of Part B into all of Part A and blend with a drill and Jiffy mixer or prop.

EXHIBIT D

Run drill at low speeds to minimize entrapped air. Mix for 1 to 2 minutes. Part A is pigmented white and Part B is black. After mixing, the material should be gray in color without any streaks. (Watch material temperatures since pot life will shorten dramatically at high temperatures.)

- E. After cleaning and preparing the cracks, pour Euco 452 LV epoxy along the cracks and allow to seep in. Add more materials as it settles. Pressure inject Euco 452 LV epoxy for type of cracks which require injection under pressure. Clean surface of slab of excess epoxy before it hardens.
- F. No curing membranes or materials are required. Euco 452 LV Epoxy is self-curing.
- G. Tools and equipment may be cleaned with Euco solvent, xylene, or aromatic solvents.

3.02 **CLEAN UP:** Upon completion of work in this section, remove all surplus materials, rubbish, and debris and leave the site in a neat condition.

END OF SECTION

DIVISION 5 - METALS

SECTION 05120 – STRUCTURAL STEEL

PART 1 – GENERAL

2.01 SUMMARY

- A. This Section includes the following:
 - 1. Structural steel.
- B. Related Sections include the following:
 - 1. SECTION 09900 - PAINTING for surface preparation and priming requirements.

1.02 SUBMITTALS

- A. Submit in accordance with SECTION 01330 – SUBMITTALS.
- B. Product Data: For each type of product specified.
- C. Shop Drawings detailing fabrication of structural steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
 - 5. Shop drawings made from reproductions of the contract documents are not acceptable.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses of architects and owners, and other information specified. Submit AISC Fabrication Plant Quality Certification. At completion of fabrication, the Fabricator shall submit a certificate of compliance stating that the work was performed in accordance with the construction documents.
- E. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, "Structural Welding Code - Steel, " for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
 2. Electrode manufacturer and trade name, for demand critical welds.
- F. Welding certificates.
- G. Mill test reports for structural steel, including chemical and physical properties.
- H. Product Test Reports: For the following:
1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 2. Shop primers.
- I. Field quality-control test and inspection reports.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work. Fabricator shall be designated an AISC-Certified Plant, Category STD.
- C. Comply with the applicable provisions of the following specifications and documents:
1. AISC 303-16 "Code of Standard Practice for Steel Buildings and Bridges."
 2. AISC 341-16 "Seismic Provisions for Structural Steel Buildings."
 3. AISC 360-16 "Specification for Structural Steel Buildings."
- D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."
1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports.

Protect steel members and packaged materials from corrosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.05 COORDINATION

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

4.01 MATERIALS

- A. Plates: ASTM A36.
- B. Welding Electrodes: Comply with AWS requirements.
- C. Structural Steel Tubing: ASTM A500, Grade C.
- D. Headed Anchor Rods: ASTM F1554, Grade 36, straight.
 1. Nuts: ASTM A 563 hex carbon steel.
 2. Plate Washers: ASTM A 36 carbon steel.
 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
 4. Finish: Hot-dip zinc coating, ASTM A 153, Class C.
- E. Welding Electrodes: Comply with AWS requirements.

2.02 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI#79 and compatible with any topcoat.
- B. Galvanizing: Steel components as required on drawings and at all exposed conditions shall be hot-dipped galvanized in accordance with ASTM A 123 and ASTM A 153, as applicable.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, complying with ASTM A 780.

2.03 FABRICATION

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
1. Mark and match-mark materials for field assembly.
 2. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
 3. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
- B. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and shop roughness.
1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
 2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges, " for architecturally exposed structural steel.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- E. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.
1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

2.05 SHOP CONNECTIONS

- A. Shop install and tighten non-high-strength bolts, except where high-strength bolts are indicated.
- B. Weld Connections: Comply with AWS D1.1 for tolerances, procedures, appearances and quality of welds, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp or exceeding tolerances in AISC 303 for mill material.
 - 2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2-inch and larger. Grind flush butt welds. Dress exposed welds.

2.06 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 - 1. Surfaces to be field welded.
 - 2. Surfaces to receive sprayed-on fireproofing.
 - 3. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:
 - 1. SSPC-SP 2 "Hand Tool Cleaning."
 - 2. SSPC-SP 3 "Power Tool Cleaning."
 - 3. SSPC-SP 5 "White Metal Blast Cleaning."
 - 4. SSPC-SP 6 "Commercial Blast Cleaning."
 - 5. SSPC-SP 7 "Brush-Off Blast Cleaning."
 - 6. SSPC-SP 8 "Pickling."
 - 7. SSPC-SP 10 "Near-White Blast Cleaning."
 - 8. SSPC-SP 11 "Power Tool Cleaning to Bare Metal."
 - 9. SSPC-SP 14 "Industrial Blast Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC's "Painting System Guide No. 7" to provide a dry film thickness of not less than 1.5 mils.

2.07 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123.

2.08 SOURCE QUALITY CONTROL

- A. Fabricators shall participate in the AISC Quality Certification Program and work in accordance with their written procedural and quality control manuals and periodic auditing of fabrication practices by independent inspection agencies.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, in accordance with Fabricator's written procedural and quality control manuals.
 - 1. Liquid Penetrant Inspection: ASTM E165.
 - 2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Radiographic Inspection: ASTM E94; minimum quality level "2-2T."
 - 4. Ultrasonic Inspection: ASTM E164.
- E. In addition, to visual inspection, shop-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:
 - 1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

5.01 EXAMINATION

- A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

- B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Retain the services of a professional structural engineer licensed in Hawaii to design and supervise installation of any temporary supports. Remove temporary supports when permanent structural steel, connections and bracing are in place, unless otherwise indicated.

3.03 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges. " Maintain erection tolerances of architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges. "
- C. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowance for differences between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- D. Splice members only where indicated.
- E. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- F. Do not use thermal cutting during erection, unless approved by Contracting Officer. Finish sections thermally cut within smoothness limits in AWS D1.1.
- G. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.04 FIELD CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1 for tolerances, procedures, appearances and quality of welds, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp or exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 - 3. Verify that weld sizes, fabrication sequences, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2-inch and larger. Grind flush butt welds. Dress exposed welds.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
 - 1. Liquid Penetrant Inspection: ASTM E165.
 - 2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Radiographic Inspection: ASTM E94; minimum quality level "2-2T."
 - 4. Ultrasonic Inspection: ASTM E164. All complete penetration welds must be ultrasonically tested.
- E. In addition to visual inspection, field-welded shear connections will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:
 - 1. Bend test will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.

2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

3.06 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same materials as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on structural steel are included in SECTION 09901 - PAINTING.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.

END OF SECTION

SECTION 05400 – COLD-FORMED METAL FRAMING

PART 1 – GENERAL

3.01 SUMMARY

B. This Section includes the following:

1. Cold-formed steel wall framing at elevator enclosure

C. Related Work Described Elsewhere: SECTION 09200 - GYPSUM BOARD.

1.02 SUBMITTALS

A. Submit in accordance with SECTION 01330 – SUBMITTALS.

B. Product Data: For each type of stud, accessory, and product indicated.

C. Shop Drawings detailing fabrication of structural steel components.

1. Include layout, spacing, sizes, thicknesses, and types of cold-formed wall framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

D. Qualification Data: For testing agency.

E. Mill test reports for structural steel, including chemical and physical properties.

F. Product Test Reports: For each listed product, for tests performed by a manufacturer and witnessed by a qualified testing agency or performed by a qualified testing agency.

1. Steel sheet.
2. Power-actuated anchors.
3. Mechanical fasteners.
4. Miscellaneous structural clips and accessories.

1.03 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified testing agency, or inhouse testing with calibrated test equipment, indicating steel sheet complies

with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling in accordance with ASTM C1007.

6.01 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated on the drawings, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329-inch.
 - 2. Flange Width: 1-1/4 inches minimum.
 - 3. Materials must conform to the minimum standard as follows:
 - a. 18 Gauge and Lighter: ASTM A653 SS Grade 33 or ASTM A1011 SS Grade 33
 - b. 16 Gauge and Heavier: ASTM A653 SS Grade 50, Class 1 or 3 or ASTM A1011 SS Grade 50
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated on the drawings, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: Matching steel studs.
 - 2. Flange Width: 1-1/4 inches minimum.
- C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428-inch.
 - 2. Flange Width: One-inch plus the design gap for one-story structures.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: 0.032-inch.
 - b. Flange Width: One-inch plus the design gap for one-story structures.
 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: 0.032-inch.
 - b. Flange Width: Equal to sum of outer deflection track flange width plus one-inch.
- F. Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.02 ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A1003/A1003M, structural grade, Type H, metallic coated, of same grade and coating used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

2.03 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.
- B. Power-Actuated Fasteners: Fastener system of type suitable for application, fabricated from corrosion-resistant materials, with capability to sustain, without failure, allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.
- C. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

2.04 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780/A780M.
- B. Shims: Load bearing, of high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

2.05 FABRICATION

- A. Fabricate cold-formed steel walls and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate walls using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than 3 exposed screw threads.
 - 4. Fasten other materials to cold-formed steel members by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: ASTM C955. Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8-inch in 10-feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8-inch.

7.01 EXAMINATION

- A. Examine supporting substrates, abutting structural framing, and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed steel trusses without reducing thickness of fire-resistive materials below that is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.03 EXTERIOR NON-LOAD BEARING WALL FRAMING INSTALLATION

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16-inch. Tolerance shall also meet the requirements indicated in paragraph entitled "Fabrication Tolerances" hereinabove and paragraph entitled "Erection Tolerances" hereinbelow.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by screw fastening. Wire tying of framing members is not permitted. Locate mechanical fasteners and install according to Structural Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

- H. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8-inch in 10-feet (1:960) and as follows:
1. Space individual framing members no more than plus or minus 1/8-inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
- I. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- J. Space studs as follows:
1. Stud Spacing: As indicated on the Structural drawings.
- K. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- L. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
1. Install single deep-leg deflection tracks and anchor to building structure.
 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 3. Connect vertical deflection clips to studs and anchor to building structure.
 4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- M. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Structural Drawings but not more than 48 inches apart. Fasten at each stud intersection.
1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12-inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - a. Install solid blocking at centers indicated on Shop Drawings.
 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- N. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.04 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Contracting Officer.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.05 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05500 - MISCELLANEOUS METALS
PART 7 - GENERAL

7.01 SUMMARY

- A. Provide all miscellaneous metal as indicated on the drawings and specified in this Section.
- B. Miscellaneous framing and supports. Include all anchors, angles, bolts for items, and other accessories shown in details and or required for the complete installation of work in all sections.

7.02 REFERENCES

- A. The publications and standards referenced herein form a part of the Specifications.
- B. ANSI A14.3 Ladders – Fixed – Safety Requirements.
- C. OSHA 1910.23 Ladders

7.03 SUBMITTALS

- A. Submit under provisions of SECTION 01330 – SUBMITTAL PROCEDURES.
- B. Shop Drawings:
 - 1. Before beginning fabrication of miscellaneous metal articles, the Contractor shall submit complete shop and erection drawings showing details of methods, materials, and finishes proposed for use. Shop drawings shall give complete information necessary for the fabrication of the component parts of the articles, including the location, type, and size bolts and welds. They shall clearly distinguish between shop and field bolts and welds.
- C. Test Reports and Certifications:
 - 1. The following documents shall be submitted:
 - a. Welding Procedure Specifications (WPS), per AWS D1.1, for welding procedures proposed for use in making production welds.
 - b. Welding Procedure Qualification Record (PQR) to support welding procedures proposed for production welds not otherwise prequalified.
 - c. Welding Performance Qualification for welders and welding operators to be employed on the Work.
 - d. Certified mill test reports for chemistry and mechanical properties.
 - e. Manufacturer's certification verifying conformance to these Specifications and that all products in contact with potable water are NSF-approved.

7.04 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall take reasonable care in the proper handling and storage of articles or materials during erection operations to avoid accumulation of dirt and

foreign matter. The Contractor shall remove from the articles or materials, dust, dirt, or other foreign matter that accumulates during construction. Coated surfaces shall be protected from abrasion or other damage during handling, storing, and erecting.

- B. Materials taken from stock by the Contractor shall be of a quality at least equal to that required by the ASTM specifications applicable to the classification covering the intended use and shall be supported by test reports prepared at the mill where the material was manufactured or at a testing laboratory approved by the Contracting Officer.
- C. Store products inside under cover until installation.

PART 8 - PRODUCTS

8.01 MATERIALS

A. Carbon Steel

- 1. Structural shapes shall be in accordance with ASTM A36.
- 2. Bars and shapes shall be in accordance with ASTM A36 or ASTM A108 Grade 1018.
- 3. Plate 2 inches and less in thickness shall be in accordance with ASTM A36 or ASTM A283 Grade C or Grade D.

B. Stainless Steel

- 1. All welded stainless steel materials shall be pickled and passivated after fabrication in accordance with the requirements of ASTM A380. The Contractor shall use pickling and passivating solution, for fieldwork.
- 2. Unless otherwise shown on the Drawings, materials in contact with water, intermittently or continuously, or in a wet or moist environment shall be stainless steel, Type 316L, where welding is required.
- 3. Stainless steel bars and shapes shall be in accordance with ASTM A276 Type 316L where welding is required, unless otherwise specified or shown on the Drawings.
- 4. Stainless steel plate, sheet, and strip shall be in accordance with ASTM A167 Type 316L where welding is required, unless otherwise specified or shown on the Drawings.
- 5. Rolled stainless steel shapes shall be in accordance with the requirements of ASTM A479, 316L where welding is required, heat treatment waived, unless otherwise specified or shown.
- 6. Stainless steel pipe shall be in accordance with ASTM A312 Type 316L.
- 7. Stainless steel tubing shall be in accordance with ASTM A554 Type MT316L.
- 8. Where shown on the Drawings, age-hardened stainless steel shall be in accordance with ASTM A564 Type 630, cold finished. Heat-treatment or age hardening shall be conducted at 900°F.
- 9. Stainless steel wire cloth shall conform to the requirements of ASTM E2016, Type 316.

C. Aluminum

1. Plate and sheet shall be in accordance with ASTM B209, Alloy No. 5052 H32.

D. Fasteners

1. Threads for bolts and nuts shall be in accordance with ANSI B1.1.
 - a. Threads for bolts 1-inch and less in diameter shall be coarse-thread series and threads for bolts 1 1/8-inch and greater in diameter shall be the 8pitch thread series. Anti – Seize shall be applied to all threads prior to installation.
 - b. The fit shall be Class 2 free fit; except that Class 3 medium fit shall be provided in holes tapped for studs.
2. Unless otherwise shown on the Drawings, bolts shall have heavy hexagon heads and heavy hexagon nuts.
3. The lengths of studs and bolts, excluding anchor bolts, shall provide a projection of not less than 1/4-inch nor more than 1/2-inch through the nut when it is drawn tight; however, in exposed locations the projection shall be not more than 1/4-inch.
4. Carbon Steel Nuts and Bolts
 - a. Carbon steel bolts, anchor bolts, and U-bolts, not in contact with water shall be in accordance with ASTM A307, Grade A.
 - b. Carbon steel nuts not in contact with water shall be in accordance with ASTM A563.
 - c. Steel washers shall be in accordance with ASTM F436.
 - d. Carbon steel bolts greater than 1-inch in diameter shall be the 8-pitch thread series and shall be ferritic steel in accordance with ASTM A193, Grade B7. Accompanying nuts shall be in accordance with ASTM A194, Grade 2H. Anti – Seize shall be applied to all threads prior to installation.
5. Stainless Steel Fasteners
 - a. Except as otherwise specified or shown on the Drawings, stainless steel fasteners shall be used where the material will be immersed in water, intermittently or continuously, or in moist-environment installations.
 - b. Stainless steel studs, bolts, nuts, and washers shall be stamped indicating the type of stainless steel.
 - c. Type 316 or 316N stainless steel fasteners shall be in accordance with ASTM A193 Grade B8MA or Grade B8MNA for bolting and stud material, and ASTM A194 Grade 8MA or Grade 8MNA for nuts. Fasteners for age-hardened stainless steel shall be manufactured in accordance with ASTM F593 and F594 Type 630. Anti – Seize shall be applied to all threads on all types of fasteners.
 - d. Stainless steel washers shall conform to ASTM F436 except that they shall be punched from steel conforming to ASTM 167 Type 316 or machined from bar stock conforming to ASTM A276 Type 316.

E. Welding Rods

1. Welding rods for welding carbon steel shall be E70XX low-hydrogen, in accordance with AWS A5.1 or A5.17 for welding carbon steel
2. Electrodes for welding stainless steel shall be Type E316L in accordance with AWS A5.4 or AWS A5.9
3. Electrodes for welding stainless steel to carbon steel shall be Classification
4. Number E309L or E312 in accordance with AWS A5.4 or A5.9.
5. Electrodes for welding aluminum shall be filler alloy 5356 in accordance with AWS A5.10.

F. Concrete Anchors

1. Concrete anchors shall be in accordance with Specifications Section 03250, Concrete Anchors. Stainless steel fasteners shall be used where the material will be immersed in water, intermittently or continuously, or in moist-environment installations.

G. Anti-Galling Compound

1. The anti-galling compound to be used on threads of carbon steel and stainless steel fastener assemblies shall be a compound certified by ANSI/NSF or EPA, for use in potable water systems.
2. Acceptable Products:
 - a. Ramco TRX-Synlube, Ramco Anti-Seize
 - b. Husk-It, Husky Lube-O-Seal
 - c. Or approved equal.

8.02 FABRICATION OF MISCELLANEOUS METAL WORK

- A. The Contractor shall take the necessary precautions as described in ASTM A143 and ASTM A384 during fabrication of articles to be galvanized, to properly fabricate and prepare the material to prevent embrittlement, warpage, and distortion.
 1. Violation of the provisions of this paragraph will be sufficient cause for rejection of the Work.
 2. Steel tubing with cover plates welded at both ends or other enclosed assemblies shall have vent and drain holes drilled at locations on the assembly approved by the Contracting Officer. The holes shall be drilled during fabrication and before galvanizing.
- B. All edges, corners, and welds shall be struck and deburred.

8.03 FABRICATION – WELDING OF CARBON STEEL

- A. Except for the modifications set forth in this Section, the welding of structures or articles fabricated from carbon steel shall be in accordance with the AISC Manual of Steel Construction and AWS D1.1 as referenced therein.

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1. Electroslag and electrogas welding procedures will not be permitted.
2. Allowable unit stresses for base metals and for effective areas of weld metal for application to structures shall be as shown in the AISC Manual of Steel Construction.
3. Joints to be welded by automatic machines shall be abrasive-blasted to white metal in accordance with SSPC-SP5. Weld flux residue, weld splatter, and minor weld defects not removed by the abrasive blasting shall be removed in accordance with SSPC-SP-11 Power Tool Cleaning to Bare Metal.
4. The depth of each pass shall not exceed 1/8-inch for manual welding, and the weld puddle width shall not exceed three times the electrode diameter or 3/8inch, whichever is less.
5. Welding of pipe or tubing shall be in accordance with the recommendations of AWS D10.12.
6. Runoff tabs shall be removed by hand flame-cutting or other means as close to the edge or the finished member as practical, followed by grinding to a smooth surface contiguous with the adjacent metal.
7. Runoff tabs shall be removed by hand flame-cutting or other means as close to the edge or the finished member as practical, followed by grinding to a smooth surface contiguous with the adjacent metal.

8.04 FABRICATION – WELDING OF STAINLESS STEEL

- A. Welding of structures or articles fabricated from stainless steel shall be in accordance with the following:
1. Welding on austenitic stainless steel shall be performed by the shielded metal arc process using direct current.
 2. Electrodes for welding austenitic stainless steels shall be in accordance with AWS A5.4 Classification Number E316L. Electrodes for welding stainless steel to carbon steel shall be Classification Number E309L or E312 electrodes.
 3. Weld procedures shall be qualified in accordance with AWS B2.1.
 4. Welding of stainless pipe or tubing shall be in accordance with the recommended practices of AWS D10.4.
 5. Stainless steel to carbon steel welds performed in the field will not require stress-relieving heat treatment provided the interpass temperature does not exceed 350°F.
 6. Stress-relieving of austenitic stainless steel where deemed necessary by Contracting officer, shall be performed at 750°F for 4 hours, plus an additional 30 minutes for each additional inch over 1/2-inch weld section thickness, or a full solution anneal at 1900°F shall be performed with rapid quench.
 7. Stainless steel welds shall be deburred and ground smooth using grinding wheels of aluminum oxide. Carborundum or other carbon bearing wheels are not acceptable for use on stainless steel surfaces. Wire brushing of stainless steel surfaces shall be performed only with stainless steel brushes. Grind

wheels and brushes used to clean stainless steel shall not have been used on carbon steel surfaces.

8. After shop fabrication stainless steel shall be cleaned, descaled, and passivated in accordance with ASTM A380.

8.05 SHOP FINISHES

A. Galvanizing

1. Galvanizing shall have an average weight per square foot of 2.0 ounces and not less than 1.8 ounces per square foot.
2. Except where otherwise specified, galvanizing shall be performed after fabrication, including cutting, punching, welding, and drilling, has been completed.
3. Prior to galvanizing, items shall be cleaned by abrasive blasting to white metal in accordance with SSPC-SP5.
 - a. Weld flux residue, weld splatter, and minor weld defects not removed by the abrasive blasting shall be removed in accordance with SSPC-SP-11 Power Tool Cleaning to Bare Metal.
 - b. After abrasive blasting and mechanical cleaning, items shall be fluxed and immediately hot dipped.
4. Galvanizing shall be done in the largest possible subassemblies consistent with the appearance of the completed item and with the prevention of warpage of the product.
5. Galvanizing shall be repaired in accordance with one of the methods specified in Part 3 of this Section.
6. Where galvanized light-gauge sheet goods are specified, upset edges of factory die-punched holes need not have the bare edges re-galvanized and the galvanized coating adjacent to such die-punched edges need not be repaired.

B. Aluminum

1. Aluminum shall be coated in accordance with Specifications Section 09910, Reservoir Painting and Protective Coating Systems.
2. Where specified, aluminum materials shall receive a hard anodized finish after all fabrication work (holes, bends, etc.) has been completed.

8.06 FIXED VERTICAL LADDERS (INTERIOR)

- A. Galvanized steel construction.
- B. Design as shown in the drawings, subject to code and OSHA compliance.
- C. Provide fasteners appropriate to mounting substrate.
- D. Paint as specified in Section 09900 – PAINTING.

8.07 BIRD SCREEN (POWERLOUVER WINDOW)**A. Bird Screen:**

1. 1/2 in x 1/2 in mesh 0.63 in diameter wire intercrimped screen made of aluminum in a removable frame.
2. Screen provides 76% free area.
3. Screen frames are secured to aluminum angles on the interior face of the CMU opening with stainless steel sheet metal screws and are fully removable for the repair or replacement.
4. Screen and fasteners anodized to match the louver windows.

PART 9 - EXECUTION**9.01 INSTALLATION**

- A. Installation and anchorage details for miscellaneous metal items shall be as shown on the Drawings. Details not shown shall be developed by the Contractor and indicated on the submittal shop drawings.
- B. Anti-galling compound shall be used each time carbon steel or stainless steel fasteners are assembled or reassembled and shall be applied in the fastener threads in accordance with the manufacturer's printed recommendations.

9.02 REPAIR OF GALVANIZED SURFACES

- A. Areas of galvanizing damaged during fabrication, shipping, erection, or any other time prior to acceptance of the Work shall be prepared and recoated by one of the following methods:
 1. Parts damaged in the shop shall be removed from the site, stripped of existing coating, cleaned, and re-galvanized in accordance with ASTM A123 or A153 as applicable.
 2. Field or shop repair areas shall be cleaned and recoated with a 2.0 mil coating of zinc alloy using meltable zinc-based alloy bars (hot bar process).
 3. The damaged area shall be thoroughly cleaned using a wire brush, a light grinding action in accordance with SSPC-SP3 Power Tool Cleaning or mild abrasive blasting in accordance with SSPC-SP 7 Brush-off Blast Cleaning. The cleaning shall extend beyond the damaged area to lap the undamaged galvanized coating at least 1/2-inch.
 4. Weld flux residue, and weld splatter of a size or type that cannot be removed by blast cleaning shall be removed in accordance with SSPC-SP11 Power Tool Cleaning to Bare Metal.
 5. The cleaned area shall be preheated to at least 600°F but not more than 750°F. The surrounding galvanized area shall not be burned. The area to be repaired shall be wire brushed during this preheat.
 6. The cleaned preheated area shall be rubbed with the repair alloy stick to deposit an evenly distributed layer of the zinc alloy.

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7. The repaired area shall be wiped with a damp cloth to remove flux residue.
8. Dry-film thickness shall be verified using a magnetic or electromagnetic-type gauge, in accordance with ASTM D1186.
9. Dry-film thickness shall be verified using a magnetic or electromagnetic-type gauge, in accordance with ASTM D1186.
10. Zinc wire used in repair shall contain not less than 99.98% zinc.
11. The surface to be repaired shall be blast cleaned to white metal in accordance with SSPC-SP5. The area to be blast cleaned shall extend at least ½-inch onto the surrounding sound coating area.
12. Weld flux residue and weld splatter of a size or type that cannot be removed by blast cleaning shall be removed in accordance with SSPC-SP11 Power Tool Cleaning to Bare Metal. .
13. Sprayed coating shall be applied within 2 hours after surface preparation has been completed and before any visible deterioration (flash-rust) has occurred.
14. Sprayed coating shall be applied within 2 hours after surface preparation has been completed and before any visible deterioration (flash-rust) has occurred.
15. The coating shall be applied to the clean and dry surface by metal spraying pistols fed with zinc wire or zinc powder.
16. The surface of the sprayed zinc shall be of uniform texture, free of lumps, coarse areas, and loosely adhered particles.
17. Dry film thickness shall be verified using a magnetic or electromagnetic-type, gauge, in accordance with ASTM D1186.
18. In the field, for areas where the hot bar or metalizing process methods cannot be used, and with the permission of the Contracting officer, the damaged areas shall be repaired with multiple coats of an approved coating such as Rustoleum Zinc Rich Cold Galvanizing Aerosol; CRC Zinc-It; Spray-on #740 zinc-rich; Sherwin Williams #140 Zinc-Rich; or approved equal.
19. The damaged area shall be cleaned and recoated with a organic zinc-rich paint to a minimum dry film thickness (DFT) of 6.0-mils applied in two coats.
20. The surface to be repaired shall be blast cleaned to white metal in accordance with SSPC-SP5. The area to be blast cleaned shall extend at least ½-inch onto the surrounding sound coating area.
21. Weld flux residue and weld splatter of a size or type that cannot be removed by blast cleaning shall be removed in accordance with SSPC-SP11 Power Tool Cleaning to Bare Metal.
22. Dry film thickness shall be verified using a magnetic or electromagnetic-type gauge, in accordance with ASTM D1186.
23. In areas where abrasive blasting cannot be used or cannot effectively clean the required area, power disk sanding or other cleaning methods shall be used, subject to the approval of the Contracting Officer.
24. Apply paint containing zinc dust to the prepared area as recommended by the paint manufacturer.

EXHIBIT D

END OF SECTION

SECTION 05530 – METAL LADDER**PART 1 GENERAL****1.01 SUMMARY**

- A. Section includes
 - 1. Metal Ladders
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Anchor bolts, steel pipe sleeves, indicated to be cast into concrete.

1.02 RELATED SECTIONS

- A. SECTION 14240 – MODERNIZE HYDRAULIC ELEVATORS

1.03 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.04 SUBMITTALS

- A. Submit in accordance with SECTION 01330 – SUBMITTAL PROCEDURES
- B. Shop Drawings
Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Also indicate thickness, type, grade, class of metal, and dimensions. Show reinforcement, anchorage and accessory items. Provide Shop Drawings for the following: Ladders
- C. Product Data
Ladders
- D. Certificates
Provide fabricator certification for ladder assembly stating that the ladder and associated components have been fabricated according to the requirements of 29 CFR 1910.23.

1.06 QUALIFICATIONS OF WELDERS

- A. Qualify welders in accordance with AWS D1.1/D1.1M - Steel. Use procedures, materials, and equipment of the type required for the work.

1.07 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.08 DELIVERY, STORAGE, AND PROTECTION

- A. Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Carbon Steel.
ASTM A36/A36M
- B. Steel Pipe
ASTM A53/A53M, Type E or S, Grade B.
- C. Fittings for Steel Pipe
Standard malleable iron fittings ASTM A47/A47M.
- D. Galvanizing
 - 1. Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A123/A123M, ASTM A153/A153M, ASTM A653/A653M or ASTM A924/A924M, Z275 G90, as applicable.
- E. Galvanize
 - 1. Anchor bolts, washers, and parts or devices necessary for proper installation, unless indicated otherwise.
- F. Repair of Zinc-Coated Surfaces
 - 1. Repair damaged surfaces with galvanizing repair method and paint conforming to ASTM A780/A780M or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat surfaces to which stick or paste material is applied, with a torch to a temperature sufficient to melt the metallics in stick or paste; spread molten material uniformly over surfaces to be coated and wipe off excess material.
- G. Shop Cleaning and Painting
 - 1. Surface Preparation: blast clean surfaces in accordance with SSPC SP 6/NACE No.3. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean.
 - 2. Pretreatment, Priming, and Painting: apply pretreatment, primer, and paint in accordance with manufacturer's printed instructions.

2.02 LADDERS

- A. General
 - 1. For elevator pit ladders, comply with ASM A17.1/CSA B44.
- B. Steel Ladders
 - 1. Fabricate vertical fixed ladders conforming to 29 CFR 1910.23 and Section 5 of ALI A14.2. Space siderails 18 inches apart unless otherwise indicated.

2. Siderails: Continuous, 3/8 by 2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 3/4-inch diameter steel bars, spaced one foot apart maximum.
4. Anti-Slip Ladder Rung Covers: 1/8" Pultruded FRP traction Anti-Slip Rung Covers with embedded fused alumina grit. Product is based on Safeguard Technology, Hi-Traction Anti-Slip Ladder Rung Covers to establish the basis of quality. Approved equal products, accepted by the Contracting Officer will also be acceptable.
5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
6. Top rung of the ladder must be level with the top of the access level.
7. Extend the side rails of through or side step ladders 48 inches above the access level.
8. Support each ladder at top and bottom and not more than 60 inches on center with welded steel brackets. Provide intermediate clip angles not over 48 inches on centers.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Install items at locations indicated, according to manufacturer's instructions. Verify all measurements and take all field measurements necessary before fabrication. Provide Exposed fastenings of compatible materials, generally matching in color and finish, and harmonize with the material to which fastenings are applied. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Poor matching of holes for fasteners will be cause for rejection. Conceal fastenings where practicable. Thickness of metal and details of assembly and supports must provide strength and stiffness. Formed joints exposed to the weather to exclude water. Items listed below require additional procedures

3.02 WORKMANSHIP

- A. Metalwork must be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching must produce clean true lines and surfaces. Continuously weld along the entire area of contact. Do not tack weld exposed connections of work in place. Grind smooth exposed welds. Provide smooth finish on exposed surfaces of work in place, unless otherwise approved. Where tight fits are required, mill joints. Cope or miter corner joints, well formed, and in true alignment. Install in accordance with manufacturer's installation instructions and approved drawings, cuts, and details

3.03 ANCHORAGE, FASTENINGS, AND CONNECTIONS

- A. Provide anchorage where necessary for fastening metal items securely in place. Include for anchorage not otherwise specified or indicated slotted inserts, expansion anchors, and powder-actuated fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine bolts,

carriage bolts and powder-actuated threaded studs for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, to which fastenings are applied. Conceal fastenings where practicable.

3.04 WELDING

- A. Perform welding, welding inspection, and corrective welding, in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

3.05 FINISHES

- A. Dissimilar Materials
 - 1. Where dissimilar metals are in contact, protect surfaces with a coat conforming to MPI 79 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect with ASTM D1187/D1187M, asphalt-base emulsion.
- B. Field Preparation
 - 1. Remove rust preventive coating just prior to field erection, using a remover approved by the rust preventive manufacturer. Surfaces, when assembled, must be free of rust, grease, dirt and other foreign matter.

3.06 LADDER

- A. Secure to the adjacent construction with the clip angles attached to the stringer. Secure to masonry or concrete with not less than two 1/2 inch diameter expansion bolts. Install intermediate clip angles not over 48 inches on center. Install brackets as required for securing of ladders welded or bolted to structural steel or built into the masonry or concrete. Ends of ladders must not rest upon floor.

3.07 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.
- B. After installation, all surfaces shall be cleaned and ready to receive final treatment. All unused materials, tools and equipment shall be removed from the project site.

END OF SECTION

DIVISION 6 – WOOD AND PLASTICS

PART 10 -

SECTION 06100 - ROUGH CARPENTRY

PART 11 -

PART 12 - GENERAL

12.01 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Sheathing.

12.02 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 1. WCLIB: West Coast Lumber Inspection Bureau.
 2. WWPA: Western Wood Products Association.

12.03 SUBMITTALS

- A. Submit in accordance with Section 01330 – SUBMITTAL PROCEDURES.
- B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

12.04 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 13 - PRODUCTS

13.01 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

13.02 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground and Category UC3b for exterior construction not in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all rough carpentry unless otherwise indicated.

13.03 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity.

13.04 DIMENSION LUMBER FRAMING

- A. Framing: Grade as indicated.
 - 1. Species: Douglas fir-larch; WCLIB or WWPA.

13.05 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: NES NER-272.
- C. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

13.06 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Simpson Strong-Tie Co., Inc. or approved equal.
 - a. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - b. Use for interior locations unless otherwise indicated.

PART 14 - EXECUTION

14.01 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- H. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

14.02 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

14.03 LUMBER FRAMING INSTALLATION

- A. Install lumber with crown edge up. Provide continuous members unless otherwise indicated; tie together over supports as indicated if not continuous.
- B. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

14.04 PROTECTION

- A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION**SECTION 07210 - THERMAL INSULATION****PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Molded polystyrene foam-plastic board.
 - 2. Mineral-wool blanket.
- 1.
- B. Related Requirements:
 - 3. Section 09290 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.03 ACTION SUBMITTALS

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

1.04 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 4.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 - 5.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 PRODUCTS**2.01 MOLDED POLYSTYRENE FOAM-PLASTIC BOARD**

- A. Molded Polystyrene Board, Type IX: ASTM C 578, Type IX, 25-psi minimum compressive strength.

2.02 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Unfaced (in concealed wall cavity): ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- B. Glass-Fiber Blanket, Kraft Faced (under mansard roof framing): ASTM C 665, Type II (nonreflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

2.03 MINERAL-WOOL BLANKETS

- A. Mineral-Wool Blanket, Unfaced (in concealed wall cavity): ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.04 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
- B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

2.05 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
 - 6.
 2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

PART 3__ EXECUTION**3.01 PREPARATION**

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.02 INSTALLATION, GENERAL

- A. Comply with the insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.03 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 7. 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 8.
 - 9. 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 10.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 11.
 - 12. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
 - 2.
 - 3. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.04 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 07240 – EXTERIOR INSULATION AND FINISH SYSTEMS

14.05 PART 1 - GENERAL

1.01 SUMMARY

A. Provide all exterior insulation and finish system, including the following:

1. DEFS applied over sheathing board on metal studs.
2. DEFS applied over concrete or CMU.

B. Related Work Specified Elsewhere:

1. Section 05400 – COLD-FORMED STEEL FRAMING
2. Section 07620 - SHEET METAL FLASHING AND TRIM
3. Section 07920 - SEALANTS

1.02 REFERENCES

A. ASTM Standards

1. B117: Test method for Salt Spray (Fog) Testing.
2. C203: Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
3. C578: Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
4. C920: Standard Specification for Elastomeric Joint Sealants.
5. C1135: Test Method for Determining Tensile Adhesion Properties of Structural Sealants.
6. C1177: Specification for Glass Mat Gypsum for Use as Sheathing.
7. C1382: Standard Method for Determining Tensile Adhesion Properties of Sealants When Use in Exterior Insulation and Finish Systems.
8. D968: Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
9. D2247: Practice for Testing Water Resistance of Coatings in 100 Percent Relative Humidity.
10. D2794: Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

EXHIBIT D

11. D3273: Test for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
12. E84: Test Method for Surface Burning Characteristics of Building Materials.
13. E96: Standard Test Methods for Water Vapor Transmission of Materials.
14. E119: Method for Fire Tests of Building Construction and Materials.
15. E695: Method for Measuring Relative Resistance to Impact Loading.
16. E2178: Test Method for Air Permeance of Building Materials.
17. E2357: Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

B. National Fire Protection Association (NFPA) Standards

1. 268, Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
 - 1.
2. 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.
 - 2.

1.03 SUBMITTALS

- A. Submit in accordance with Section 01330 - SUBMITTAL PROCEDURES.
- B. Manufacturer's:
 1. Specifications, details, installation instructions and product data. Submit data for each type and component of exterior insulation and finish systems indicated.
 2. Code compliance report for air and water-resistive barrier and water-resistive barrier.
- C. Fastener manufacturer's pull-out or withdrawal capacity testing for frame construction.
- D. Sealant manufacturer's certificate of compatibility.
- E. Shop Drawings: Submit plans, elevations, sections, details of components, details of penetration and termination, flashing details, joint locations and configurations, fastening and anchorage details, including mechanical fasteners, and connections and attachments to other work.

- F. Samples for Initial Selection: Submit samples for each type of finish-coat color and texture indicated. Include similar Samples of joint sealants and exposed accessories involving color selection.
- G. Samples for Verification: Submit 24-inch square panels for each type of finish coat color and texture indicated, prepared using same tools and techniques intended for actual work, including custom trim, each profile, a typical control joint filled with sealant of color selected. Include sealants and exposed accessory Samples to verify each color selected.
- H. Qualification Data: Submit data for Installer and fabricator/erector.
- I. Maintenance Data: Submit in Operations and Maintenance manuals.
- J. Warranty:
 - 1. Submit draft warranty (unsigned) as noted under 1.04 WARRANTY for approval during Submittal process.
 - 2. Submit signed WARRANTY at the completion of the project.

1.04 WARRANTY

- A. Submit original and copies of a properly executed manufacturer's warranty upon final completion of the project.
- B.
- B. Work under this section shall be warranted against defects in materials, including substrate and workmanship for a period from the project acceptance date as stated below. Written manufacturer's warranty shall include materials and labor required to repair deficiencies. Efflorescence removal and uniform color restoration to address conditions identified during the initial 12 months of this warranty shall be provided as part of this warranty at no additional cost to the State.
 - 1. DEFS (Direct-Applied Exterior Finish System): 15 years from the date of Project Acceptance.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Shall have marketed Exterior Insulation and Finish Systems in United States for at least ten (10) years.
 - a. Shall have completed projects of same building size and type as this project.
 - 2. Applicator:
 - a. Shall have attended the manufacturer's educational seminar for installation of system.
 - b. Shall possess a current certificate of education from the manufacturer.
 - c. Shall be experienced and competent in installation of plaster-like materials for at least three (3) years.
 - d. Successful completion of minimum of three (3) projects of similar size and complexity compared to the specified project.

- e. Employ skilled mechanics who are experienced and knowledgeable in air and water-resistive barrier and DEFS application, and familiar with the requirements of the specified work.
 - f. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with Manufacturer's published specifications and details and the project plans and specifications.
- B. Technical Representative: The Manufacturer's technical representative shall review all drawings and details and revise as required to meet the manufacturer's system. These revisions shall be incorporated in the shop drawing submittal.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution and set quality standards for fabrication and installation. Approved mockups may become part of the completed Work if undisturbed at time of project acceptance.
- 1.06 PERFORMANCE REQUIREMENTS
- A. DEFS Performance: Comply with the following:
- 1. Bond Integrity: Free from bond failure within DEFS components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
 - 2. Weathertightness: Resistant to water penetration from exterior into DEFS and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of DEFS and assemblies behind it, including substrates, supporting wall construction, and interior finish.
- 1.07 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.
- B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes. Stack insulation board flat and off the ground.
- 1.08 PROJECT CONDITIONS
- A. Weather Limitations: Do not apply DEFS adhesives or coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air and substrate temperatures permit DEFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.
- 1.09 COORDINATION
- A. Coordinate installation of DEFS with related Work specified in other sections to ensure that wall assemblies, including sheathing, water/weather-resistive barrier, flashing, trim, joint sealants, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not

allow water to penetrate behind flashing and water/weather-resistive barrier behind DEFS.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Product by Manufacturer: STO CORP., 3800 Camp Creek Parkway, Atlanta, GA 30331.
- B. Or approved equal.

2.02 MATERIALS

- A. **Compatibility:** Provide substrates, water-heather-resistive barriers, adhesive, fasteners, board insulation, reinforcing meshes, base- and finish-coat systems, sealants, and accessories that are compatible with one another and approved for use by EIFS manufacturer for Project.
- B. **Colors, Textures, and Patterns of Finish Coat:** As selected by Contracting Officer from manufacturer's full range of colors in "fine texture".
- C. **Primer Sealer:** DEFS manufacturer's standard substrate conditioner designed to seal substrates from moisture penetration and to improve the bond between substrate of type indicated and adhesive used for application of insulation.
- D. **Flexible Membrane Flashing:** Where indicated or required, provide cold-applied, fully self-adhering, self-healing, rubberized-asphalt and polyethylene-film composite sheet or tape and primer; DEFS manufacturer's standard or product recommended in writing by DEFS manufacturer.
- E. **Adhesive for Application of Insulation:** DEFS manufacturer's standard formulation designed for indicated use, compatible with substrate, and complying with one of the following requirements:
 - 1. Job-mixed formulation of Portland cement complying with ASTM C 150, Type I, and polymer-based adhesive specified for base coat.
 - 2. Factory-blended dry formulation of Portland cement, dry polymer admixture, and fillers specified for base coat.
 - 3. Factory-mixed non-cementitious formulation designed for adhesive attachment of insulation to substrates of **type** indicated, as recommended by DEFS manufacturer.
- F. **Molded, Rigid Cellular Polystyrene Board Insulation:** Comply with DEFS manufacturer's requirements, ASTM C 578 for Type I, and EIMA's "EIMA Guideline Specification for Expanded Polystyrene (EPS) Insulation Board" for more stringent

requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:

1. Aging: Before cutting and shipping, age insulation in block form by air drying for not less than six **weeks** or by another method approved by EIMA that produces equivalent results.
 2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, per ASTM E 84
 3. Dimensions: Provide insulation boards not more than 24 by 48-inches and minimum of 2-inch thickness but not more than 4-inches thick or less than thickness allowed by ASTM C 1397
 4. Forms: Fabricate to forms where indicated or required.
- G. Exterior Sheathing Board: Silicone-treated gypsum core surfaced with inorganic fiberglass mat and alkali-resistant surface coating on both sides; one-hour fire resistant rated. Sheathing board shall be compatible with and approved (as suitable base) by the exterior finish manufacturer. Sheathing board shall be USG Securerock Brand Ultralight Glass-mat Sheathing or approved equal; 5/8-inch thick, ASTM C 1177/C 1177M, Type X.
- H. Reinforcing Mesh: Balanced, alkali-resistant, open-weave glass-fiber mesh treated for other EIFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. per EIMA 105.01, complying with ASTM D 578 and the following requirements for minimum weight:
1. Standard-Impact Reinforcing Mesh: Not less than 4.0 oz./sq. yd.
 2. High-Impact Reinforcing Mesh: Not less than 15 oz./sq.yd.
 3. Strip Reinforcing Mesh: Not less than 3.75 oz./sq. yd.
 4. Comer Reinforcing Mesh: Not less than 7.2 oz./sq. yd.
- I. Base-Coat Materials: EIFS manufacturer's standard mixture complying with one of the following requirements for material composition and method of combining materials:
1. Job-mixed formulation of Portland cement complying with ASTM C 150, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use where required.
 2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing Portland cement.
 3. Factory-blended dry formulation of Portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.

4. Factory-mixed non-cementitious formulation of polymer-emulsion adhesive and inert fillers that is ready to use without adding other materials.
- J. Waterproof Base-Coat Materials: Where indicated or required, provide DEFS manufacturer's standard waterproof mixture complying with one of the following requirements for material composition and method of combining materials:
1. Job-mixed formulation of Portland cement complying with ASTM C 150, Type 1, white **or** natural color; and manufacturer's standard polymer-emulsion adhesive designed for use where required.
 2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing Portland cement.
- K. Primer: DEFS manufacturer's standard factory-mixed elastomeric-polymer primer for preparing base-coat surface for application of finish coat.
- L. Finish-Coat Materials: DEFS manufacturer's standard acrylic-based coating with enhanced mildew resistance complying with the following requirements for material composition and method of combining materials:
1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
 2. Sealer: Manufacturer's waterproof, non-yellowing clear acrylic-based sealer for protecting finish coat.
- M. Water: Potable.
- N. Mechanical Fasteners: DEFS manufacturer's standard corrosion-resistant fasteners consisting of thermal cap, standard washer and shaft attachments, and fastener indicated below; selected for properties of pullout, tensile, and shear strength required to resist design loads of application indicated; capable of pulling fastener head below surface of insulation board; and of the following description:
1. For attachment to steel studs from 0.033 to 0.112-inch in thickness, provide steel drill screws complying with ASTM C 954.
 2. For attachment to light-gage steel framing members not less than 0.0179-inch in thickness, provide steel drill screws complying with ASTM C 1002.
 3. For attachment, provide manufacturer's standard fasteners suitable for substrates.
 4. For attachment to masonry and concrete substrates, provide sheathing dowel in form of a plastic wing-tipped fastener with thermal cap, sized to fit insulation thickness indicated and to penetrate substrate to depth required to secure anchorage.

- O. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with DEFS manufacturer's written requirements; manufactured from UV-stabilized PVC; and complying with ASTM D 1784, manufacturer's standard Cell Class for use intended, and ASTM C 1063.
1. Casing Bead: Prefabricated one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
 2. Drip Screed/Track: Prefabricated one-piece type for attachment behind insulation with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
 3. Weep Screed/Track: Prefabricated one-piece type for attachment behind insulation with perforated face leg extended to form a drip and weep holes in track bottom, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg; designed to drain incidental moisture that gets into wall construction to the exterior at terminations of DEFS with drainage.
 4. Expansion Joint: Prefabricated one piece V profile; designed to relieve stress of movement.
 5. Window Sill Flashing: Prefabricated type for both flashing and sloping sill over framing beneath windows; with end and back dams; designed to direct water to exterior.
- P. Sealants:
1. Sealant Products: Provide DEFS manufacturer's approved sealant that is compatible with joint fillers, joint substrates, and other related materials and complies with requirements of Section 07920 - JOINT SEALANTS.
 2. Sealant Color: Comply with the following requirement: Match finish coat color of system.

2.03 MIXING

- A. General: Comply with DEFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by DEFS manufacturer. Mix materials in clean containers. Use materials within time period specified by DEFS manufacturer or discard.

2.04 PART 3 - EXECUTION

EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of DEFS.
- B. Examine substrates and junctures at other construction for suitable conditions where DEFS will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

2.05 PREPARATION

- A. Protection of Surfaces: Protect contiguous work from moisture deterioration and soiling caused by application of DEFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
- B. Protection of DEFS: Protect DEFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind DEFS and deterioration of substrates.
- C. Preparation: Prepare and clean substrates to comply with DEFS manufacturer's written requirements to obtain optimum bond between substrate and adhesive for insulation.
- D. Primer/Sealer: Apply over gypsum sheathing substrates to protect substrates from degradation and where required by DEFS manufacturer for improving adhesion of insulation to substrate.
- E. Waterproof Base Coat: Apply over substrates requiring waterproofing and/or additional protection as recommended by manufacturer.
- F. Flexible-Membrane Flashing: Where indicated or required, install over weather-resistant barrier, applied and lapped to shed water; seal at openings, penetrations, terminations, and where indicated by DEFS manufacturer's written instructions to protect wall assembly from degradation. Prime substrates, if required, and install flashing to comply with DEFS manufacturer's written instructions and details.
- G. Concrete and Concrete Masonry Substrates: Provide clean, dry, neutral-pH substrates for insulation. Verify suitability of substrate by performing bond and moisture tests recommended by DEFS manufacturer.

2.06 DEFS INSTALLATION

- A. Base Coat Over Sheathing Board:
 - 1. Apply base coat to recommended thickness but not less than 1/16-inch over entire sheathing board surfaces, including edges.

2. Immediately place the reinforcing fabric against the wet base coat and by troweling from the center to the edges, embed the fabric into the coating.
3. Standard reinforcing fabric must be continuous, free of wrinkles and be fully embedded in the base coat.
4. Allow at least 24 hours drying time. Additional time may be required for temperature or humidity conditions.

B. Finish Coat Over Sheathing Board:

1. Thoroughly mix the factory-prepared finish coat material in accordance with manufacturer's printed instructions.
2. Provide finish color(s) and texture(s) to match approved sample(s).
3. Apply primer to base coat according to manufacturer's instructions.
4. Apply finish coat by trowel over cured primer and in thickness required by system manufacturer to produce a uniform finish of texture and color to match approved sample.

2.07 DEFS INSTALLATION OVER CMU AND CONCRETE

- A. Clean surfaces of loose or deleterious materials, such as grease, oil, dirt, etc. Fill all concrete masonry struck joints, and surface defects 1/8-inch and deeper with leveler base coat.
- B. Apply primer to substrate surface and allow to dry thoroughly.
- C. Apply finish coat, troweled tightly to minimum thickness of 1/16-inch. Provide finish color and texture to match approved sample.
- D. Apply clear sealer over dry finish coat, in number of coats and thickness as required by system manufacturer.

2.08 INSTALLATION OF JOINT SEALANTS

- A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements of SECTION 07920 - JOINT SEALANTS, and with "EIMA Guide for Use of Sealants with Exterior Insulation and Finish Systems, Class PB."
 1. Clean surfaces to receive sealants to comply with indicated requirements and system manufacturer's written instructions.
 2. Apply primer recommended in writing by sealant manufacturer for surfaces to be sealed.
 3. Install sealant backing to control depth and configuration of sealant joint and to prevent sealant from adhering to back of joint.

4. Apply masking tape to protect areas adjacent to sealant joints. Remove tape immediately after tooling joints, without disturbing joint seal.
5. Apply joint sealants after base coat has cured but before applying finish coat.

2.09 CLEANING AND PROTECTION

- A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive DEFS coatings.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer and DEFS manufacturer, that ensure that DEFS are without damage or deterioration at time of project acceptance.

END OF SECTION

SECTION 07620 - FLASHINGS AND SHEETMETAL

PART 1 - GENERAL

- 14.01 **GENERAL REQUIREMENTS:** The General Terms and Conditions, HCDA (not specifically attached), the Special Provisions, and all other applicable documents preceding these specifications shall govern all work specified hereinafter in all DIVISIONS AND SECTIONS.
- 1.02 **WORK INCLUDED:** The work to be performed under this section shall include furnishing of all labor, materials, equipment and tools for the complete installation of all new sheetmetal work and for all incidentals, as indicated on the drawings and/or as specified herein.
- 1.03 **GUARANTEE:** This Contractor shall give to the Officer-in-Charge a written guarantee which shall guarantee for a period of two (2) years from the date of acceptance of the contract. All sheetmetal work to be absolutely watertight and agreeing to repair any and all leaks at his own expense, provided such leaks are due to faulty materials or workmanship installed by him.

PART 2 - PRODUCTS

- 2.01 **MATERIALS:** All materials shall be new, unmarked, undamaged, and as follows:

Sheet Metal - 20 ga. galvanized steel/16 oz. sheet copper.

Galvanized/Brass nails, screws, and rods.

Galvanized/Copper clips and straps.

Solder - Half pig lead and half pure tin.

- 2.02 **SHEETMETAL:** Unless otherwise noted, corrugated metal roof shall be formed from sheetmetal.

PART 3 - EXECUTION

- 3.01 **WORKMANSHIP:** All workmanship shall be equal to the best standard of practice, work accurately form to sizes, shapes and dimensions as detailed on drawings, with all lines, angles, in true alignment, and installed true to plumb or to required planes, without defects, sags, bulges, and wages; intersections coped or flanged to accurate fit and rigidly secured; also work shall be so formed, fabricated, and installed as to adequately provide for all possible expansion and contraction in the completed work as well as to ensure a weather and watertight installation. All exposed edges shall be beaded or returned, and all sheetmetal work closely fitted over base work with all necessary stiffeners, anchors, straps, etc., as necessary.

- 3.02** Sheet metal work shall be in minimum of 10-foot sections. Joints shall have a minimum of 6-inch laps.
- 3.03** **PAINTING:** Sheet metal shall receive one coat of 221-12 zinc dust primer and two (2) coats of 312-XX Alkyd High Gloss Enamel Finish by W. P. Fuller or approved equal before installation. Color shall match existing building surface.
- 3.04** **FLASHING PAN:** Where column stubs, sign anchors, railing posts, pipe supports, or other projects extend through the roof surface, install a minimum 4" high flashing collar with 6" flange. Install flange on top layer of base sheet in flashing compound. Seal flange with 6" wide strip of fiberglass fabric set in asphalt. Cut 2 collars of base sheet to fit snugly around collar and extend 6" and 12" beyond edge of flange, applied in asphalt. Fill the inside of collar with flashing compound. Can't the flashing compound around projection above the level of outside rim. Provide sheet metal cover flashing over flashing pan.
- 3.05** **INSPECTION:** All reroofing work shall be subject to inspection at any time to insure strict compliance with plans and specifications. Test areas shall be cut whenever requested by the Officer-in-Charge to verify conformance to the specifications. Any unsatisfactory areas shall be remedied by the installer.
- 3.06** **CLEANING UP:** Upon completion of the work, this Contractor shall remove all rubbish, waste materials, and equipment from the premises, and leave same in clean acceptable condition, satisfactory to the Officer-in-Charge.

END OF SECTION

SECTION 07840 - PENETRATION FIRESTOPPING

PART 15 - GENERAL

15.01 SUMMARY

A. Section Includes:

1. Penetration firestopping systems for the following applications:
 - a. Penetrations in fire-resistance-rated walls.
 - b. Penetrations in horizontal assemblies.
 - c. Penetrations in smoke barriers.

15.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

15.03 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

15.04 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

15.05 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

15.06 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 16 - PRODUCTS

16.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Approval in its "Approval Guide."

16.02 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 - 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
- F. Manufactured Piping Penetration Firestopping System: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 - 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
 - 4. Sleeve: Molded-PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.

5. Stack Fitting: ASTM A48/A48M, gray-iron, hubless-pattern wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
- G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
1. Permanent forming/damming/backing materials.
 2. Substrate primers.
 3. Collars.
 4. Steel sleeves.

16.03 FILL MATERIALS

- A. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- B. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- C. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- D. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- E. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- F. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

16.04 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

- B. eristics for application indicated.

PART 17 - EXECUTION

17.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

17.02 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

17.03 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

- C. Install fill materials by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

17.04 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Manufacturer's name.
 6. Installer's name.

17.05 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

17.06 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

17.07 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Penetration Firestopping Systems for Metallic and Nonmetallic Pipes, Conduit, or Tubing through concrete wall or floor:
 - 1. UL-Classified Systems: C-AJ--8131
 - 2. F-Rating: 2 hours.
 - 3. T-Rating: 1/4 hours.
 - 4. Type of Fill Materials: As required to achieve rating.
- C. Penetration Firestopping Systems for Electrical and Tel/Comm Cables:
 - 1. UL-Classified Systems: C-AJ- 3021.
 - 2. F-Rating: 2 hours.
 - 3. T-Rating: 0 hour.
 - 4. Type of Fill Materials: As required to achieve rating.
- D. Penetration Firestopping Systems for Data Cables and Electric Cables:
 - 1. UL-Classified Systems: W-L-3132.
 - 2. F-Rating: 1 hour and 2 hours.

EXHIBIT D

3. T-Rating: 0 hour.
 4. Type of Fill Materials: As required to achieve rating.
- E. Penetration Firestopping Systems for multiple penetrations of metallic, non-metallic and data/power cables through concrete wall or floor:
1. UL-Classified Systems: C-AJ-1344.
 2. F-Rating: 2 hours.
 3. T-Rating: 1/4 hour.
 4. Type of Fill Materials: As required to achieve rating
- F. Penetration Firestopping Systems for Electrical and Tel/Comm Cables:
1. UL-Classified Systems: W-L-2241.
 2. F-Rating: 1 or 2 hours.
 3. T-Rating: 1/4 hour.
 4. Type of Fill Materials: As required to achieve rating

END OF SECTION

SECTION 07920 – SEALANTS**PART 1 – GENERAL**

1.01 GENERAL REQUIREMENTS: The General Terms and Conditions, City and County of Honolulu (not specifically attached), the Special Provisions, and all other applicable documents preceding these specifications shall govern all work specified hereinafter in all DIVISIONS AND SECTIONS.

1.02 DESCRIPTION OF WORK: Completely close with sealant all joints indicated or specified to be sealed to a watertight condition.

1.03 SUBMITTALS

A. Submit under provisions of Section 01300 – SUBMITTALS.

B. Manufacturer's Data: Submit copies of manufacturer's product data and specifications for type of sealant required to the Officer-in-Charge for acceptance.

C. Material Safety Data Sheets (MSDS): Submit MSDS for each sealant product.

D. Color Samples: Submit three (3) sets each of color finish samples of sealants.

1.04 JOB CONDITIONS

A. Examine joint surfaces and backing, and their anchorage to the structure and conditions under which joint sealer work is to be performed, and notify Contractor in writing of conditions detrimental to proper completion of the work and performance of sealers. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

B. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions. Proceed with the work only when weather conditions are favorable for proper cure and development of high early bond strength.

1.05 PRODUCT HANDLING

A. Delivery: Deliver sealants to the jobsite in sealed containers labeled to show the designated name, formula, or specification number, lot number, color, date of manufacture, shelf life, curing time, manufacturer's directions, and name of manufacturer.

B. Storage: Carefully handle and store all materials to prevent inclusion of foreign materials. Remove from project site all damaged and deteriorated materials and materials exceeding their life.

C. All sealant materials shall be installed prior to expiration of shelf life.

1.06 WARRANTY: The Contractor shall execute to the City a 5-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 City. The warranty shall provide the following at no cost to the City:

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

- A. Sealants shall contain no asbestos.
- B. Sealant Backer Rod: Compressible rod stock of polyethylene foam, polyethylene-jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable, nonabsorptive material as recommended for compatibility with sealant by the sealant manufacturer to control the joint depth for sealant placement, to break bond of sealant at bottom of joint, to form optimum shape of sealant bead on back side, and to provide a highly impressible backer which will minimize the possibility of sealant extrusion when joint is compressed. Do not use oakum or other types of absorptive materials as backstops.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer.
- D. Masking Tape: Non-staining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.
- E. Primer for Sealants: Non-staining, as recommended by the sealant manufacturer.
- F. Sealants:
 1. At Vertical and Overhead Joints: One-part polyurethane-based sealant, conforming to ASTM C 920, Type S, Grade NS, Class 25, Class 25, Use NT. Provide one of the following or an accepted equal.
 - a. Dymonic: Tremco, Inc.
 - b. Chem-Calk 900: Bostick Construction Products Division
 - c. Sikaflex 1a: Sika Corporation
 - d. Dynatrol I: Pecora Corporation
 - e. NP-1 Sonneborn

2. At Horizontal Traffic-Bearing Joints: Two-part polyurethane based sealant, conforming to ASTM C920, Type M, Grade P, Class 25, Use T. Provide one of the following or an accepted equal.
 - a. Sikaflex 2c SL: Sika Corporation
 - b. THC-900: Tremco, Inc.
 - c. Urespan NE-300: Type HM: Pecora Corporation
 - d. SL-2: Sonneborn

3. Bedding Compound: For installation of thresholds and similar items indicated to be bedded in sealant, use a preformed butyl-polyisobutylene sealant tape. Size of tape as required for the specific application. Provide one of the following or an accepted equal.
 - a. Extru-Seal: Pecora Corporation
 - b. 440 Tape: Tremco, Inc.
 - c. Chem-Tape 40: Bostik Construction Products Division

PART 3 – EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS: Comply with manufacturer's printed instructions, except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.

3.02 EXAMINATION: Examine joints indicated to receive joint sealers, with installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

3.03 JOINT PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
 1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; water repellants; water; and surface dirt.
 2. Clean concrete, masonry, and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form release agents from concrete.

4. Steel Surfaces in Contact with Sealant: Scrape and wire brush to remove loose mill scale. Remove dirt, oil, or grease by solvent cleaning, and wipe surfaces with clean cloths.
 5. Clean metal, glass, and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.04 INSTALLATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturer's printed installation instructions applicable to Products and applications indicated, except where more stringent requirements apply. Do not apply sealant on wet surfaces or when the surface temperature exceeds 130 degrees F.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths, which allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.
 2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.

3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.
- D. **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.
 - E. **Installation of Sealants:** Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
 - F. **Tooling of Nonsaz Sealants:** Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 2. Provide flush joint configuration per Figure 5B in ASTM C 1193, where indicated.
- 3.05 CLEAN UP:** Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.
- 3.06 PROTECTION:** Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

END OF SECTION

DIVISION 9 - FINISHES**SECTION 09110 - NON-STRUCTURAL METAL FRAMING****PART 1 GENERAL**

1.01 GENERAL REQUIREMENTS: The General Terms and Conditions, City and County of Honolulu (not specifically attached), the Special Provisions, and all other applicable documents preceding these specifications shall govern all work specified hereinafter in all DIVISIONS AND SECTIONS.

1.02 SUMMARY

A. Section Includes:

4. 1. Non-load-bearing steel framing systems for interior partitions.
- 5.
6. 2. Suspension systems for interior soffits.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 INFORMATIONAL SUBMITTALS

Product Certificates: For each type of code-compliance certification for studs and tracks.

A. Evaluation Reports: For embossed steel studs and tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.05 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

PART 2 PRODUCTS**2.01 PERFORMANCE REQUIREMENTS**

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.02 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

- 7.
 2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C 645. Use either steel studs and tracks.
8. 1. Steel Studs and Tracks:
 - a. Minimum Base-Metal Thickness: As indicated on Drawings.
 - b. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide the following:
1. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
9. 1. Minimum Base-Metal Thickness: 0.0269 inch.
- E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.
10. 1. Depth: 1-1/2 inches.
 - 11.
 12. 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
13. 1. Minimum Base-Metal Thickness: 0.0179 inch.
 - 14.
 15. 2. Depth: As indicated on Drawings.

2.03 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
16. 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- A. Isolation Strip at Exterior Walls: Provide one of the following:
1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
 - 17.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 18. 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
 - 19.
 - 20. 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
 - 21.
 - 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
 - 22.
 - 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.03 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- B. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

EXHIBIT D

1. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
- 23.
2. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

END OF SECTION

SECTION 09290 – GYPSUM BOARD

PART 18 - GENERAL

18.01 **GENERAL REQUIREMENTS:** The General Terms and Conditions, City and County of Honolulu (not specifically attached), the Special Provisions, and all other applicable documents preceding these specifications shall govern all work specified hereinafter in all DIVISIONS AND SECTIONS.

18.02 ACTION SUBMITTALS

- A. Product data.
- B. Samples: For each texture finish indicated on same backing indicated for Work.

PART 19 - PRODUCTS

19.01 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. Manufacturers: USG Corp., Georgia Pacific, National Gypsum or approved equal.

19.02 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C1396/C1396M.
 - 1. Thickness: 1/2 inch.
 - 2. Long Edges: Tapered.
- B. Gypsum Board, Type X: ASTM C1396/C1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- C. Gypsum Ceiling Board: ASTM C1396/C1396M.
 - 1. Thickness: 1/2 inch.
 - 2. Long Edges: Tapered.

19.03 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.

19.04 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.

19.05 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

PART 20 - EXECUTION

20.01 INSTALLATION OF PANELS

- A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- B. Comply with ASTM C840.

20.02 FINISHING OF GYPSUM BOARD

- A. Prefill open joints, and damaged surface areas.
- B. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- C. Gypsum Board Finish Levels: Finish panels to levels indicated below and in accordance with ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09900 "Painting."

20.03 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION

DIVISION 9 - FINISHES

SECTION 09651 - RESILIENT FLOOR TILE

PART 21 - GENERAL

21.01 SUMMARY

- A. Provide resilient tile flooring as indicated on the drawings and as specified herein.
- B. Section Includes:
 - 1. Vinyl composition floor tile.

21.02 SUBMITTALS

- A. Submit in accordance with SECTION 01300 – SUBMITTAL PROCEDURES
- B. Manufacturer's Data: Submit manufacturer's technical product data and installation instructions substantiating that all products comply with project requirements.
- C. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts
- D. Samples: Full-size units of each color and pattern of floor tile required.
- E. Manufacturer Cleaning and Maintenance data.

21.03 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be delivered to the jobsite in original unopened containers marked with grade and manufacturer's brand name. Handle and store materials carefully to prevent damage to materials.

21.04 ENVIRONMENTAL CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor coverings.

PART 22 - PRODUCTS

22.01 VINYL COMPOSITION FLOOR TILE

- A. Manufacturer: Armstrong Flooring, (verify and match existing Armstrong Flooring "field" tile: color, pattern, texture, etc.)
- B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch.
- E. Size: 12 by 12 inches.
- F. Colors and Patterns: As indicated on Drawings.

22.02 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

22.03 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 23 - EXECUTION

23.01 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.

EXHIBIT D

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 7 or more than 10 pH.
 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.
- F. Provide adequate ventilation to remove moisture and fumes from the areas where new flooring is being installed

23.02 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- C. Lay tiles square with room axis
- D. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

EXHIBIT D

- E. Lay tiles with grain direction alternating in adjacent
- F. Scribe, cut, and fit floor tiles to butt neatly and tightly to permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- G. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- H. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- I. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

23.03 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Spots of adhesive shall be removed immediately as work progresses. Floor shall not be washed or waxed until the adhesive has completely set, and in no case until after the minimum length of time recommended by the manufacturer has elapsed. The flooring shall be cleaned with a neutral cleaner as recommended by the manufacturer and then damp-mopped with clear water. Flooding of the floor is not permitted. When the floor is dry, 2 coats of an approved non-slip wax shall be applied with a clean lambs wool mop. Each coat shall be buffed thoroughly when dry with a weighted rotary electric floor polishing machine. After polishing, the Contractor shall be responsible for protecting the flooring until acceptance of the project.
- C. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply three coats minimum.
 - 2. Cover floor tile until Project Acceptance.

END OF SECTION

SECTION 09900 – PAINTING

PART 24 - GENERAL

24.01 **GENERAL REQUIREMENTS:** The General Terms and Conditions, City and County of Honolulu (not specifically attached), the Special Provisions, and all other applicable documents preceding these specifications shall govern all work specified hereinafter in all DIVISIONS AND SECTIONS.

24.02 **SUMMARY**

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Officer-in-Charge will select from standard colors and finishes available. Paint surfaces including but not limited to the following:
 - 1. Surfaces exposed during this work.
 - 2. Surfaces damaged during this work.
 - 3. Surfaces requiring touch-up painting.

- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

24.03 **REFERENCES**

- A. ASTM D 16 - Definition of terms relating to Paint, Varnish, Lacquer and Related Products.

- B. ASTM D 2016 - 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).

24.04 DEFINITIONS

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

24.05 SUBMITTALS

- A. Submit in accordance with GR 6 - SUBMITTALS.
- B. Product Data:
 - 1. Materials List: Provide an inclusive list of required patching and coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - a) For products with premixed colors, provide manufacturer's standard color chips for selection by Officer-in-Charge.
 - 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 (MSDS).
- C. Certifications: Provide a letter certifying paints and coatings are free of asbestos, lead, zinc-chromate, strontium chromate, cadmium, mercury, crystalline silica, and other EPA regulated and hazardous materials. Provide a letter certifying the amounts of mildewcide added by both the paint manufacturer and paint supplier.
- D. Schedule of Finishes: Provide finish schedule including paint spread rates required to achieve final dry film thickness.
- E. Schedule of Operations: Provide a work schedule showing sequence of operation and installation dates.
- F. Samples:
 - 1. Submit color and finish samples, at manufacturers normal paint chip size illustrating range of colors and textures available for each surface finishing product scheduled.
 - 2. After color and finish sample are returned, submit paint finish samples, 8.5" x 11" in size illustrating selected colors and textures for each selection. Divide sample in horizontal strips showing prime and overlapping second and finish coats. Show coat tinting. Prepare transparent finish samples on

same material as that on which coating will be applied. Identify each sample.

- G. Manufacturer's Instructions: Indicate special surface preparation procedures, and substrate conditions requiring special attention. Refer to Article 3.02 PREPARATION.
- H. Qualification Data: For Applicator
- I. Delivery Receipts: Provide 3 copies of the delivery receipt, signed by the user's representative, attesting to delivery of extra paint as required under Article 3.07 EXTRA PAINT.
- J. Warranty: Submit warranty as noted under item entitled "WARRANTY" hereinbelow.

24.06 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: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
 - 1. Exception: Alkali resistant primers if compatible with the intermediate coat paint products.

24.07 REGULATORY REQUIREMENTS

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

24.08 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.

24.09 PROJECT CONDITIONS

- A. Do not apply materials when surfaces and ambient temperatures are outside the ranges required by the paint product manufacturer. Do not apply exterior coatings during rain or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- B. Protect public, pedestrians and tenants from injury. Provided, erect and maintain safety barricades around scaffolds, hoists and where constriction operations create hazardous conditions.
- C. Completed Work: Provide necessary protection for wet paint surfaces
- D. .Protective Covering and Enclosures: Provide and install clean sanitary drop cloth or plastic sheets to protect furniture, equipment, floor and other areas that are not scheduled for treatment. Remove any paint applied to surfaces not scheduled for treatment.
- E. Fire Safety: Contractor and its employees shall not smoke in the vicinity of the paint storage area. Exercise precautions against fire at all times and remove waste rags, plastic (polyester sheets), empty cans, etc. from the site at the end of each day.
- F. 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.

24.10 WARRANTY

- A. Provide a two (2) year guarantee that the work performed under this section conforms to the contract requirements and is free of any defect of material or workmanship.
- B. The Surety shall not be liable beyond two (2) years from the project acceptance date.

PART 25 - PRODUCTS

25.01 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: 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. 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 as indicated in the contract documents are for bid purposes only. Contractor shall coordinate with the Users and the Officer-in-Charge for final approval on color selection from the manufacturer's full range.

- E. EPA Regulated and Hazard Materials: Do not use paint or paint products containing asbestos, lead, mercury, zinc chromates, strontium-chromate, cadmium, crystalline silica, or the EPA regulated or hazardous materials. Select paint from the Master Painter's Institute's Approved Product List.

25.02 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.

25.03 EXTERIOR PAINT SCHEDULE

- A. Concrete: Provide the following finish systems over exterior concrete:
1. Acrylic Finish: Two finish coats over a primer.
 - a. Primer: Exterior Concrete primer. MPI 42.
 - b. Finish Coats: Exterior acrylic paint. MPI 11.
 - c. Finish Coat Gloss Level: Semi-gloss or match existing adjacent surface.
 - d. System DFT: 4.5 mils.
- B. Concrete Unit Masonry: Provide the following finish systems over exterior concrete unit masonry:
1. Acrylic Finish: Two finish coats over block filler.
 - a. Block Filler: Concrete unit masonry block filler. MPI 4.
 - b. Finish Coats: Exterior acrylic paint. MPI 11.
 - c. Finish Coat Gloss Level: Semi-gloss or match existing adjacent surface.
 - d. System DFT: 11 mils.
- C. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
1. Alkyd Finish: Two finish coats over a primer.
 - a. Primer: Exterior ferrous-metal primer. MPI 23.
 - b. Finish Coats: Exterior acrylic paint. MP194.
 - c. Finish Coat Gloss Level: Semi-gloss or match existing adjacent surface.
 - d. System DFT: 5.25 mils.

- D. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:
1. Acrylic Finish: Two finish coats over a galvanized metal primer.
 - a. Primer: Exterior galvanized metal primer. MPI 134.
 - b. Finish Coats: Exterior acrylic paint. MPI 11 Q-G5.
 - c. Finish Coat Gloss Level: Semi-gloss or match existing adjacent surface.
 - d. System DFT: 4.5 mils.

25.04 INTERIOR PAINT SCHEDULE

- A. Concrete: Provide the following finish systems over interior concrete:
1. Acrylic Finish: Two finish coats over a primer.
 - a. Primer: Exterior concrete primer. MPI 50.
 - b. Finish Coats: Interior acrylic paint. MPI 54.
 - c. Finish Coat Gloss Level: Semi-gloss or match existing adjacent surface.
 - d. System DFT: 5 mils.
- B. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:
1. Acrylic Finish: Two finish coats over a block filler.
 - a. Block Filler: Concrete unit masonry block filler. MPI 4.
 - b. Finish Coats: Interior acrylic paint. MPI 141.
 - c. Finish Coat Gloss Level: Semi-gloss or match existing adjacent surface.
 - d. System DFT: 11 mils.
- C. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
1. Acrylic Finish: Two finish coats over a primer.
 - a. Primer: Interior gypsum board primer. MPI 50.
 - b. Finish Coats: Interior acrylic paint. MPI 141.
 - c. Finish Coat Gloss Level: Semi-gloss or match existing adjacent surface.
 - d. System DFT: 4 mils.
- D. Wood: Provide the following paint finish systems over new interior wood surfaces:
1. Acrylic-Enamel Finish: Two finish coats over a primer.
 - a. Primer: Interior wood primer for acrylic-enamel and semigloss alkyd-enamel finishes. MPI 39.
 - b. Finish Coats: Interior acrylic enamel. MPI 141.
 - c. Finish Coat Gloss Level: Semi-gloss or match existing adjacent surface.
 - d. System DFT: 4.5 mils.

- E. Ferrous Metal: Provide the following finish systems over ferrous metal:
 - 1. Acrylic Finish: Two finish coats over a primer.
 - a. Primer: Interior ferrous-metal primer. MPI 79.
 - b. Finish Coats: Interior acrylic paint. MPI 141.
 - c. Finish Coat Gloss Level: Semi-gloss or match existing adjacent surface.
 - d. System DFT: 5 mils.

- F. Galvanized and Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
 - 1. Acrylic Finish: Two finish coats over a primer.
 - a. Primer: Interior zinc-coated metal primer. MPI 79.
 - b. Finish Coats: Interior acrylic paint. MPI 141.
 - c. Finish Coat Gloss Level: Semi-gloss or match existing adjacent surface.
 - d. System DFT: 5 mils.

PART 26 - EXECUTION

26.01 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 Contracting Officer about anticipated problems when using the materials specified over substrates primed by others.

26.02 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.

EXHIBIT D

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, 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 Officer-in-Charge.
 - 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.
 3. 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 Officer-in-Charge.
 - a. 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 Contracting Officer 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 and dust off.
1. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 2. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 3. If transparent finish is required, back prime with spar varnish.
 4. Back prime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 5. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
- F. Surface Preparation Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
1. If mill scale or mild surface rust cannot be removed with solvent, then blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3 and SSPC-SP 10/NACE No. 2.
 2. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 3. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat. Spot priming specified here shall be in addition to full prime painting scheduled in Part 3 below.
- G. 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

- H. Surface Preparation - Repainting: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. General: Correct defects and clean surfaces which affect work of this section. Remove existing coatings that exhibit loose surface defects.
 - a. Provide barrier coats over marks, patches, and other imperfections which may bleed through surface finish.
 - b. Remove from surfaces to be repainted all foreign matter such as nails, screws, staples, tape and gum.
 - c. Remove all loose, blistered, scaled, crazed or chalky finish to an existing tight and firm finish.
 - d. Remove mildew as noted in PREPARATION Article.
 - e. Spot prime areas where bare wood, concrete, masonry, plaster, fill, seal or patched material is exposed with the specified primer and feather out onto adjacent paint.
 - f. Patch existing holes larger than 1/4"x1/4".
 - g. Inspect existing sealant joints and remove failing sealant and re-seal joint prior to painting.
 2. Wash all surfaces with a solution of tri-sodium phosphate and water or other appropriate solution to remove any accumulated film of wax, oil, grease, smoke, dust, dirt, chalking or other foreign matter which would impair the bond of, or bleed through the new paint finish. After washing, rinse the surface with potable water and allow to thoroughly dry. Rinsing may be performed by high pressure water washing as noted in PREPARATION Article.
 - a. Surfaces shall dry a minimum of 24 hours before the application of primers. For wood surfaces drying shall continue until the moisture content of the wood is less than 15 percent. For concrete and concrete masonry surfaces test for alkali and moisture.
 3. Lightly sand the surface where existing finish remains tight and firm. Where the paint has been removed, sand the edges of scarred areas to a smooth feathered edge.
 4. Fill holes (nail, tack, staple, and other similar items), cracks, open joints and other imperfections with appropriate compound and allow to set (door and trim included). Seal all openings which will permit the entrance of water. Sealing compounds shall be compatible with the substrate, primer and paint. Apply and allow sealants to set in accordance with the manufacturer's recommendations.
 5. Cementitious Materials: Seal all cracks hairline to 1/8 inch in width with concrete patching compound. All cracks over 1/8 inch in width and holes 1/4 inch diameter or greater shall be sealed with a latex modified or epoxy modified reinforced patching system before paint application. All patching shall be done in accordance with the patching manufacturer's

EXHIBIT D

- recommendations and instructions. All patching shall be done in accordance with the manufacturer's recommendations and instructions. Apply texture, if required, to match existing textured surfaces.
- a. Concrete Floors: Remove contamination, acid etch, neutralize and rinse floors with clean water. Verify required acid-alkali balance is achieved. Allow to dry.
 6. Plaster Surfaces: Scarred plaster areas shall be patched with appropriate plaster materials. Fill holes, cracks, open joints and damaged areas with vinyl base or latex modified patching system. Apply texture, if required, to match existing textured surfaces.
 7. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
 8. Wood:
 - a. Interior: Wipe off dust and grit prior to sealing.
 - b. Exterior: Wash glu-laminated wood with solvent to remove grease and dirt prior to sealing.
 - c. Seal knots, pitch streaks, and sappy sections with sealer. Fill fastener holes and cracks after priming has dried; sand between coats.
 9. Ferrous and Galvanized Metal Surfaces:
 - a. Comply with preparation requirements of the Steel Structures Painting Council (SSPC) Standard SP3.
 - b. Remove rust, loose mill scale and blistering / loose paint by power tool chipping, de-scaling, sanding, wire brushing and grinding down to bare metal. Only tightly adhering surface rust, mill scale and paint which cannot be removed with a dull putty knife may remaining. Do not burnish the surfaces during cleaning.
 - c. Completely wipe surfaces with mineral spirits or other appropriate solution to remove accumulated film of wax, oil, grease, smoke, dust, dirt, chalky or other foreign matter which would impair the bond of, or bleed through the new paint finish. Patch imperfections, holes, dents to form a smooth surface.
 - d. Lightly sand the surface where existing finish remains tight and firm. Where the paint has been removed, sand the edges of scarred areas to a smooth feathered edge. Allow the surfaces to thoroughly dry and immediately spot prime bare metal areas with the specified primer and feather out onto adjacent paint.
 10. Aluminum Surfaces Scheduled for Paint Finish:
 - a. Remove surface contamination by steam or high pressure wash.
 - b. Remove oxidation with acid etch and solvent washing.
 - c. Apply etching primer immediately following cleaning.
 11. PVC and Plastic Surfaces:

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- a. Clean the PVC and plastic of all dirt, dust and oil prior to painting. Wash surface and dry thoroughly.
 - b. Sandpaper the PVC or plastic pipe (220 grit) to gently roughen the surface to-be-painted, clean off excess sanded material.
 - c. In a well ventilated area, spray a light, thin primer coat with an even side-to-side motion along the length of the pipe or material.
 - d. Allow 10 minutes between coats before applying following coats.
 - e. Repeat the light, thin coats until the desired build up is achieved.
- I. 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.
- J. 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 and provide sufficient differences in shade of undercoats to distinguish each separate coat.

26.03 APPLICATION

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

6. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 9. 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, roller.
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. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- F. 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.
- G. 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.
- H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

26.04 FIELD QUALITY CONTROL TESTING

- A. Inspection and Approvals: Obtain written approval upon completion of each phase of work (phases of work are: surface preparation and spot prime, prime, first finish coat, second finish coat) before proceeding into the next phase or work. For any particular area of work that deviates from the submitted work schedule, notify the Contracting Officer 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 Officer-in-Charge. Remove rejected material from the job site immediately. Redo rejected work at no cost to the State.
- B. Thickness Testing: The Contracting Officer will require all paints and their applied thickness tested determine compliance with the Contract Documents. 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.
 - 2. Test schedule: One (1) test per each surface painted, unless otherwise directed by Contracting Officer.
 - 3. Tests shall be paid by Contractor and performed by Contractor.

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- 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. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

- D. Alkalinity Testing: Measure pH Level of surface to be painted. Notify Contracting Officer if alkalinity level is below the maximum permitted by the paint or primer manufacturer.
 - 1. Test schedule: One (1) test per each surface type, unless otherwise directed by Contracting Officer.
 - 2. Tests shall be paid by Contractor and performed by Contractor.

- E. Adhesion Testing:
 - 1. Provide adhesion testing per ASTM D3759 Test 8 (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. Cost of testing shall be borne by Contractor.
 - 3. Test schedule: One (1) test per each surface type, unless otherwise directed by Contracting Officer.
 - 4. Tests shall be paid by Contractor and performed by 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 Officer-in-Charge 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.

26.05 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site. After

completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

26.06 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 Contracting Officer.
- 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. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

26.07 EXTRA PAINT

- A. The Contractor shall provide extra paint in each of the different colors of exterior and interior paint used for walls, eaves and trim to the facility upon completion of the project. The paint shall be in unopened one gallon cans and shall be in the quantities listed below:
 - 1. Paint used over large areas, such as the exterior of the building - 5 gallons of each color and each type used (alkyd, latex, gloss, semi-gloss, flat, etc.).
 - 2. Paint used in single room areas and in small areas, such as bathrooms and doors - 1 gallon of each color and each type used (alkyd, latex, gloss, semi-gloss, flat, etc.)

END OF SECTION

DIVISION 13 - FIRE PROTECTION

SECTION 13851 - ADDRESSABLE FIRE ALARM SYSTEM**PART 1 - GENERAL**1.01 **SUMMARY**

- A. Furnish all labor, tools, equipment, materials, and accessories required to provide a complete, electrically supervised, closed circuit fire alarm system as specified herein and as shown on the plans.
- B. System Description: This work includes providing for modifications to the existing fire alarm system to form a complete and functional fire alarm system as described herein and on the Contract Drawings. The system shall include all wiring, raceways, pull boxes, cabinets, outlet and mounting boxes, control equipment, alarm and supervisory signal initiating devices, alarm notification appliances, supervising station fire alarm system transmitter, and all other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described. The system layout on the drawings is a proposed layout. Provide system complete and ready for operation.
- C. Provide equipment, materials, installation, workmanship, inspection, and testing in strict accordance with the required provisions of **NFPA 72**, **ISO 7240-16**, **IEC 60268-16**, except as modified herein. The **system layout** on the drawings show the intent of coverage and are shown in suggested locations. Submit plan view drawings showing device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, wire counts and circuit identification in each conduit, and circuit layouts for all floors. Final quantity, system layout, and coordination are the responsibility of the Contractor.
- D. The fire alarm system must be independent of the building security, building management, and energy/utility monitoring systems other than for control functions.
- E. Existing Fire Alarm Equipment (to remain): The existing fire alarm system will be confirmed and new equipment shall be fully compatible with and shall operate accurately and reliably with the existing system.
- F. Existing Fire Alarm Equipment (to be removed): Existing fire alarm equipment to be removed at the completion of the project shall be maintained fully operational until the new equipment has been tested and accepted. As new equipment is installed, it shall be tagged "NOT IN SERVICE" until the new equipment is accepted. Once the new system is completed, tested, and accepted by the Contracting Officer, it shall be placed in service and connected to the supervising station fire alarm system. All new equipment shall have tags removed and the existing equipment shall be tagged "NOT IN SERVICE" until removed from the building.

- G. Removal of Existing Equipment: After acceptance of the new system by the Contracting Officer, all existing equipment not connected to the new system shall be removed, all unused exposed conduit shall be removed, and all damaged surfaces shall be restored.

1.02 **REFERENCES**

- A. The publications listed herein form a part of this specification to the extent referenced. The publications may be referred to in the text by the basic designation only. Unless otherwise indicated, the most recent edition of the publication with current revisions and amendments will be enforced.

1.03 **RELATED WORK**

- A. SECTION 09901 - PAINTING: Painting of conduits, raceways, cabinets, junction boxes, etc.
- B. SECTION 13930 - FIRE PROTECTION: Alarm initiating devices shall be installed with the sprinkler system.
- C. SECTION 16100 - ELECTRICAL WORK: All power circuiting (conduit and wiring) including circuiting to breakers and circuiting (conduit and wiring/cabling) to all fire alarm equipment and devices.

1.04 **SUBMITTALS**

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Partial submittals will not be acceptable. Submit for approval one complete sets of submittals as described below in electronic format, Portable Document Format (PDF). Submit for approval 6 complete sets of submittals as described below. Annotate descriptive data to show the specific model, type, and size of each item the Contractor proposes to furnish. Do not commence work until all submittals have been reviewed and approved. Review and acceptance of shop drawings shall not relieve the Contractor of responsibility to provide for a complete and proper installation.
- C. Manufacturer's Catalog Data:
1. Manual fire alarm pull stations.
 2. Smoke sensors.
 3. Heat Detectors.
 4. Wire and cables.
 5. Notification devices.
 6. Addressable interface devices (monitor module).
 7. Addressable control modules.
 8. Isolation modules.

- D. Shop Drawings:

1. Point-To-Point Floor Plan Layouts and Riser Wiring Diagrams: Drawings shall be job specific. "Typical" or "generic" drawings are not acceptable. The diagrams shall include but not be limited to the following:
 - a. Locations of All System Elements: Indicate all devices, junction boxes, handholes, and pass-through devices and entities where the cables and conductors can be accessed by personnel.
 - b. Labeling of All Elements: All devices, junction boxes, etc. shall be labeled by functional designations, locations and numbers such as building alphabet, room function and room number, and handhole number.
 - c. Fire Alarm Wiring and Color Codes: All cable and conductor color codes, the wire marking system and marker designation as specified herein shall be shown.
 - d. Provide a complete description of the system operation in matrix format on the drawings.

- E. Calculations:
 1. Standby battery capacity calculations shall list the type of devices and modules, quantities, unit amperage draw for standby and alarm conditions, total amperage draw and battery amp/hour rating.
 2. Provide detailed voltage drop calculations for all notification appliance circuits and releasing device circuits.
 3. Provide data on each circuit to indicate that there is at least 25 percent spare capacity for notification appliances and 25 percent spare capacity for initiating devices.

- F. Certificate: Submit certification of the fire alarm system installer and technician's qualifications as stipulated in item entitled "QUALITY ASSURANCE" hereinbelow.

- G. Contractor's Warranty: Submit Contractor's Warranty as stipulated in item entitled "CONTRACTOR'S WARRANTY" hereinbelow.

- H. Reports: Submit written notification of all tests and test results as stipulated in item entitled "TESTING" hereinbelow.

- I. Test Plan: Submit audio test plan as stipulated in item entitled "TESTING" hereinbelow.

- J. As-Built Drawings: Drawings shall provide a detailed description of system operation during alarm, supervisory, and trouble modes and shall include a complete list of all system addresses including input/output logic. Upon completion and before final acceptance of the work, submit complete set of as-built drawings of the system as stipulated in item entitled "MISCELLANEOUS" hereinbelow. Drawings shall include all components and circuit diagrams complete with conductor color codes and a listing of

initiating devices. Submit 24-inch by 36-inch drawings on reproducible media with title block similar to full size contract drawings.

- K. Operations and Maintenance Manual: Provide 5 bound copies of the Operations and Maintenance Manuals in 3-hole binders with hard covers and 5 digital copies of the Operations and Maintenance Manuals on CD's. The manuals shall be submitted to the Contracting Officer, a minimum of 2 weeks prior to the final test.
1. The manual may be provided in several volumes if so approved by the Contracting Officer.
 2. All drawings shall be folded to letter size by individual sheets so they can be retained in the manual.
 3. The manual shall contain the following:
 - a. Manufacturer's Printed Equipment/System Operations and Maintenance Manual, and Device Brochures:
 - 1) Start-up, operating, preventative maintenance, adjustment and troubleshooting procedures, and parts list.
 - 2) System Control Diagrams.
 - 3) Internal equipment wiring diagrams.
 - b. Manufacturer's Representatives: The names, addresses and phone numbers of the fire alarm system manufacturer, the nearest manufacturer's representative, and the nearest supplier of the manufacturer's equipment and parts.
 - c. Fire Alarm System Test Results: Provide completed test data sheets with the recorded measured data obtained during pre-final testing in the designated spaces and a printout of the equipment program. The test plan shall be developed in accordance with NFPA 72, Chapter 7. Submit the following information.
 - 1) Test information applicable for the project.
 - 2) Standard attendance signature sheets.

1.05 QUALITY ASSURANCE

- A. Qualification of Installer: Installation shall be accomplished by an electrical contractor (C-13) or an Electronic systems contractor (C-15) with a minimum of 5 years experience in the installation of fire alarm systems in the State of Hawaii. However, a C-13 contractor must provide the power connection to the system. The services of a technician provided by the control equipment manufacturer shall be provided to supervise installation, adjustments, and tests of the system. Prior to installation, submit data for approval by the Contracting Officer, showing that the Contractor has successfully installed addressable, programmable analog intelligent interior fire alarm systems of the same type as specified herein, or that the Contractor has a firm contractual agreement with a subcontractor having such required

experience. Include the names and locations of at least 2 installations where the Contractor or the subcontractor referred to above, has installed such systems. Indicate the type and design of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months. Submit names and phone numbers of points of contact at each site.

- B. Qualifications of System Technician: Installation drawings, shop drawings, and "as-built" drawings shall be prepared by, or under the supervision of, a qualified technician. Qualified technician shall be an individual who is experienced with the types of work specified herein and is currently certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level-III certification in Fire Alarm Systems program. Contractor shall submit data showing the name and certification of the technician at or prior to submittal of drawings.
- C. Regulatory Requirements: Devices and equipment for fire alarm service shall be listed by Underwriters Laboratories, Inc., approved by the Factory Mutual System, or listed by other nationally recognized testing laboratories.
- D. Requirements for Fire Protection Service: Equipment and material shall have been tested by Underwriters Laboratories, Inc. and listed in UL FPED or approved by Factory Mutual and listed in FM P7825. Where the terms "listed" or "approved" appear in this specification, they shall mean listed in UL FPED or FM P7825. The omission of these terms under the description of any item of equipment described shall not be construed as waiving this requirement.
- E. Standard Products: Materials and equipment shall be standard new products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least one year prior to bid opening. Select material from one manufacturer, where possible, and not a combination of manufacturers, for any particular classification of materials.
- F. Modification of References: In NFPA publications referred to herein, consider advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; interpret reference to "authority having jurisdiction" to mean the County Building and Fire Departments.
- G. Fire alarm supplier shall locally stock spare parts including alarm initiating devices, notification appliances and control panel components.

1.06 **PERMITTING**

- A. Permits, Tests and Inspections: Apply, secure and pay for all required permits, fees, licenses, tests, inspections and royalties necessary to accomplish the work. Schedule and coordinate required tests and inspections.

1.07 **CONTRACTOR'S WARRANTY**

- A. The Contractor shall warranty and certify in writing all work in this section for a period of 2 years. Should any equipment or material fail due to defective equipment, material or workmanship within this period, the Contractor shall replace the item at no cost to the Owner.
- B. The 2-year warranty shall start at the end of thirty consecutive days of trouble free operation after certification by the County Fire Department and acceptance by the Contracting Officer whichever date is the latest.
- C. During the fire alarm system's two-year warranty period, the Contractor shall provide complete maintenance and testing services for the entire fire alarm system in accordance with the manufacturer's instructions and NFPA 72. The system shall be tested and serviced every 6 months during the warranty period, for a total of 4 testing/servicing actions. Reports prepared on Contractor-furnished standardized forms similar to the forms in NFPA 72 shall be submitted to the Owner's Authorized Representative, each time a test and/or maintenance action occurs.
- D. During the 2-year warranty period, the Contractor shall, upon the receipt of notice from the Owner's representative, promptly make all repairs arising out of defective material, workmanship or equipment. The Contractor shall respond to such notices within 12 hours after receipt of the notice.
- E. The local representative or supplier shall have direct access to replacement parts and a fire alarm repairman, either on his own staff or in a manufacturer's service center, to ensure the system can be restored to normal operation within 2 days of system failure. All costs including air-fare, car rental, travel time, etc. shall be borne by the Contractor.
- F. It is understood that the Owner will undertake repairs if, following 2 working days after receipt of such notice, the Contractor fails to make or undertake the repairs with due diligence. The expense in connection therewith shall be charged to the Contractor.

PART 2 - PRODUCTS

2.01 **MANUFACTURER QUALIFICATIONS**

- A. All components of each new system shall be provided by a single manufacturer, shall be of current design and shall be in regular and recurrent production. Provide design, materials and devices for a protected premises fire alarm system, complete, conforming to NFPA 72, except as otherwise or additionally specified herein.

2.02 **INTERIOR FIRE ALARM SYSTEM DESIGN**

- A. Definitions: Wherever mentioned in this specification or on the drawings, the equipment, devices, and functions shall be defined as follows:

1. Addressable System: A system in which multiple signals are transmitted via the same conduction path to a fire alarm control panel, decoded and separated so that each signal will initiate the specified response.
 2. Hard Wired System: A system in which alarm and supervisory initiating devices are directly connected, through individual dedicated conductors, to a central control panel without the use of analog/addressable circuits or devices.
 3. Interface Device: An addressable device which interconnects hard wired systems or devices to an analog/addressable system.
 4. Fire Alarm Control Panel (FACP): A master control panel having the features of a remote fire alarm control unit and to which remote fire alarm control units are interconnected. The panel has central processing, memory, and input and output terminals.
- B. System Operation: The system shall be a complete, supervised, noncoded, analog/addressable fire alarm system conforming to NFPA 72, UL 864, and UL 2017. The system shall operate in the alarm mode upon actuation of any alarm initiating device. The system shall remain in the alarm mode until initiating device(s) are reset and the fire alarm control panel is manually reset and restored to normal. The system may be placed in the alarm mode by local microphones as provided in the Remote Annunciator with Microphone Station devices. The system shall provide the following functions and operating features:
1. The FACP and remote fire alarm control units, if used, shall provide power, annunciation, supervision, and control for the system.
 2. Provide Class B initiating device circuits (for conductor lengths of 10 feet or less).
 3. Provide Class B signaling line circuits.
 4. Provide Class B notification appliance circuits. The visual alarm notification appliances shall have the flash rates synchronized.
 5. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.
 6. Provide an audible and visual trouble signal to activate upon a single break or open condition, or ground fault. The trouble signal shall also operate upon loss of primary power (AC) supply, absence of a battery power supply, low battery voltage, or removal of alarm or supervisory panel modules. Provide a trouble alarm silence feature which shall silence the audible trouble signal, without affecting the visual indicator. After the system returns to normal operating conditions, the trouble signal shall again sound until the trouble is acknowledged. A smoke sensor in the process of being verified for the actual presence of smoke shall not initiate a trouble condition.
 7. Provide a notification appliance silencing switch which, when activated, will silence the audible signal appliance, but will not affect the visual alarm indicator, the liquid crystal display, or the automatic notification of the other networked panels, where applicable. This switch shall be overridden upon activation of a subsequent alarm.

8. Provide alarm verification capability for smoke sensors. Alarm verification shall initially be set for 30 seconds.
9. Provide program capability via switches in a locked portion of the FACP to bypass the automatic notification appliance circuits, and elevator recall features. Operation of this programming shall indicate this action on the FACP display and printer output.
10. Alarm, supervisory, and/or trouble signals shall be automatically transmitted to the other networked panels, where applicable.
11. Alarm, supervisory, and/or trouble signals shall be automatically transmitted to a UL Listed central monitoring station.
12. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.
13. The system shall be capable of being programmed from the panel's keyboard. Programmed information shall be stored in non-volatile memory.
14. The system shall be capable of operating, supervising, and/or monitoring both addressable and non-addressable alarm and supervisory devices.
15. There shall be no limit, other than maximum system capacity, as to the number of addressable devices which may be in alarm simultaneously.
16. Where the fire alarm system is responsible for initiating an action in another emergency control device or system, such as an elevator system, the addressable fire alarm relay shall be within 3 feet of the emergency control device.
17. An alarm signal shall automatically initiate the following functions:
 - a. Transmission of an alarm signal to the other networked panels, where applicable.
 - b. Visual indication of the device operated on the fire alarm control panel (FACP)
 - c. Continuous actuation of all alarm notification appliances, except those in stairs or in elevator cabs.
18. Provide elevator recall in accordance with ASME A17.1/CSA B44 and as specified herein. Activation of any smoke/heat detector in an elevator shaft, machine room, or lobby (except at designated recall level) must cause all elevators associated with that shaft, machine room, or lobby to return nonstop to the designated level. Activation of a smoke detector in the lobby or machine room at the designated level must cause all elevators associated with that lobby to return nonstop to the assigned alternate level. Activation of a detector in an elevator shaft, machine room, or lobby must also cause illumination of elevator cab warning signal (fire hat) in addition to other requirements of this paragraph.
19. Operation of a sprinkler waterflow switch serving an elevator machinery room or shaft shall operate shunt trip circuit breaker(s) to shut down power to the elevators in accordance with ASME A17.1/CSA B44.
20. A supervisory signal shall automatically initiate the following functions:
 - a. Visual indication of the device operated on the FACP, and sound the audible alarm at the respective panel.
 - b. Transmission of a supervisory signal to the other networked panels, where applicable.

- c. Transmission of a supervisory signal a UL Listed central monitoring station.
- 21. A trouble condition shall automatically initiate the following functions:
 - a. Visual indication of the system trouble on the FACP, and sound the audible alarm at the respective panel.
 - b. Transmission of a trouble signal to the other networked panels, where applicable.
 - c. Transmission of a trouble signal a UL Listed central monitoring station.
- 22. The maximum permissible elapsed time between the actuation of an initiating device and its indication at the FACP shall be 10 seconds.
- 23. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FACP shall not exceed 200 seconds.

C. System Monitoring:

- 1. Valves: Each valve affecting the proper operation of a fire protection system, including automatic sprinkler control valves, standpipe control valves, sprinkler service entrance valve, and valves at backflow preventers, whether supplied under this contract or existing, shall be electrically monitored to ensure its proper position. Each tamper switch shall be provided with a separate address.

D. "Microphone Notification" System Functions:

- 1. Notification Appliance Network: The audible notification appliance network consists of speakers located to provide intelligible instructions at all locations in the building and areas as indicated. The
- 2. Strobes: Provide strobes to alert hearing-impaired occupants.

E. Overvoltage and Surge Protection: Signaling Line Circuit Surge Protection: Provide a factory approved surge suppressor at power inputs to control panels and power extender panels and on all signaling line circuits that leave the building, conforming to UL 1449. Suppressor shall be hybrid MOV type providing a maximum clamping voltage of 500 volts and a 150 joule minimum energy dissipation capacity.

F. Fire Alarm Notification Appliance Circuit Power Extender Panels: Provide fire alarm notification appliance circuit power extender panels as required. Fire alarm power extender panel shall comply with the applicable requirements of UL 864. Panel shall be modular, installed in a surface-mounted steel cabinet with hinged door and cylinder lock. The extender panel(s) shall have the necessary components and equipment required to provide a minimum of 4 supervised, Class B notification appliance circuits. Each appliance circuit shall be rated for 2 amperes at 24 volts DC. An alarm signal from the FACP will initiate the notification appliance circuits to extend the alarm. Primary power for the panel shall be 3 amperes at 120 volts AC, nominal. Standby power shall be same as FACP and charger shall be housed integrally within the cabinet.

- G. Addressable Interface Devices (Monitor Module): The initiating device being monitored shall be configured as a Class B initiating device circuit. The system shall be capable of defining any module as an alarm module and report alarm trouble, loss of polling, or as a supervisory module, and reporting supervisory short, supervisory open or loss of polling for devices such as waterflow switches, valve supervisory switches, fire pump monitoring, independent smoke detection systems, relays for output function actuation, etc. The monitor module shall be UL or FM listed as compatible with the control panel. The monitor module shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. Monitor module shall be mounted in a 4-inch square, 2-1/8 inch deep electrical box. Monitor module shall contain an integral LED that flashes each time the monitor module is polled. Pull stations with a monitor module in a common backbox are not required to have an LED. Control Modules shall be located in environmental areas that reflect the conditions to which they were listed.
- H. Addressable Control Module: The control module shall be capable of operating as a relay (dry contact form C) for interfacing the control panel with other systems such as to control door holders or initiate elevator fire service. The module shall be UL or FM listed as compatible with the control panel. The indicating device or the external load being controlled shall be configured as a Class "B" notification appliance circuits. The system shall be capable of supervising, audible, visual and dry contact circuits. The control module shall have both an input and output address. The supervision shall detect a short on the supervised circuit and shall prevent power from being applied to the circuit. The control model shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. The module shall be mounted in a 4-inch square, 2-1/8 inch deep electrical box and shall be capable of Class B supervised wiring to the indicating or control device. Module shall contain an integral LED that flashes each time the module is polled. Control Modules shall be located in environmental areas that reflect the conditions to which they were listed.
- I. Isolation Modules: Provide isolation modules to isolate wire-to-wire short circuits on a loop and limit the number of other modules or sensors that are incapacitated by the short circuit fault. Place isolator modules at signaling line circuit T-taps where the T-tap will contain more than 5 addressable devices and located such that not more than 20 addressable devices are connected between isolation modules. If a wire-to-wire short occurs, the module shall automatically open the circuit. On repair of the short, the module shall automatically reconnect the isolated section of the signaling line circuit. The module shall be mounted in a 4-inch square, 2-1/8 inch deep electrical box. Module shall contain an integral LED that flashes each time the module is polled and illuminates steadily to indicate that a short has been detected and isolated.
- J. Smoke Sensors:

1. Photoelectric Smoke Sensors: Provide addressable photoelectric smoke sensors as follows:
 - a. Provide analog/addressable photoelectric smoke sensors utilizing the photoelectric light scattering principle for operation in accordance with UL 268. Smoke sensors shall be listed for use with the fire alarm control panel.
 - b. Provide self-restoring type sensors which do not require any readjustment after actuation at the FACP to restore them to normal operation. Sensors shall be UL listed as smoke-automatic fire sensors.
 - c. Components shall be rust and corrosion resistant. Vibration shall have no effect on the sensor's operation. Protect the detection chamber with a fine mesh metallic screen which prevents the entrance of insects or airborne materials. The screen shall not inhibit the movement of smoke particles into the chamber.
 - d. Provide twist lock bases for the sensors. The sensors shall maintain contact with their bases without the use of springs. Provide companion mounting base with screw terminals for each conductor. Terminate field wiring on the screw terminals. The sensor shall have a visual indicator to show actuation.
 - e. Where device is surface mounted, provide manufacturer's surface mounting backbox or device skirt.
 - f. The sensor address shall identify the particular unit, its location within the system, and its sensitivity setting. Sensors shall be of the low voltage type rated for use on a 24 VDC system.
 - g. An operator at the control panel, having a proper access level, shall have the capability to manually access the following information for each initiating device.
 - 1) Primary status
 - 2) Device type
 - 3) Present average value
 - 4) Present sensitivity selected
 - 5) Sensor range (normal, dirty, etc.)

2. Smoke Sensor Testing: Smoke sensors shall be tested in accordance with manufacturer's recommended calibrated test method. Submit smoke sensor testing procedures for approval.

- K. Heat Detectors: Heat detectors shall be designed for detection of fire by fixed temperature. The alarm condition shall be determined by comparing sensor value with the stored values. Heat detector spacing shall be rated in accordance with UL 521. Detectors located in areas subject to moisture, exterior atmospheric conditions, or hazardous locations as defined by NFPA 70 and as indicated, shall be types approved for such locations.

1. Fixed Temperature Detectors: Detectors shall be designed for surface outlet box mounting and supported independently of wiring connections. Detectors shall be designed to detect high heat. The detectors shall have a specific temperature setting of 175 degrees Fahrenheit. The UL

521 test rating for the fixed temperature detectors shall be rated for 50 by 50 feet.

2. Self-Test Routines: Automatic self-test routines shall be performed on each sensor that will functionally check sensor sensitivity electronics and ensure the accuracy of the value being transmitted. Any sensor that fails this test shall indicate a trouble condition with the sensor location at the control panel.
 3. An operator at the control panel, having the proper access level, shall have the capability to manually access the following information for each heat sensor:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Sensor range.
 4. An operator at the control panel, having the proper access level, shall have the capability to manually control the following information for each heat sensor:
 - a. Alarm detection sensitivity values.
 - b. Enable or disable the point/device.
 - c. Control sensor's relay driver output.
 5. Where device is surface mounted, provide manufacturer's surface mounting backbox or device skirt.
- L. Manual Pull Stations: Provide metal or plastic, surface mounted, double action, addressable manual pull stations, which are not subject to operation by jarring or vibration. Stations shall be equipped with screw terminals for each conductor. Stations which require the replacement of any portion of the device after activation are not permitted. Stations shall be finished in fire-engine red with molded raised lettering operating instructions of contrasting color. The use of a key or wrench shall be required to reset the station. Where the device is surface mounted, provide manufacturer's surface mounting backbox or device skirt.
- M. Notification Appliances:
1. Visual Notification Appliances: Provide strobe light visual alarm signals which operate on a supervised 24 volt DC circuit. Visual notification appliances must conform to the applicable requirements of UL 1638, UL 1971 and conform to the Architectural Barriers Act (ABA). Visual Notification Appliances must have clear high intensity optic lens, xenon flash tubes, or light emitting diode (LED) and be marked "FIRE" in letters of contrasting color. The light pattern must be disbursed so that it is visible above and below the strobe and from a 90 degree angle on both sides of the strobe. Strobe flash rate must be 1 flash per second and a minimum of 15, 30, 75, or 110 candela, based on the UL 1971 test. Strobe must be surface mounted. Where the device is surface

mounted, provide manufacturer's surface mounting backbox or device skirt. Provide synchronized strobe operation. Visible appliances may be part of an audio-visual assembly where indicated.

2. Fire Alarm Speakers: Speaker notification appliances shall conform to the applicable requirements of UL 464. Surface mounted speaker notification appliances shall be painted red. Recessed speaker notification appliances shall be installed with a grill that is painted red. Speakers shall conform to the applicable requirements of UL 1480.
 - a. Speakers shall have six different sound output levels and operate with audio line input levels of 70.7 VRMs or 25 VRMs, by means of selectable tap settings. Interior speaker tap settings shall include taps of 1/4, 1/2, 1, and 2 watt. Exterior speakers must also be multi-tapped with no more than 15 watt maximum setting. Speakers must incorporate a high efficiency speaker for maximum output at minimum power across a frequency range of 400 Hz to 4,000 Hz and must have a sealed back construction. Speakers shall be capable of installation on standard 4-inch square electrical boxes. Where speakers and strobes are provided in the same location, they may be combined into a single unit. All inputs shall be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the FACP.
 - b. Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of 16 gauge or molded high impact plastic and equipped with mounting holes and other openings as needed for a complete installation. Fabrication marks and holes shall be ground and finished to provide a smooth and neat appearance for each plate. Each plate shall be primed and painted. Where the device is surface mounted, provide manufacturer's surface mounting backbox or device skirt.
 - c. Speakers shall utilize screw terminals for termination of all field wiring.
3. Connections: Provide screw terminals for each notification appliance. Terminals shall be designed to accept the size conductors used in this project without modification.

N. System Field Wiring:

1. Provide wiring materials under this section as specified in SECTION 16100 -ELECTRICAL WORK with the additions and modifications specified herein. NFPA 70 accepted fire alarm cables that do not require the use of raceways except as modified herein are permitted.
2. Wiring Within Cabinets, Enclosures, Boxes, Junction Boxes, and Fittings: Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure, or cabinet. Conductors which are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting, or junction box shall be connected to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make connections

- with approved pressure type terminal blocks, which are securely mounted. The use of wire nuts or similar devices shall be prohibited.
3. System Wiring: Signaling line circuits and initiating device circuit field wiring shall be copper, No. 16 AWG size conductors at a minimum. Notification appliance circuit conductors, that contain audible alarm devices, other than speakers, shall be solid copper No. 14 AWG size conductors at a minimum. Speaker circuits shall be copper No. 16 AWG size conductors at a minimum. Wire size shall be sufficient to prevent voltage drop problems. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage. Power wiring, operating at 120 VAC minimum, shall be No. 12 AWG solid copper having similar insulation. Shielded wiring shall be utilized where recommended by the manufacturer. For shielded wiring, the shield shall be grounded at only one point, which shall be in or adjacent to the FACP. Color coding is required for circuits and shall be maintained throughout the circuit. Provide wiring in electrical metallic tubing in dry locations not enclosed in concrete or where not subject to mechanical damage. Provide rigid conduit in all other locations. Conceal conduit in finished areas of new construction and wherever practicable in existing construction. The use of flexible conduit not exceeding a 6 foot length shall be permitted in initiating device circuits. The minimum conduit size shall be 0.75-inch.
 4. Above Grade Alarm Wiring: Conductors shall be FPL, FPLP, and FPLR fire alarm cables. Type TW is not permitted.
 5. Cable Markers:
 - a. Rectangular, commercially available polyethylene cable tags with pre-punched holes at each corner for the attachment with self-locking ties.
 - b. Minimum 0.035-inch thick.
 - c. Average Tensile Strength: 4500 pounds psi.
 - d. Non-corrosive, non-conductive, resistant to acids, alkalis, organic solvents, salt water and distortion-resistant in temperatures up to 300 degrees Fahrenheit.
 - e. White or yellow and machine printed with a description similar to "Fire Alarm Cable - Buildings A to E" in black block letters 1/8-inch or larger in vertical height. Handwritten markers are not acceptable.
 - 1) The preprinting shall be permanent and shall not fade or dissolve.
 - 2) The tags shall be suitable for marking with black permanent markers. There shall also be space available for additional notes (for maintenance / service contractor use only).
 6. Cable and Conductor Ties: One-piece, self-locking nylon ties having a minimum loop tensile strength of 175 pounds and resistance to the same conditions as cable marker.

7. Conductor Terminations: Labeling of conductors at terminal blocks, FACP, and remote fire alarm control units shall be provided at each conductor connection. Each conductor or cable shall have a shrink-wrap label to provide a unique and specific designation. Each FACP contain a laminated drawing which indicates each conductor, its label, circuit, and terminal. The laminated drawing shall be neat, using 12 point lettering minimum size, and mounted within each cabinet, panel, or unit so that it does not interfere with the wiring or terminals. Maintain existing color code scheme where connecting to existing equipment.
- O. Environmental Enclosure or Guards: Environmental enclosures shall be provided to permit Fire Alarm components to be used in areas that exceed the environmental limits of the listing. The enclosure shall be listed for the device or appliance as either a manufactured part number or as a listed compatible accessory for the UL category that the component is currently listed. Guards required to deter mechanical damage shall be either a listed manufactured part or a listed accessory for the category of the initiating device or notification appliance.
- P. Corrosion and Fungus Protection: Metallic equipment shall be coated with a rust inhibiting treatment and standard finish per the manufacturer's standard. Components shall be protected against corrosion and fungus (e.g. circuit boards shall be epoxy coated).

2.03 NAMEPLATES

- A. Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new plate permanently affixed to the item or equipment. Major components include, but are not limited to, the following:
1. Fire alarm control panels.
 2. Furnish to obtain approval by the Contracting Officer, before installation. Obtain approval by the Contracting Officer for installation locations. Nameplates shall be etched metal or plastic, permanently attached by screws to panels or adjacent walls.

PART 3 - EXECUTION

3.01 EXAMINATION OF THE DRAWINGS AND SPECIFICATIONS

- A. Confirm and coordinate voltages and requirements of equipment furnished by other trades which will be connected to the fire alarm system. They include detectors, dampers, fire sprinkler devices, and any other equipment connected to the fire alarm system. Include the above information on the field-post as-built drawings.

3.02 EXAMINATION OF EXISTING SITE CONDITIONS

- A. Cabinets, panels, annunciators, outlets, pull stations, audio / visual devices and other equipment and devices shall be installed in the locations and heights shown on the drawings and/or as specified herein.
 - 1. The location of the equipment and devices shown on the plans are approximate. Before installing, the Contractor shall study adjacent construction, verify all dimensions and sizes of equipment at the job site and perform installation in what he considers the most logical manner.
 - 2. Any changes from the locations shown on the drawings must be approved by the Contracting Officer and shown on the "field-posted as-built" drawings.
 - 3. Any device may be relocated within 10 feet before installation at the direction of Contracting Officer, without additional charge to the Owner.
- B. The Contractor shall determine the location of existing conduits and cables and record their route on the field-posted as-built drawings.

3.03 **INSTALLATION**

- A. Protect dissimilar metals with approved fittings and treatment.
- B. Coat steel conduits installed underground with an approved asphaltic paint or plastic coating or wrap with a shingled layer of a pressure sensitive plastic tape, half-lapped. Do not use aluminum in contact with the earth.
- C. All metallic conduits and boxes shall be grounded with a green wire ground conductor.
- D. Equipment Installation: Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with NFPA 70, NFPA 72, and as modified herein.
 - 1. FACP (and other similar equipment cabinets): Locate the FACP where indicated on the drawings. Surface mount the enclosure with the top of the cabinet 6 feet maximum above the finished floor. All conductor terminations shall be labeled and a drawing containing all conductors, their labels, their circuits and their interconnection shall be permanently mounted in the FACP.
 - 2. Manual Stations: Locate manual stations where shown on the drawings. Mount stations so that the highest point of their operating handles are a maximum of 4 feet above the finished floor in accordance with ADAAG guidelines. Mount stations so they are located no farther than 5 feet from the exit door they serve, measured horizontally.
 - 3. Notification Appliance Devices: Locate notification appliance devices where shown on the drawings and as required by NFPA 72. Mount assemblies on walls as required by NFPA 72 and to meet the intelligibility requirements. Ceiling mounted speakers shall conform to NFPA 72.

4. Smoke Sensors and Heat Detectors: Locate sensors/detectors on a 4-inch mounting box. Sensors/detectors located on the ceiling shall be installed not less than 4-inches from a side wall to the near edge. Those located on the wall shall have the top of the sensor/detector at least 4-inches below the ceiling, but not more than 12-inches below the ceiling. In the case of solid joist construction, the sensors/detectors shall be mounted on the bottom of the joists. On smooth ceilings, sensors/detectors shall be installed not over 25 feet apart in any direction. Closer spacing shall be used when recommended by the sensor/detector manufacturer or required by NFPA 72. Install smoke sensors no closer than 3 feet from air handling supply outlets. Heat detectors shall be installed in strict accordance with their UL listing. Heat detectors provided to meet ASME/ANSI A17.1 requirements for elevator power disconnect shall be located adjacent to each sprinkler head in the elevator machinery room.
5. Water Flow Detectors and Tamper Switches: Connect to water flow detectors and tamper switches.

E. Cables and Conductors:

1. Below Grade Cable Installation: Cable shall be installed as indicated on the drawings.
 - a. Conduits shall be sloped as noted on the drawings to provide drainage at handholes and manholes.
 - b. Cables shall not be installed in the same ducts, conduits, handholes, etc. with non-fire alarm circuits.
 - c. Align and clean ducts and conduits before cable installation using mandrels, and scrapers and wire brushes. Arrange with the Contracting Officer, to have an inspector present for conduit and duct cleaning, and cable installation.
 - d. Properly sized tensiometer and pulling devices shall be used for cable installation. Jerking of cables during the pulling installation process shall not be allowed.
 - 1) At the request of the Contracting Officer, the Contractor shall provide proof and date of calibration of the tensiometer and cable pulling devices used.
 - 2) Cable pulling tensions shall not exceed manufacturer's recommended pulling tensions.
 - 3) Use cable lubricants and compounds that will neither change the physical characteristics nor increase the conductor insulation dielectric constants of the cable sheath.
 - e. Should the Contractor proceed with conduit cleaning and cable installation without having notified the Contracting Officer, if directed by the Contracting Officer, the Contractor shall remove the cable(s) for inspection and reinstall at no additional cost to the Owner.

- 1) The Contractor may reinstall the removed cable if inspection and/or tests show no cable damage.
 - 2) If the cable is damaged, the Contractor shall install a new replacement cable at no additional cost to the Owner.
2. Above Grade Conductor Installation:
- a. Conductors shall not be installed in the same conduits, ducts, junction boxes, etc. with non-fire alarm circuits. 120 volt AC fire alarm circuit conductors shall not be in the same cable nor installed with cables and other conductors in the same conduits, ducts, enclosures, junction boxes, etc. with 24 volt DC fire alarm circuits.
 - b. Conductors shall be installed in continuous lengths. Splices shall be made in above ground junction boxes by terminating wires with wirenut connections.
 - c. Cable pulling tensions shall not exceed manufacturers' recommended pulling tensions.
 - d. Wire-nut Connectors: Permitted for connections in above grade locations only, in junction boxes and equipment and to devices that are not available or manufactured with screw-type connections.
3. Conductor Color Code: Conductors shall be provided with color coding. Color coding shall be maintained throughout the circuit and documented on the as-built drawings.
- F. Cable and Conductor Terminations and Dress. The following requirements shall apply to equipment cabinets, junction and outlet boxes larger than 12-inches by 12-inches:
1. Electric equipment shall be installed in a neat and workmanlike manner in accordance with NEC.
 2. Cable conductors or individual conductors shall be bundled, dressed and held together with cable straps, ties or lace and fanned in a manner that equipment terminals are visible and accessible, and allow the connections to be removed and reconnected without moving a large number of wires.
 - a. Conductors to screw type connectors shall be terminated with wire lugs or with approved cable termination connectors compatible with the specific termination.
 - b. Conductors shall be labeled as specified herein.
 3. Cabinets, junction boxes, outlet boxes, other boxes, shall have sufficient space to accommodate all conductors installed in them without crowding.
 4. Completed work shall be uncrowded and uncluttered and shall allow accessibility without cutting and/or removing of any straps, ties, laces, cables, components, devices, brackets, modules, equipment and like items.

5. Cables shall be secured to junction boxes, equipment cabinet backboards, console members, or to other system components using cable clamps and wraps. Provide cable support posts as required to facilitate system installation.

G. Cable and Conductor Identification System:

1. Underground Cable Markers:

- a. Provide markers at both ends of the cables and at all intermediate locations where the cables are accessible and visible.
- b. Each marker shall be secured with 2 nylon ties.

2. Conductor Markers:

- a. Provide markers at ends of each conductor connected to the control panels and terminal cabinets at each building.
- b. Attach markers a minimum of 4-inches from the ends of conductors in a manner that will not permit accidental detachment.

3. Signaling Line Circuits: Signaling line circuits shall be labeled by circuit number as shown on the shop drawings. Conductors shall be labeled in the fire alarm panel(s), the building's main fire alarm junction box and other enclosures larger than 12-inches by 12-inches.

4. Audible and Visual Notification Circuits: Notification circuits shall be labeled by signaling circuit number as shown on the drawings. Conductors shall be labeled in the fire alarm panel(s) and in the building's main fire alarm junction box and other enclosures larger than 12-inches by 12-inches.

H. Framed Operating Instructions: A framed set of operating instruction printed on a white background or engraved Main Fire Alarm Panel Operating Instructions shall be provided. The framed instructions shall be permanently mounted adjacent to the main fire alarm control panel.

I. Field Touch-up Painting: Touch-up painted surfaces and fire alarm system components damaged during installation to match the existing or specified paint and color.

J. Disconnection and Removal of Existing System: Fire alarm control panels and fire alarm devices not connected to the new system shall be disconnected and removed. Contact the Contracting Officer to determine if any of the existing equipment shall be salvaged.

1. The existing fire alarm and smoke detection system shall remain in operation at all times during the installation and commissioning of the new system. The Contractor shall take precautions to avoid any accidental activation of the existing fire alarm system. When making

modifications to the existing systems, the Contractor shall minimize the time the existing system is out of service. Prior to any impairment of the existing system the Contractor shall notify the State and County Fire Department. The Contractor shall comply with 29 CFR 1910.36 and 29 CFR 1910.37. No impairment shall exceed 8 hours. The Contractor shall establish a fire watch to monitor the impaired area until the entire fire alarm system is returned to full operation. The Contractor shall schedule outages 30 days in advance. Once the new system is on-line and accepted by the Owner, remove the old system. As new equipment is installed, label it "NOT IN SERVICE". Upon acceptance, remove labels.

2. Disconnect and remove the existing fire alarm and smoke detection systems where indicated.

K. Connection of New System: The following new system connections shall be made during the last phase of construction, at the beginning of the preliminary tests. New system connections shall include:

1. Connection of new control modules to existing magnetically held smoke door (hold-open) devices.
2. Connection of new elevator recall smoke sensors to existing wiring and conduit.
3. Connection of new system monitoring to existing fire alarm monitoring service.

Once these connections are made, system shall be left energized and new audio/visual devices activated. Report immediately to the Contracting Officer, coordination and field problems resulting from the connection of the above components.

3.04 **TESTING**

A. Testing of the New Fire Alarm System:

1. After completion of the fire alarm system's installation, turn on and leave the system on for a minimum of 3 consecutive weeks to demonstrate that the contract work operates, and meets the requirements of the specifications.
2. Upon successful completion of the 3 weeks operational period, arrange with the Contracting Officer, for a pre-final fire alarm system test and inspection. The test and inspection shall demonstrate that all the Contractor-installed fire alarm system equipment, devices cables and conductors are operating acceptably and have been installed in accordance with this specification. Accordingly, the test demonstrates that the system is ready for a final test of the overall fire alarm system.
 - a. Representatives at the pre-final test shall include the Contractor, fire alarm system manufacturer's representative, user, the user's facility maintenance agency personnel, and the Contracting Officer.

Representatives at the Final test shall include all the foregoing representatives and the County Fire Department Inspector.

3. Preliminary Test Results: Include the control panel and initiating and indicating devices, a unique identifier for each device with an indication of test results, and signature of the factory-trained technician of the control panel manufacturer and equipment installer. With reports on preliminary tests, include a hard copy of printer output information from preliminary testing, i.e. download historical file so that all test data is available for Owner review.
 - a. Tests:
 - 1) Dielectric Strength and Insulation Resistance Tests: Test the dielectric strength and the insulation resistance of the system interconnecting wiring by means of an instrument capable of generating 500 volts dc and equipped to indicate leakage current in 1000 megohms. For the purpose of this test, the instrument shall be connected between each conductor on the line and between each conductor and ground at the control panel end of the line, with the other extremity open circuited and all series-connected devices in place. The system shall withstand the test without breakdown and shall indicate a resistance of not less than 500,000 ohms, the measurement being taken after an electrification of not more than one minute with a dc potential of not less than 100 volts nor more than 550 volts. The tests shall be witnessed by the Contracting Officer, and test results recorded for use at the final acceptance test.
 - 2) Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the Contracting Officer, and test results recorded for use at the final acceptance test.
 - 3) Ground Resistance Tests: Measure the resistance of each connection to ground. Ground resistance shall not exceed 5 ohms. The tests shall be witnessed by the Contracting Officer, and test results recorded for use at the final acceptance test.
 - 4) Smoke Sensor Tests: Prior to formal inspection and tests, clean and perform sensitivity tests on each smoke sensor. Clean the smoke sensors in accordance with the manufacturer's recommended procedures. Present recorded data at the formal inspection for verification. Approved copies shall become part of the operations and maintenance manual for the fire alarm system.
 - 5) Preliminary Testing: Conduct preliminary tests to ensure that all devices and circuits are functioning properly. Tests shall meet the requirements of paragraph entitled "Minimum System Tests" of this section. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable

to the Owner a minimum of 7 calendar days before the formal acceptance test date required in the paragraph below. Without the submission of this report, the final acceptance test is automatically canceled.

4. Formal Acceptance Testing: Notify the Contracting Officer, in writing when the system is ready for final acceptance testing. Submit request for test at least 15 calendar days prior to the test date. A final acceptance test will not be scheduled until the O and M Manuals are submitted and the following are provided at the job site:
 - a. Marked-up red line drawings of the system as actually installed.
 - b. Dielectric strength and insulation resistance test results.
 - c. Loop resistance test results.
 - d. Complete program printout including all input/output addresses.
 - e. A compact disc containing the entire software program for the system.
 - f. A list of passwords permitting access by designated Owner employees to all levels of the software programs(s).
The final tests shall be witnessed by the County Fire Department or the Authority Having Jurisdiction (AHJ). At this time, any and all required tests shall be repeated according to the AHJ. Following acceptance of the system, as-built drawings and Operation and Maintenance (O and M) Manuals shall be submitted for review and acceptance. In existing buildings, the transfer of devices from the existing system to the new system and the permission to begin demolition of the old fire alarm system will not be permitted until the as-built drawings and O and M Manuals are received.
 - g. Minimum System Tests: Test the system in accordance with the procedures outlined in NFPA 72. The required tests are as follows:
 - 1) Verify the absence of unwanted voltages between circuit conductors and ground. The tests shall be accomplished at the preliminary test with results available at the final system test.
 - 2) Verify that the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
 - 3) Test each initiating and indicating device and circuit for proper operation and response at the control unit.
 - 4) Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturer's operating and maintenance manual.
 - 5) Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the time period and in the manner specified.
 - 6) Determine that the system is operable under trouble conditions as specified.
 - 7) Visually inspect all wiring.
 - 8) Test the battery charger and batteries.

- 9) Verify that all software control and data files have been entered or programmed into the FACP. Hard copy records and 2 identical disc copies of the software and data files shall be provided to the Contracting Officer.
- 10) Verify that red-line drawings are accurate.
- 11) Measure the current in circuits to assure there is the calculated spare capacity for the circuits.
- 12) Measure voltage readings for circuits to assure that voltage drop is not excessive.
- 13) Disconnect the verification feature for smoke sensors during tests to minimize the amount of smoke or test gas needed to activate the sensor.
- 14) Measure the voltage drop at the most remote appliance on each notification appliance circuit.

h. Audio Tests:

- 1) Provide test equipment and conduct audio test for the fire alarm system in and around the building and in areas where new audio alarm devices have been installed.
 - 2) Audio measurements shall be made in offices and other rooms (e.g. equipment and storage rooms) and buildings with the doors in the open and closed position.
 - 3) An audio test plan and proposed test equipment shall be submitted for review and approval with the test plans submittal in accordance with NFPA 72.
 - 4) The measured data shall be recorded on data sheets provided by the Contractor and shall be part of the test plan submission and records.
 - 5) At the request of the Contracting Officer, the Contractor shall provide proof of instrument calibration and date of calibration.
- i. Contractor shall be responsible for notifying the AHJ and Fire Department of formal acceptance testing.

5. In addition to satisfactory acceptance tests of the contractor's new work, the entire fire alarm system must be accepted and certified by the County Fire Department or AHJ before commencement of the specified system warranty period with full maintenance responsibility. The tests must demonstrate that the entire facility fire alarm system is operating in order to receive the Fire Department Certification.
6. If requested by the Contracting Officer, isolate the contractor's new work from the overall system and demonstrate that the new work does not affect the operation of the overall fire alarm system and shall repeat tests at no additional cost to the Owner.

- B. Concealed Work: Concealed work re-opened and re-closed at random during the formal inspection as requested by the Contracting Officer, shall be done at no additional cost to the Owner.

- C. Testing Tools and Equipment: The Contractor shall provide the tools and equipment, including handheld radios, etc. necessary to accomplish the testing.

3.05 **TRAINING**

- A. Conduct training and instruction for the operating and maintenance staff, as designated by the Contracting Officer, on the operation of the fire alarm panel and system.
- B. The training session shall be conducted during normal business hours, and shall consist of a total of 8 hours of instructions.
- C. The initial training session shall be 4 hours in duration and shall start after the system is functionally completed, but prior to final acceptance tests. The remaining 4 hours of instruction time shall be scheduled at the discretion of the Owner and within one year of initial operation and acceptance of the system.
- D. Instruction shall include hands-on training in routine operations and queries (reading of normal status and trouble status) of the fire alarm system.
- E. Training shall be provided for the new fire alarm system and additional circuits and devices.
- F. Instruction shall include operations and query of system status, etc.; and hands-on training in the procedures and process for operations and obtaining system status, trouble and other functional information to determine when to call for repairs and how to report the type of trouble encountered. Provide all passwords necessary to reprogram the system.

3.06 **MISCELLANEOUS**

- A. Upon completion of the work, the Contractor shall submit an "As Built" or corrected plan, or any data therefore required by the Contracting Officer, showing in detail all construction changes.
- B. All incidental parts which are not shown on the plans or called for in the proposal or specified herein or in the special provisions and which are necessary to complete the lighting system shall be furnished and installed by the Contractor as though such parts were shown on the plans and/or specified.

END OF SECTION

SECTION 13930 - WET PIPE SPRINKLER SYSTEM

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

A. As specified in SECTION 00700.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS

SECTION 09901 - PAINTING: Painting of all pipe, bracing, hangers and valves.

SECTION 13851 - ADDRESSABLE FIRE ALARM SYSTEM: Alarm initiating devices shall be connected.

1.03 PAYMENT PROCEDURES

Permits, Tests and Inspections: Apply, secure and pay for all required permits, fees, licenses, tests, inspections and royalties necessary to accomplish the work. Schedule and coordinate required tests and inspections.

1.04 SCOPE

The work includes designing and providing new combined automatic wet pipe fire sprinkler for uniform distribution of water by hydraulic design to afford complete fire protection coverage throughout the entire building, stair shafts (where required by NFPA 13), elevator hoist ways and elevator machine rooms.

The design, equipment, materials, installation, and workmanship shall be in strict accordance with the required and advisory provisions of NFPA 13, and IBC, except as modified herein.

Each system shall be provided with earthquake protection and shall include all materials, accessories, and equipment necessary to provide each system complete and ready for use. Design and install each system to give full consideration to blind spaces, piping, electrical equipment, ductwork, and all other construction and equipment to afford complete coverage in accordance with detailed drawings to be submitted for approval. Devices and equipment for fire protection service shall be listed by the Underwriters' Laboratories, Inc. or approved by Factory Mutual System. In the NFPA publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; reference to the "authority having jurisdiction" shall be interpreted to mean the Hawaii Insurance Bureau and the Building and Fire Departments. The work shall begin at the point indicated.

1.05 APPLICABLE PUBLICATIONS

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

International Building Code (IBC), 2018 Edition with State Amendments
 NFPA 1, Hawaii State Fire Code, 2018 Edition with State Amendments
 American Society for Testing and Materials (ASTM) Publications

A 53 95 Pipe, Steel, Black Welded and Seamless
 A 795 95 Black Welded and Seamless Steel Pipe for Fire Protection
 Use

American Water Works (AWWA) Publications

C601 86 Disinfecting Water Mains

American Welding Society, Inc. (AWS)

A 5.8 81 Brazing Filler Metal

Factory Mutual (FM) Publication

Approval Guide (updated online)

National Fire Protection Association (NFPA) Publications

NFPA 13 2016 Installation of Sprinkler Systems
 NFPA 25 2017 Inspection, Testing, & Maintenance of Water Based
 Fire Protection Systems
 NFPA 72 2016 National Fire Alarm Code

Underwriters' Laboratories, Inc. (UL) Publications

Fire Protection Equipment Directory (updated online)

1.06 SUBMITTALS

Submit under provisions of SECTION 01330 - SUBMITTAL PROCEDURES. Partial submittals will not be acceptable. Submit for approval one complete sets of submittals as described below in electronic format, Portable Document Format (PDF). Annotate descriptive data to show the specific model, type, and size of each item the Contractor proposes to furnish. Prepare working drawings on sheets not smaller than 24 by 36 inches, in accordance with the requirements for "Working Drawings (Plans) as specified in NFPA 13 and include data essential to the proper installation of each system. Do not commence work until the design of each system and the various components have been approved. The Contracting Officer will review and approve all submittals. Before work is commenced, submit for

approval complete sets of working drawings and calculations for each sprinkler system. Working drawings and calculations must be stamped by a Hawaii licensed professional mechanical engineer.

1. Manufacturer's Data:
 - a. Sprinklers
 - b. Spare sprinkler cabinet and sprinkler stoppers
 - c. Alarm pressure and water flow switches
 - d. Valve tamper switches
 - e. Floor control valve
 - f. Pipe, fittings, and mechanical couplings
 - g. Pipe hangers and supports
 - h. Earthquake sway bracing and seismic restraint
 - i. Valves including gate, check, relief
2. Shop (Working) Drawings:
 - a. Sprinkler system layout conforming to NFPA 13.
3. Design Data:
 - a. Sprinkler system hydraulic calculations
Seismic bracing calculations
4. Certificates of Compliance:
 - a. Contractor's material and test certificate per NFPA 13
5. Guaranty
6. Operation and Maintenance Manuals: Provide five (5) bound copies of the Operations and Maintenance Manuals in three (3) hole binders with hard covers. Submit one electronic copy in portable document format (PDF). Electronic copy shall be exact copy of the hard copy. The manuals shall be submitted to the Contracting Officer a minimum of two (2) weeks prior to the final test and shall be approved by the Contracting Officer and consultant.
 - a. Alarm pressure and water flow switches.
 - b. Valve tamper switch.
7. Test Plan: A minimum of fifteen (15) days prior to the Preliminary Testing, the Contractor shall submit a "Test Plan" which shall describe how the system will be tested. This shall include a step-by-step description of all tests and shall indicate the type and location of test apparatus to be employed. Tests shall not be conducted until the test plan is approved by the Contracting Officer and the consultant.
8. As-Built Drawings: Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES. Upon completion and before final

acceptance of the work, submit a complete set of as-built drawings of the system for record purposes. Submit one electronic copy in portable document format (PDF).

1.07 QUALITY ASSURANCE

Qualifications of Installer: Prior to installation, submit data for approval by the Contracting Officer, showing that the Contractor is a licensed fire protection contractor (C-20) and has successfully installed automatic fire extinguishing sprinkler systems of the same type and design as specified herein, or has a firm contractual agreement with a subcontractor having such required licensed experience. The data shall include the names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. The Contractor shall indicate the type and design of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months.

Qualifications of System Technician: Installation drawings, shop drawing and as-built drawings shall be prepared, by or under the supervision of, an individual who is experienced with the types of works specified herein and is currently certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level-III certification in the Fire Protection/Automatic Sprinkler System program. Contractor shall submit data for approval showing the name and certification of all involved individuals with such qualifications at or prior to submittal of drawings.

Requirements for Fire Protection Service: Equipment and material shall have been listed for fire protection service by Underwriters Laboratories, Inc. or approved by the Factory Mutual System or listed by other nationally recognized testing laboratories. The omission of these terms under the description of any item of equipment described shall not be construed as waiving this requirement.

Modifications of References: In NFPA publications referred to herein, consider advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" whenever it appears. Interpret reference to "authority having jurisdiction" to mean the County Building and Fire Departments.

Special Inspection Final Report: Provide a copy of the final special inspection report.

1.08 GUARANTY AND CERTIFICATE

The Contractor shall guaranty and certify in writing all work in this section for period of two (2) years. Should any equipment or material fail due to defective equipment, material or workmanship within this period, the Contractor shall replace the item at no cost to the State.

The two (2) year guaranty shall start at the end of thirty (30) consecutive days of trouble free operation after certification by the Fire Department and acceptance by the State whichever date is the latest.

1.09 INSPECTION, MAINTENANCE, AND TESTING SERVICE AGREEMENT

The Contractor shall include two (2) year inspection, maintenance, and testing service agreement in the bid. The two (2) year period shall begin at the end of thirty (30) consecutive days of trouble free operation after certification by the Fire Department and acceptance by the State whichever is the latest. The agreement shall cover all labor, parts, insurance taxes, fees, and other incidental costs to inspect and test the system in accordance with NFPA 25, Fire Code. Inspection and testing of the system shall be conducted based on the frequencies in NFPA 25.

PART 2 - PRODUCTS

DESIGN OF SPRINKLER SYSTEM

Sprinkler System: Design of wet pipe fire sprinkler system shall be by hydraulic calculations for uniform distribution of water over the design area and shall conform to NFPA 13 and to the requirements as specified herein.

Distribution of Water: Distribution shall be essentially uniform throughout the area in which it is assumed the sprinkler heads will open.

Density of Application of Water: Size pipe to provide the specified density when the system is discharging the specified total maximum required flow. Application to horizontal surfaces below the sprinklers shall be as indicated on the drawings.

Sprinkler Discharge Area: Area shall be the hydraulically most remote area as defined by NFPA 13. The design area shall be as indicated on the drawings.

Hose Allowances: Hydraulic calculations shall include the allowance as indicated on the drawings.

Friction Losses: Calculate losses in pipe in accordance with the Hazen-Williams formula with 'C' value of 120 for steel pipe, 100 for buried cement-lined ductile-iron pipe and 100 for existing pipe

Location of Sprinkler Heads: Heads in relation to the ceiling and walls and the spacing of sprinklers shall not exceed that permitted by NFPA 13.

Water Supply: Base hydraulic calculations on the water supply as indicated on the drawings.

EQUIPMENT

Sprinkler Heads: Release element of each head shall be as indicated on the drawings or higher as suitable for the individual location where it is installed. Provide quick response upright sprinkler heads. Provide Electroless Nickel Plated (ENT) type sprinkler heads only. Provide high temperature sprinklers in the elevator machine room and shaft. Provide intermediate temperature (200 degrees F) fire sprinkler heads in the elevator lobby.

Cabinet: Provide extra sprinkler heads and sprinkler head wrench and three of the proper types of sprinkler stoppers in a metal cabinet adjacent to the sprinkler riser. The number and types of extra sprinkler heads shall be as specified in Fire Code Article 13.3.3.5.1.5.

Sprinkler Supervisory Devices: Provide as indicated. Connection of the sprinkler supervisory devices to the building fire alarm system shall be provided under SECTION 13851 - ADDRESSABLE FIRE ALARM SYSTEM.

Alarm Pressure and Water Flow Switches: UL listed or FM approved.

Valve Tamper Switch: Provide each control valve with a listed or approved tamper switch for the automatic transmittal of a trouble signal. Valve tamper switches which are integral to the control valve will be acceptable.

Floor Control Valves: Provide floor control valves where indicated, install in accordance with Figure A.8.17.4.2 (a) of NFPA 13, and provide a water pressure gage at each floor control valve. UL floor control valve assemblies will be acceptable.

ABOVE GROUND PIPING SYSTEMS

Inspect, test and approve piping before burying, covering, or concealing. Provide fittings for changes in direction of piping and for all connections. Make changes in piping sizes through reducing pipe fittings; the use of bushings will not be permitted. Welding shall be performed in the shop; field welding will not be permitted.

Pipe and Fittings:

Provide in accordance with NFPA 13. All piping and fittings shall be steel. All piping and fittings exposed to exterior conditions shall be primed and painted red with epoxy coating. All piping shall be minimum schedule 40 black steel only. Hot dipped galvanized steel piping is not permitted.

Fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded shall be welded, threaded, or grooved-end type. Use of plain-end fittings with mechanical couplings which utilize steel gripping devices to bite into pipe when pressure is applied will not be permitted. "Mechanical T", "Clamp T" or any other bolted branch outlet tees will not be permitted. Rubber gasketed grooved-end pipe and fittings with mechanical couplings shall be permitted in pipe sizes 1.25 inches and larger; fittings shall be UL listed or FM approved for use in sprinkler systems.

The use of flexible sprinkler hose is not permitted.

Provide an earthquake sway brace within 24 inches of each flexible coupling which is installed in horizontal piping for purposes other than earthquake protection.

Pipe Hangers, Supports, and Earthquake Sway Bracing: Provide in accordance NFPA 13. Provide retaining straps on beam clamps. Provide branch line seismic restraint.

Valves: Provide valves as required by NFPA 13 , and of types approved for fire service. Gate valves shall open by counterclockwise rotation. Check valves shall be clear opening swing check type. Provide OS&Y valves as indicated. Built-in butterfly valve with tamper switch is permitted to be used.

Relief Valve: Provide an approved relief valve on gridded systems in accordance with NFPA 13.

Identification Signs: Attach properly lettered approved metal signs conforming to NFPA 13 to each valve and alarm device. Permanently affix hydraulic design data nameplates to the riser of each system.

Inspector's Test Connection: Provide test connections about 6 feet above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device.

Main and Auxiliary Drains: Provide drain piping to discharge at safe points outside each building or to sight cones attached to drains of adequate size to readily receive the full flow from each drain under maximum pressure. Provide auxiliary drains required by NFPA 13. Provide a splash block below each exterior drain discharge.

Pipe Penetrations of Fire Rated Construction: Provide UL listed fire stopping design.

Escutcheon Plates: Provide one piece or split hinge type metal plates for piping passing through floors, walls, and ceilings in exposed areas. Provide chromium-plated finish on plates in finished areas. Provide paint finish on plates in unfinished areas. Securely anchor plates in place with setscrews or other approved positive means.

Air Venting Valve: Provide automatic air venting valve on each system. Provide the valve at the high point of the system.

Drawings.

ELECTRICAL WORK

Electrical work is specified in DIVISION 16 - ELECTRICAL except for control and fire alarm wiring in this section. Fire alarm wiring is specified in SECTION 13851 - FIRE ALARM SYSTEMS.

PART 3 - EXECUTION**3.01 INSTALLATION**

Equipment, Material, Installation, and Workmanship: Provide in accordance with NFPA 13 , except as modified herein. Install piping straight and true to bear evenly on hangers. Keep the interior of new and existing piping affected by the Contractor's operations thoroughly cleaned of water and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping and fittings so that water and foreign matter will not enter the pipes or fittings. Inspect piping before placing into position. Inspect, test, and approve piping before burying, covering, or concealing. Provide fittings for changes in direction of piping and for all connections. Make changes in piping sizes through tapered reducing pipe fittings; do not use brushings.

Pipe Hangers (Supports): Provide additional hangers to support the concentrated loads in piping between hangers, such as for flanged valves.

Pipe Penetrations: Penetrations of fire rated walls shall be fire stopped. Provide UL Listed fire stopping system.

3.02 ELECTRICAL INSTALLATION

Comply with local ordinances and regulations of City and County of Honolulu as well as NFPA 70, and NFPA 72. Workmanship is subject to the approval of the Contracting Officer.

3.03 FIELD PAINTING

Painting: Clean, pretreat, prime, and paint new sprinkler systems including valves, piping, conduit, hangers, supports, rods, miscellaneous metalwork, and accessories. Apply coatings to clean dry surfaces using clean brushes. Clean the surfaces to remove dust, dirt, rust and loose mill scale. Immediately after cleaning, provide the metal surfaces with one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, and one coat of primer applied to a minimum dry film thickness of one mil. Exercise care to avoid painting of sprinkler heads or protective devices. Remove materials which are used to protect sprinkler heads, while painting is in process, upon the completion of painting. Remove sprinkler heads which are painted and provide new clean sprinkler heads of the proper type. Provide primed surfaces with the following:

Sprinkler Systems: Provide primed surfaces with two coats of red epoxy applied to a minimum dry film thickness of one mil.

3.04 FIELD TESTING AND FLUSHING

Preliminary Tests:

- Perform an air pressure leakage test for all sprinkler piping per NFPA 13, and NFPA 14 Paragraph 8-2.3, prior to hydrostatic testing.
- Hydrostatically test the sprinkler system at 200 psig, for a period of two hours. Piping above suspended ceilings shall be tested, inspected and approved before installation of ceilings.
- Test the alarms and other devices. Test the water flow alarms by flowing water through the inspector's test connection.
- Test the elevator devices by flowing water through the test connection. Test the valve supervision.
- When tests have been made completed and corrections made, submit a signed and dated certificate, similar to that specified in NFPA 13, with a request for a formal inspection and tests.

Formal Inspection and Tests:

The City and County of Honolulu, Building and Fire Departments, Contracting Officer or the designated representative will witness formal tests and approve all systems before they are accepted. Submit the request for formal inspection at least 15 days prior to the date for formal inspection is to take place. An experienced technician regularly employed by the sprinkler installer shall be present during the inspection. At this inspection, repeat any or all of the required tests as directed. Correct defects in the work provided by the Contractor and make additional tests until it has been demonstrated that the systems comply with all contract requirements. Furnish appliances, equipment, electricity, instruments, connecting devices, and personnel for the tests. All necessary tests encompassing all aspects of system operation shall be made, including the test listed in the previous section, and any deficiency found shall be corrected and the system retested at no cost to the State.

3.05 INSTRUCTING OPERATING PERSONNEL

Upon completion of the work and at a time designated by the State, provide for a period of not less than 4 hours the services of experienced technicians regularly employed by the manufacturer of the sprinkler system to instruct the operating staff in the proper operation and maintenance of the equipment.

END OF SECTION

DIVISION 14 - CONVEYING EQUIPMENT

SECTION 14240 - MODERNIZE HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes alterations to the existing electric traction passenger elevator fixtures, car finished flooring, hoistway equipment, and machine room equipment.
- B. Related Sections include the following: Air-conditioning work, electrical work, and sump pump work. Coordinate with respective disciplines to insert proper verbiage and sections.
 - 1. DIVISION 9, SECTION 09651 - RESILIENT TILE FLOORING for finish flooring in elevator cars.
 - 2. DIVISION 9, SECTION 09901 - PAINTING.
 - 3. DIVISION 13, SECTION 13851 - ADDRESSABLE FIRE ALARM SYSTEM.
 - 4. DIVISION 16, SECTION 16100 - ELECTRICAL WORK.

1.2 DEFINITIONS

- A. Defective Elevator Work: Operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
- B. Refurbish: The term "refurbish" shall be defined as the complete disassembly of a part or system. All parts shall be inspected for wear, corrosion, and/or damage. All parts and systems shall be repaired and rebuilt to a new condition with OEM parts. All rust and corrosion shall be removed and all exposed metals finished with two coats of rust-inhibiting machine enamel. All refurbished parts shall be deemed to be in an "As-New" condition, per OEM standards and covered in the new equipment Warranty.
- C. Items listed in the singular are to be interpreted as being as many of each listed items as necessary to provide a complete work scope for all elevators, landings, door openings, etc.

1.3 SUBMITTALS

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

- B. **Product Data:** Include detailed information about the equipment, capacities, sizes, performances, operations, safety features, finishes, and any other relevant information regarding the proposed products.
- C. **Product Samples:** Provide samples of all the finishes and products intended for car interiors and fixtures. These samples will be reviewed and approved by the Owner and Contracting Officer before proceeding further.
- D. **Shop Drawings:** The shop drawings should clearly depict plans, elevations, sections, and details indicating service at each landing, machine room layout, coordination with the building structure, relationship with other construction elements, and equipment and signal locations. Highlight any variations from the specified requirements, maximum dynamic and static loads imposed on the building structure at support points, and the maximum and average electrical power demands. Additionally, provide data on power confirmation, manufacturer power tolerance requirements, equipment maximum heat release, and manufacturer heat and humidity tolerance requirements, along with elevator interior finish and fixture shop drawings. The modernized elevator shall remain within the existing structural reactions/loading, electrical loading, and mechanical loading of the current elevator system.
- E. **Pre-modernization decibel levels** in the elevator cab and machine room when running at contract speed without the exhaust fan running.
- F. **Product brochures, samples, catalogs, cut sheets, photos, color charts or other pertinent material** required for submission shall be submitted with the Shop Drawings. Contractor shall be responsible for all submittals requested by Contracting Officer within the specifications and contract documents.
- G. **Approval of the submittals** shall be for general review purposes only. Final responsibility for measurements, Code compliance, and specification adherence lies with the Contractor. Field verification of all dimensions is required by the Contractor.
- H. **Provide State of Hawaii licenses** for the installation Mechanic(s) that will be performing on-site work.
- I. **Maintenance Manuals:** Include operation and maintenance instructions, parts listing with sources indicated, recommended parts inventory listing, emergency instructions, and similar information. Include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel. Provide detailed instructions detailing the means to test the new elevator for compliance with ASME A17.1 and ASME A17.2. New Acceptance and THREE Year test requirements. Submit for State's information at Project closeout as specified in Division 1. Provide "On-Board", site-specific interface tools to perform diagnostic, minor programming, and test functions. Provide maintenance control program.
- J. **Inspection and Acceptance Certificates and Operating Permits:** As required by authorities having jurisdiction for normal and unrestricted elevator use.

1.4 **QUALITY ASSURANCE**

- A. Installation Qualifications: From the date of bid submittal, the elevator contractor shall have a minimum of five (5) years of continuous licensed operation in the State of Hawaii, along with a minimum of fifty (50) elevator modernizations completed in the State of Hawaii, similar in material, design, and a record of successful in-service performance.

According to Section SPECIAL CONDITIONS, the Contractor must provide documentation to confirm their compliance. This includes submitting the Installation Qualification and experience documentation, along with references and a list of installations, within five (5) consecutive calendar days from the date of the request by the State of Hawaii, as outlined in Section 01330 – SUBMITTAL PROCEDURES. Failure to provide the necessary documentation to validate compliance with the qualification requirements specified herein may result in the rejection of the submittal. If the Contractor does not meet the required Installation Qualifications, their bid may be rejected.

B. References

1. All work shall be completed in accordance with national, state, and local codes in effect at the time the work is performed. All requirements of local building department and fire jurisdictions will be met by the Contractor.
2. State of Hawaii, Local Fire, Elevator and Accessibility Codes.
3. The American Society of Mechanical Engineers, Safety Code for Elevators and Escalators (ASME A17.1 – 2010 or latest edition).
4. The American Society of Mechanical Engineers, Safety Code for Existing Elevators and Escalators (ASME A17.3 – 2011 or latest edition).
5. Americans with Disabilities Act Accessibility Guidelines (ADAAG) and Fair Housing Act Design Manual.
6. National Fire Protection Association (NFPA 13)
7. National Electrical Code (NEC), NFPA / ANSI 70 (latest edition)
8. International Building Code (IBC) 2012, ICC A117.1-2009
9. HAR Title 12, Subtitle 8, Part 11, Chapter 229 and 230.1

- C. Accessibility Requirements: In addition to local governing regulations, comply with “Americans with Disabilities Act” (ADA), 2010 ADA Standards, including 2010 Standards for Titles II and II Facilities: 2004 ADAAG, Section 407.

- D. Approved Elevator System Manufacturers: GAL Manufacturing, Elevator Controls and Smartrise.

- E. Non-Proprietary: The elevator control and drive systems that are approved must be universally maintainable, with built-in on-board diagnostics, fault logging, and testing per ASME A17.1. They should also have minor programming capability without the need for external electronic tools, hand-helds, or computers. If any systems require these external devices, they should be included in the Close-Out Submittal package, along with detailed operating instructions. Additionally, all parts for the entire elevator system should be easily accessible for purchase and inventory.

1.5 **PROJECT WORK SUMMARY**

- A. Provide all engineering, labor, material, equipment, tools, permits, mobilization and resources necessary to safely and diligently modernize the elevator as specified herein. The project is intended to provide the Owner with reliable operation, minimal interruptions to Owners and Guests, and present a professional completed elevator.
- B. Modify all equipment as necessary to accommodate the installation of the new elevator equipment, machine(s)/motor(s), door operator(s) and related hardware, cab aesthetics and ADA compliant signal fixtures.
- C. Owner will not be responsible for changes/modifications for structural, mechanical, electrical or other building systems required to accommodate Contractor's equipment. Any changes/modifications will be the Contractor's responsibility.
- D. Contractor will provide protective guarding and barricading to protect the public from jobsite hazards. This includes open hoistways, machine rooms, material and tools.
- E. Contractor will take all precautions necessary to protect building premises from damage for the duration of the project. Contractor will be responsible to repair or replace items damaged or altered from original conditions due to its own construction activity.
- F. Contractor will make all necessary provisions for new components.
- G. Contractor will properly remove and dispose all elevator equipment and material removed in the process of the modernization. Disposal and removal will be completed diligently, and items will not be stored or staged in public areas. This includes all oil/debris removed and/or replaced with this project.
- H. Contractor will include all provisions per the Authority having Jurisdiction (AHJ), permits, testing and inspection costs.

1.6 **PRODUCT DELIVERY, STORAGE & HANDLING**

- A. All material shall be shipped in factory crates in applicable sizes to permit mobilization through available spaces. Contractor shall deliver the material in the manufacturer's original, unopened crating and packaging. Material shall be protected from any damage during transport, storage and the duration of the project.
- B. Delivery scheduling of material to building premises shall be pre-arranged and approved by the Owner.
- C. Storage of the material shall be coordinated by the Owner. Securing the material in the designated storage area(s) will be the responsibility of the Contractor.

- D. Hoisting of equipment and material shall be coordinated and approved in advance. The contractor shall provide a plan detailing planned methods of hoisting, including roof preparation, hoisting load certifications, and any special requirements which may affect building structure.

1.7 **SITE EXAMINATION**

- A. Contractor has carefully examined all existing site conditions, including all areas of where scope provided herein shall take place, which may affect the quality and intent of the scope specified within the contract.
- B. Contractor finds that there are no irregularities or Code provisions which may impact the scope specified, including but not limited to, machine room size and clearances, hoistway dimensions or plumbness, any beam supports either currently existing or newly installed for the contractor's equipment.
- C. Owner will not accept responsibility nor offer consideration for the Contractor's failure to visit site or a misunderstanding of materials to be furnished. In the absence of any such qualification, Contractor shall be responsible for providing all material and labor necessary to provide a complete, Code compliant installation.

1.8 **FIELD INSTALLATION QUALITY CONTROL**

A. Tests

1. Perform tests as required by Code and AHJ. Contractor shall demonstrate to AHJ that all elevators comply with all requirements set forth by ASME A17.1 and ASME A17.2 and related codes.
2. After completion of any required tests which results in damaged components, Contractor shall restore or replace damaged components and absorb all material and labor costs for these components.
3. Perform system tests for all Fire/Life Safety related items which interface with the elevator system.
4. Prior to turnover, Contractor shall perform a Continuous Run test. This test will consist of running the elevator with full rated capacity for a 1-hour period. During the test, the elevator shall make continuous random floor runs in both directions of travel. If any faults or irregularity in operation occurs, Contractor shall all necessary adjustments and re-test.
5. Perform full contract and no-load speed tests in both directions. Measurements shall be taken with a tachometer and be within 3% of rated speed.
6. Verify all performance times for floor to floor, door operation and leveling are all within acceptable levels provided herein.

1.9 CLEANING, ADJUSTING AND PAINTING

- A. Contractor is expected to thoroughly clean all machinery spaces, hoistways, car tops, pits and landing sill. These areas shall be kept free of oil, grease, dirt and debris.
- B. Adjust all equipment for optimal performance. This includes controllers, motors, drives, landing systems, door operating equipment, hoistway equipment, ride quality equipment, and safety equipment. The successful completion of these adjustments shall result in a high-quality project, providing smooth, quiet, safe and reliable operating elevator.
- C. Prior to final turnover, Contractor shall clean and paint the machine room floor, car top, pit equipment and pit floor.

1.10 OWNER'S DOCUMENTS & INSTRUCTIONAL TRAINING

- A. Contractor shall submit to the Owner, two (2) complete sets of the following items. Documents shall be neatly organized, properly bound and labeled. In addition to hard copies, Contractor shall submit these documents on a removable storage device (thumb drive).
 - 1. Straight-line wiring diagrams of the newly installed equipment, including indices of individual components and related function for each elevator.
 - 2. Parts catalogs, ordering sheets and instructions for all replacement parts included in this specification.
 - 3. Provide four (4) sets of keys required for all operation and opening of all features and systems of the newly installed elevators.
 - 4. Provide any special lubrication requirements and/or lubricants to be used. This includes any cleaning products or methods to clean/maintain new components.
 - 5. Post-modernization decibel levels in the elevator cab and machine room when running at contract speed.
 - 6. Provide operating instructions for the elevators under emergency conditions, including maintenance and testing of Fire/Life Safety, Firefighter's Service and Recall operation.
 - 7. Provide further operating instructions on maintenance, adjusting, troubleshooting and diagnostic procedures. Provide any required external diagnostic or programming tool if the new control system does not have a built-in terminal. The tool or laptop shall contain all required software, passwords, codes or related access requirements. This tool shall allow any licensed Contractor to perform diagnostic and testing of the elevator, including 5-year full load testing, to OEM standards.

1.11 **MATERIAL**

- A. Stainless Steel Type 316 with standard tempers and hardness required for fabrication, strength and durability.
- B. Exposed metal in hoistways and car tops shall have all rust removed. Components shall be wire brushed, cleaned and applied with rust inhibitor, then painted with coat of industrial enamel paint.
- C. Other exposed metal components and assemblies of oil, grease, scale and other debris shall be cleaned and painted with one coat of industrial enamel paint.
- D. Machine room and pit floors shall be painted.

1.12 **WARRANTY**

- A. Manufacturer's Warranty: Written warranty, signed by manufacturer agreeing to repair, restore, or replace defective elevator work within specified warranty period.
 - 1. Warranty Period: Warranty Period shall be one (1) year starting from date of Project Acceptance. Project Acceptance is the State of Hawaii's and Owner's acceptance of the entire project from the contractor after the work is completed, tested, and inspected in accordance with contract requirements.

PART 2 – UNIT INFORMATION

2.1 ELEVATOR EQUIPMENT DESCRIPTION

- 1. Type: Passenger
- 2. Capacity: 2,000 lbs.
- 3. Speed: 150 feet per minute (Code Data Plate). Verify to match existing.
- 4. Number of Landings: Five (5) stops. Per Contract Drawings.
- 5. Number of Openings: Five (5) openings. Per Contract Drawings.
- 6. Control: Simplex collective operation.
- 7. Machine: Submersible Power Unit.
- 8. Plunger & Cylinder: Single Stage Holed Hydraulic Cylinder
- 9. Power Supply: Per Contract Electrical Drawings. Conform to the requirements of the existing electrical system and electrical design

requirements.

2.2 **OPERATIONAL REQUIREMENTS**

- A. All elevator systems shall be able to safely lower, stop within ¼-inch of each floor and hold up to a maximum of 125% of the rated capacity of the elevator.
- B. All elevators speed shall be maintained within (+/-) 3% of the contract speed at all times, under any load condition, measured in both directions of travel.
- C. All traction elevator systems shall provide smooth acceleration and deceleration with a ¼-inch leveling accuracy at landings, under all load condition.
- D. Elevators are required to travel between two consecutive floors in 11.0 seconds, in both directions of travel. This is measured from the start of the door close at one floor to ¾ open at the next floor.
- E. New door operating systems shall open the elevator doors in 2.0 seconds. This is measured from the start of opening to fully open.
- F. New door operating systems shall close the elevator doors in 2.4 seconds. This is measured from the start of door close to fully closed.
- G. Door hold (dwell) times shall be held in the open position between 3.0 – 5.0 seconds in response to a car call registration, and between 4.0 – 7.0 seconds in response to a hall call registration.
- H. When a door detector (sensor) is interrupted/obstructed in the open position for a period longer than 20 seconds, a buzzer shall sound and the doors will close at slow speed to “nudge” the interruption/obstruction from the doorway and allow the elevator to be placed back into service.

2.3 **NOISE & VIBRATION**

- A. All elevator equipment, including supports and fastenings shall be mechanically and electrically isolated from the building structure and mainline power feeders to minimize noise and vibration transmitted to the elevator and occupied areas of the building.
- B. For all machine room equipment, provide sound isolation to eliminate vibration and structure-borne sound transmitted to the building. Provide isolation grommets and washers at hold-down bolts between any equipment and the building structure.
- C. Noise levels in running elevators shall not exceed 55 dBA and no more than 60 dBA in occupied building areas, including door operation and fan. Contractor shall provide the labor and material to eliminate machine room or hoistway noise from penetrating building occupied areas should noise levels exceed above requirements.

PART 3 – PRODUCTS**3.1 MACHINE ROOM EQUIPMENT**

- A. All equipment shall be designed, engineered and installed in complete compliance with all local codes within existing machine room space. Contractor shall be responsible for all existing building conditions and will design the new modernized systems to operate within the existing building dimensions, structural supports and electrical systems. Any and all costs for redesign of, revisions to, building spaces and/or structure to accommodate Contractor's equipment will be the responsibility of the Contractor.
- B. Hydraulic Tank Unit
1. The hydraulic tank unit shall be compactly and neatly designed. Submersible units are preferred. Where necessitated due to size of motor and pump, an overhead tank with pump, motor, valve and muffler below may be used.
 2. The motor starter shall be solid state, reduced voltage upon starting of the motor. Nordic Softstart units rated for hydraulic motors shall be used.
 3. Elevator contractor shall take power from a fused disconnect provided by others. Power supply shall match existing power supply.
 4. Provide suitable rubber isolation pads to isolate the machine and prevent transference of vibration.
 5. A blowout-proof muffler shall be provided between the pump unit and jack to minimize noise and vibration.
 6. The pump shall be designed for submersible installation and for use in oil hydraulic elevator service, of the positive displacement type, and designed for steady discharge to give smooth and quiet operation. Output of the pump shall not vary more than 10% between no load and full load.
 7. The motor shall be of the Polyphase induction type, properly designed of oil-hydraulic elevator service and for reduced voltage starting. Starting relay and motors shall be of proper size to handle loads involved at the required speeds. The motor shall be designed for 80 starts per hour or for continuous duty.
 8. A GAL Manufacturing, Elevator Controls or Smartrise controller shall be provided including necessary starting switches of adequate size, together with all relays, switches, and hardware required to accomplish the specified operation. Overload relays shall be provided to protect the motor against overloading. The controller shall be provided with a phase monitor for loss protection.

C. HYDRAULIC VALVE

1. A one piece hydraulic valve shall be used. It shall have all necessary features to meet State of Hawaii and ANSI codes.

D. PIPING AND OIL

1. All necessary pipe and fittings, including shut-off valve, will be provided to connect the hydraulic tank unit to the plunger. Pipe shall be Schedule 80. Mobil or other approved biodegradable type oil shall be furnished and used for both testing and regular service operation.
2. All materials for which there is a listing by the Underwriters Laboratories, Inc., shall conform to the applicable requirements of the Underwriters Laboratories, Inc.
3. All pipe joints shall be of the threaded. Flexible pressure hoses are not acceptable.
4. An oil line shut-off valve shall be installed in both machine room and in the pit adjacent to the jack unit.

E. PLUNGER & CYLINDER

1. Retain existing cylinder and plunger system. Replace all seals and adjust stop ring as required to allow for smooth and quiet operation. If polishing or removal of any scarring on the plunger is required, perform work as needed.

F. HYDRAULIC OIL COOLER

1. Provide new oil cooling device with adjustable thermostat control. The oil cooler's heat exchanger shall be remotely mounted outside the elevator machine room and off the ground at an approved height. Refer to Architectural Drawings for mounting location of the heat exchanger.
2. Heat removal shall be greater than 21,000 BTU / hour.
3. Circulate a minimum of 8 gallons per minute and utilize a minimum 75 PSI with a cast iron pump.

G. OPERATION SYSTEMS

1. Provide a control system manufactured by GAL Manufacturing, Elevator Controls or Smartrise, as required to provide single or group automatic operation of the type indicated as follows, and as defined in the Code as "Operations".

- a. Single Elevator Control: Selective Collective Automatic Operation, as defined in ANSI/ASME A.17.1; or
 - b. Two-Car Group Control: Group Automatic Operation, as defined in ANSI/ASME A.17.1; or Multiple-Car Elevator Control: Provide automatic dispatching of selected cars in a regulated sequence in response to hall calls; and with automatic response of system to changes in demand for different traffic conditions.
 - c. Any other control system must be approved by Contract Administrator.
2. Microprocessor controller power units shall include all diagnostic equipment required to identify malfunctioning processor units, and shall be non-proprietary so that service may be performed by a licensed elevator technician. Technical support shall be available to any licensed elevator technician.
- H. EMERGENCY (STANDBY POWER) OPERATION:
1. Battery Lowering Unit: Provide a new automated, battery lowering unit for the elevator system, along with the installation of an auxiliary contact in the electrical mainline disconnect. The unit shall allow the elevator to move to the nearest safe landing, open its doors and release any trapped passengers. The elevator shall then park at that floor with its doors closed until normal power is restored.
- I. OPERATION CONTROLS
1. Elevator(s) shall operate from two-button system within the elevator cab and each elevator lobby.
 2. Upon registered demand, the direction of travel shall not be reversed until all car call registrations have been dispatched and hall calls ahead of the car in the same direction has been responded and answered.
 3. Illumination of call buttons shall occur when a call has been registered and extinguish once the call is answered.
 4. Provide fuzzy logic and intelligence to allow real-time dispatching of elevators to learn and adjust to current building traffic patterns. The elevator system shall adjust dispatching to provide balanced, efficient service to all landings in the building.
 5. Car stopping at each landing, regardless of load and direction of travel, shall stop the elevator within ¼-inch above or below the landing sill.
 6. Provide elevator system with Firefighter's control under Phase I and Phase II operation per Code. All provisions including fixtures, signage and features shall meet requirements set forth by the State of Hawaii and ASME A17.1. System shall recall the elevator to the designated or alternate landing in the

event of a fire or emergency situation. Recall will be initiated by the Fire/Life Safety system as noted in the Related Work Section. Include all wiring, conduit and electrical hardware as required for complete installation and interface from hoistway or machine room connection points to each controller as required.

7. Provide Independent and Inspection Service operation per Code.

3.2 **HOISTWAY EQUIPMENT**

- A. Guide Rails: Reuse existing guide rails for both car and counterweight. Perform adjustments as necessary to achieve a plumb and rigid guideway. Guides rails shall safely support all forces exerted by the elevator system during normal and test operations. Clean and remove any debris from all rails, brackets, clips, flanges and fishplates of rust and paint with black rust inhibiting enamel.
- B. Buffers: Retain and refurbish existing buffers. Paint with rust inhibiting enamel.
- C. Pit Ladder: Provide new ladder to meet current Code requirements for pit access. This may include a new retractable ladder or modifications for extension grips. Contractor shall comply with requirements ASME A17.1-2010 and of the Authority Having Jurisdiction (AHJ).
- D. Pit Stop Switch: Provide new pit stop switch and install per Code.
- E. Normal & Final Terminal Stopping Switches: Provide new per Code.
- F. Hoistway Wiring: Provide new hoistway wiring. Wiring shall be constructed of copper throughout. Wiring shall not be spliced, except at junction boxes or intermediate terminal blocks, control cabinets in the machine room, and at connection blocks within the elevator cab for fixtures, interlocks and other hardware. Provide 10% spare conductors with terminated at ends at car or hoistway connection points and the machine room. Include four (4) pairs of shielded communication wires between the cab and machine, and any additional wiring specified for CCTV or Security Access controls.
- G. Traveling Cable: Provide moisture-resistant, flame-retardant traveling cable with a minimum of 10% spares. Installation shall avoid any rubbing or chaffing of the cable against the car or hoistway components. Properly secure termination with cable support grips at cable ends to prevent pressure or movement of the cable which may affect terminal connections.
- H. Secondary Traveling Cable: Provide a separate traveling cable for the dedicated use of security camera and access control systems. Cable shall include coaxial cable and common spares other peripheral items. Installation shall avoid any rubbing or chaffing of the cable against the car or hoistway components. Properly secure termination with cable support grips at cable

ends to prevent pressure or movement of the cable which may affect terminal connections.

- I. Conduit / Raceway: Provide new hoistway conduit and electrical ductwork to comply with NEC guidelines as required. Flexible conduit may be utilized as applicable, but shall not exceed 36" in length.
- J. Guides: Provide new slide guide shoes and inserts.

3.3 HOISTWAY ENTRANCE & DOOR EQUIPMENT

- A. Entrance Frames: Retain existing entrance frames on all floors. Entrance frames shall be painted refer to SECTION 09901.
- B. Hoistway Door Panels: Provide new satin stainless steel hoistway door panels constructed with internal ribs for all floors. Provide new gibs and galvanized steel mounting brackets and locate within sill groove during complete travel. Black enamel paint backside of door panels and white stencil paint applicable floor number on each door.
- C. Sight Guards: Provide new electrostatic powder coated sightguards in the same color as the Hoistway Door Panels.
- D. Door Bumpers: Provide new rubber door bumpers at all landings.
- E. Headers & Struts: Provide new galvanized header with minimum 3/16" gauge and new door bumpers to prevent door assembly from hitting struts on all floors. Pant with rust inhibiting black enamel paint.
- F. Door Tracks: Provide new steel formed bar tracks or galvanized formed tracks on all landings.
- G. Door Hangers: Provide new applied door hangers to integrate with the door panels.
- H. Interlocks: Provide new interlocks on all landings.
- I. Door Closers: Provide new Smart Torq spirator closing devices on all landings.
- J. Dust Covers: Provide new galvanized covers to protect door hardware, tracks and interlocks. Paint with black rust inhibiting enamel.
- K. Hoistway Unlocking Devices: Provide unlocking devices with escutcheon collars in door panels on all floors.
- L. Sills & Sill Supports: Retain existing sills and sill supports. Clean and polish.
- M. Fascia: Provide new galvanized fascia where required by Code.

3.4 **CAR & DOOR EQUIPMENT**

- A. Frame: Retain and reuse existing frame, cross-head and uprights. Completely remove all rust, dirt and oil from components and repaint with rust inhibiting black enamel paint.
- B. Car Top Safety Railing: Provide new 42" high railing on the car top with intermediate rail, toe board and stationary posts as required by Code.
- C. Car Top Operation Station: Provide new car top operating station per Code.
- D. Platform: Refurbish existing. Completely remove all rust, dirt and oil from components and repaint underside with rust inhibiting black enamel paint.
- E. Load Weighing: Not applicable.
- F. Sills: Provide new aluminum sill.
- G. Toe Guard: Provide new toe guard per Code requirements.
- H. Header: Provide new galvanized car door header and protect with rust inhibiting black enamel paint.
- I. Door Panels: Provide new satin stainless steel car door panel(s). Provide new gibs and galvanized steel mounting brackets and locate within sill groove for complete travel.
- J. Door Track: Provide new steel formed bar door track.
- K. Door Hangers: Provide new door hangers, upthrusts/eccentrics and rollers to interface with track.
- L. Gate Switch: Provide new gate switch.
- M. Restrictors: Provide new restrictors per Code.

3.5 **DOOR OPERATOR & RELATED DEVICES**

- A. Operator: Provide new linear closed-loop, high-speed, heavy-duty door operator with a minimum opening speed of 2.5 feet per second. Door control shall be solid-state with fully adjustable door speed, force/torque and dwell times. Operation shall include closed-loop feedback which allows for door torque adjustments in varying wind conditions, while remaining in Code tolerances. Doors shall close smoothly and quietly under all conditions.
- B. Protection Device: Provide new Janus Panachrome+ infrared door protection device and meet all Code requirements.

- C. Nudging Operation: Provide feature in the event the door is obstructed in excess of preset 20 second time interval, a buzzer will sound, and the door will close at 50% normal speed with a maximum of 2.5 ft-lbf. Feature must comply with Code requirements for Firefighter's Operation.
- D. Differential Door Dwell Timers: Provide two adjustable profiles/timers to vary the time doors remain open in response to a car or hall call. Doors shall remain open for three to five (3.0-5.0) seconds in response to a car call and four to seven (4.0-7.0) seconds for a hall call.

3.6 CAR ENCLOSURE

- A. Shell: Provide new steel cab shell with solid steel walls (side and rear walls), extended to increase the overall cab height under the crosshead and maintain proper clearances for future equipment servicing. Rear glass wall is being eliminated.
- B. Canopy: Provide new canopy and include code required modifications for escape hatch. Paint with gray machine enamel.
- C. Exhaust Fan: Provide new, 2-speed high-capacity exhaust fan. Isolate from canopy with rubber pads for quiet operation.
- D. Fronts & Transom: Provide new cab fronts and transoms finished with Brushed Stainless Steel (SS#4). Modify as necessary to allow for installation of new Car Operating Panel.
- E. Finishes: Refer Architectural Drawing for elevator cab interior finishes.
 - 1. Protective Cab Pads: Provide ONE (1) set of canvas cab pads. Pads shall be provided for rear and side walls.
 - 2. NOTE: Car Balancing: The elevator car weight shall not exceed an increase of more than 5% above the total weight of the existing car. Contractor will be required to carefully weigh all removed material and compare those to the weights of the new equipment to be added. Provide written confirmation and pictures of measuring tool with weights, showing evidence the new car weights meets this Code requirement. If the original car weight exceeds 5%, Contractor will be responsible for all ASME A17.1 code requirements, including all costs associated with structural calculations, modifications and confirmation with the AHJ.

3.7 SIGNAL FIXTURES

- A. Car Operating Panel
 - 1. Provide One (1) Main car operating panel, integrated into existing location. Secure panel with a minimum of three (3) hidden hinges and allows the entire panel length to swing open. Panel finish shall be

Brushed Stainless Steel (SS#4). Installation shall meet all applicable ADAAG requirements.

2. Illuminating, vandal-resistant, Brushed Stainless Steel (SS#4) buttons pushbuttons shall be installed. Buttons shall be minimum 1-inch in diameter and raised a minimum of 1/8-inch.
3. Buttons and related signals shall be properly identified by Braille and Arabic designations, with a minimum of 5/8-inch numerals, standard alphabet character or standard symbol. Braille and Arabic items shall meet all applicable ADA requirements for size, location and installation.
4. Operating controls of the panel shall be mounted no higher than 48-inches above the car finished floor. Keyed emergency stop switch and alarm bell shall be located no lower than 35-inches above the car finished floor.
5. Provide a keyed stop switch with proper labeling of "RUN" and "STOP" with a red collar.
6. Provide a "CALL CANCEL" button per Code.
7. Provide an alarm button per Code in the event of an emergency condition.
8. Provide a lockable Firefighter's Service Cabinet with Fire Service Instructions engraved in the panel. The cabinet shall include all Code required key switches, call buttons, jewels and annunciators.
9. Provide a lockable Service Cabinet with concealed hinges, flush to the operating panel. Include the following operational items:
 - a. Light toggle switch
 - b. 2-Speed Fan toggle switch
 - c. Inspection toggle switch
 - d. Independent Service toggle switch
 - e. Emergency Test Light button
 - f. Duplex, 120-volt, GFCI convenience outlet
 - g. Security Override/Disable switch
10. Provide all required Code signage permanently engraved in operating panel. At a minimum, include Building Name, Elevator Number, Elevator Capacity, No Smoking and Permit location.
11. Provide a hands-free, integrated Emergency Communication, using push to talk ADAAG Code compliant device built into operating panel. Device shall include all audible and visual indicators and meet applicable ASME A17.1 requirements.
12. Provide floor lockout switches.

13. Car Position Indicator: Provide a new car position indicator with a minimum 2" character display.
 14. Provide a Floor Annunciator with floor passing chimes/tones with a minimum 20 dBa. Provide Voice Annunciator including the following announcements:
 - a. Floor number and direction of travel.
 - b. Notice of doors closing during nudging operation.
 - c. Notice of car on independent service.
 - d. Notice of Firefighter's Service.
- B. Hall Pushbutton Stations: Provide surface mount hall pushbuttons where existing and provide all necessary coring. Faceplates shall be Brushed Stainless Steel (SS#4) for all landings. Faceplates shall be designed with sufficient length to cover existing wall cutouts, while meeting required button height of 42-inches above the finished floor. Buttons shall be vandal-resistant, match the finish of the faceplate, minimum of 1-inch diameter and raised a minimum of 1/8-inch.
- Faceplates shall include "In Case of Fire" signage engraved in the upper section. Contractor shall design station to minimize any cutting and patching of the wall(s). If cutting and patching is required, Contractor shall coordinate this with Owner.
- Include 1" character segmented LED digital floor position indicator for each elevator in each hall station.
- C. Firefighter's Service (Recall) Switch: Provide new Firefighter's Service Recall Phase I switch and faceplate, adjacent to elevator at the main egress landing. Faceplate shall include illumination indicators. Key box shall have Code required operating instructions and key sets.
 - D. In-Car Lanterns: Provide dual in-car lantern for each elevator installed on the jamb furthest from the hall station. Faceplate shall be Brushed Stainless Steel (SS#4) with vandal-resistant lantern indicators. Visual signals shall be digital arrows signifying location of travel with a minimum of 2-inches by 2-inches. Include audible chimes/tones consisting of single and double tones for the up and down direction of travel respectively.
 - E. Lobby Position Indicators: Not applicable.
 - F. Fire Alarm Speaker: Mount fire alarm speaker on the car top or within operating panel if space will allow. Install wiring from car top or operating panel to Life Safety Panel. Speakers will be provided by Fire Life Safety Contractor.
 - G. Emergency Communication: Provide emergency communication failure indicator, audible alert and signage indicating a failure of the car emergency

communication device. System shall provide communication for Lobby and Machine Room to elevator cab as required by ASME A17.1.

H. Access: Provide new keyed-access switches at terminal landings. Include wall penetration and coring as necessary to installation. Any faceplates shall be finished with satin stainless steel.

I. Fixture Manufacturer: Innovation Industries, Inc. shall be used for all fixtures.

3.8 **SEISMIC DEVICES**

A. Provide design, devices and operation per governing Code.

END OF SECTION

DIVISION 16 - ELECTRICAL**SECTION 16011 - GENERAL ELECTRICAL REQUIREMENTS****PART 1 - GENERAL****1.01 SUMMARY**

- A. This section specifies the general electrical requirements for all labor, materials, equipment, and services provided under DIVISION 16 - ELECTRICAL.
- B. Work specified in this Division shall include, but not be limited to the following:
 - 1. Distribution system, including overcurrent protection devices and feeders.
 - 2. Complete electrical system wiring including branch circuits, luminaires, switches, receptacles, outlets and control devices.
 - 3. Complete lighting and control systems, including time switches.
 - 4. Power wiring for electrically-operated equipment and appliances.
 - 5. Testing.
 - 6. Record drawings.

1.02 WORK INCLUDED

- A. The Contractor under this Division shall provide all labor, materials, equipment, supervision and services required for the construction of the electrical systems. The finished installations shall be complete, operable and shall include all work specified herein and shown on the Drawings.
- B. The work shall include complete testing of all equipment and wiring at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment. All systems shall be properly adjusted and in working order at the time of final acceptance.
- C. Electrical equipment and wiring system shall have sufficient capacity to accommodate all equipment, appliances and other electrical loads as specified herein and shown on the drawings and as required per National Electrical Code and other applicable codes, standards and requirements plus spare capacity to accommodate any planned future facilities and additions and minimum 20 percent spare capacity for future growth.
- D. All concrete, steel reinforcement, miscellaneous metal-work, earthwork, painting, and grouting shall conform to the applicable requirements of the detailed equipment specifications as prescribed in appropriate sections.
- E. It is the intent of these Specifications and other Contract Documents to require an installation complete in every detail. Consequently, the

Contractor will be responsible for minor details or for any special construction which may be found necessary to properly furnish, install, adjust, test, and place in successful and continuous operation, the entire electrical system and the cost of same shall be included in the contract price.

1.03 **REFERENCES**

- A. The publications listed herein form a part of this specification to the extent referenced. The publications may be referred to in the text by the basic designation only. Unless otherwise indicated, the most recent edition of the publication with current revisions and amendments will be enforced.
- B. Comply with the applicable State Code Rules and the ordinances of the County having jurisdiction over this project.
- C. In the event of conflict between pertinent codes and regulations, and the requirements of the referenced standards, or those indicated in Specifications and on drawings, the provisions of the more stringent shall govern.

1.04 **RELATED WORK**

- A. DIVISION 1 - GENERAL REQUIREMENTS.
- B. SECTION 09900 - PAINTING.
- C. DIVISION 11 - EQUIPMENT.

1.05 **DEFINITIONS**

- A. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.
- B. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.
- C. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and test methods.

1.06 **SUBMITTALS**

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Certificates:

1. Submit written certification that electrical systems are complete and operational as stipulated in item entitled "DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEMS" hereinbelow.
 2. Submit certificate of final inspection and acceptance as stipulated in item entitled "INSPECTION" hereinbelow.
- C. Warranty: Submit warranty as stipulated in item entitled "WARRANTY" hereinbelow.
- D. Record Drawings: After the work is complete, Contractor shall provide record drawings showing the as-built conditions in accordance with SECTION 01770 – PROJECT CLOSEOUT.
- E. Submittals required in the sections which refer to this section shall conform to the following additional requirements. Submittals shall include the manufacturer's name, trade name, place of manufacture, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and technical paragraph reference. Submittals shall also include applicable industry and technical society publication references, and years of satisfactory service, and other information necessary to establish contract compliance of each item to be provided. Photographs of existing installations are unacceptable and will be returned without approval. Transmittal letter shall include a listing of all items by manufacturer and catalog number which are included in the submittal package and shall clearly identify the submittal with this project.
- F. Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. Handwritten and typed modifications and other notations not part of the manufacturer's preprinted data may result in the rejection of the submittal. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified for certificates of compliance.
- G. Submittal drawings shall be a minimum of 11-inches by 17-inches in size using a minimum scale of 1/8-inch per foot, except as specified otherwise. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.
- H. Where installation procedures or part of the installation procedures are required to be in accordance with manufacturer's instructions, submit printed copies of those instructions prior to installation. Installation of the item shall not proceed until manufacturer's instructions are received. Failure to submit

manufacturer's instructions shall be cause for rejection of the equipment or material.

- I. Submit manufacturer's certifications as required for products, materials, finishes, and equipment as specified in the technical sections. Certificates from material suppliers are not acceptable. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified material". Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance.
- J. Where equipment or materials are specified to conform to industry and technical society reference standards of organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), and Underwriters Laboratories Inc. (UL), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.
- K. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.
- L. Submit text of posted operating instructions for each system and principal item of equipment as specified in the technical sections.
- M. Each submittal shall be prepared with a summary sheet attached to each copy identifying all items included in the submittal. Incomplete submittals and those without summary sheets will be returned without review.

1.07 **QUALITY ASSURANCE**

- A. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Architect. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

- B. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where 2 or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.
- C. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.
- D. Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.
- E. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70.

1.08 **PERMITS AND INSPECTION**

- A. All permits required by local ordinances shall be obtained and paid for by the Contractor.

1.09 **COORDINATION**

- A. Refer to all project Drawings and to all Sections of the project Specifications. Coordinate and fit all work accordingly so that all electrical outlets and equipment will be properly located and readily accessible. The Drawings indicate the relation of wiring and connections and must not be scaled for exact locations. Verify all construction dimensions at the project and make changes necessary to conform to the building as constructed. Work improperly installed due to lack of construction verification shall be corrected at the Contractor's expense.
- B. Work shall be scheduled to avoid delays, interferences, and unnecessary work. If any conflicts occur, necessitating departures from the Drawings and Specifications, details of departures and reasons therefore shall be submitted immediately for consideration by the Architect.

1.10 **DELIVERY, HANDLING AND STORAGE**

- A. Deliver all materials of this Division in manufacturer's original unopened packages or containers with label intact and legible.

- B. Use means necessary to protect the materials of this section before, during and after installation; to protect the installed work and materials of all other trades; and to protect the original structure, work and materials of the Owner.
- C. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Architect and at no additional cost to the Owner.

1.11 **DRAWINGS AND SPECIFICATIONS**

- A. Electrical system drawings are diagrammatic and symbolic. Locations of outlets, devices, raceways, apparatus, etc., shown are approximate and shall be installed with the required maintenance and code clearances and to avoid conflict with other systems and trades. Visit site and verify lineal footages required and check scales and dimensions shown on architectural drawings prior to bidding to verify locations, routing and lineal footages of electrical work required for inclusion into bid. Study the project drawings and specifications, and make installation in most logical manner for eye appeal and coordination with other systems and trades. Unless dimensioned or noted otherwise, orderly configuration and visual composition are fully intended.
- B. Include additional components and wiring which are not shown or specified herein but are required for proper control and operation to provide for a complete and operable system within intent indicated on the drawings and specifications.
- C. Study the project drawings and specifications prior to bidding and provide additional wiring including apparatus and devices for equipment furnished by others without additional cost.
- D. Relocate devices, fixtures, apparatus and associated wiring including raceways, within 10 feet of the original location, without additional cost, for code compliance and to avoid conflict with other systems or trades, structures, utilities and when directed before installation.
- E. Equipment ratings or wire sizes that are missing or shown in error shall be provided to have adequate capacity to serve the required and future loads plus minimum 20 percent spare capacity, and be in compliance with NEC.
- F. Verify voltages and other ratings of energy conversion, transformation and electrical utilization equipment prior to placing order with factory. Input voltages of equipment shall match serving utility or system voltage available.

1.12 **POSTED OPERATING INSTRUCTIONS**

- A. Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:

1. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
2. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
3. Safety precautions.
4. The procedure in the event of equipment failure.
5. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

- B. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.13 **MANUFACTURER'S NAMEPLATE**

- A. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.14 **FIELD FABRICATED NAMEPLATES**

- A. ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125-inch thick, white, with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one inch by 2.5-inches. Lettering shall be a minimum of 0.25-inch high normal block style.

1.15 **WARNING SIGNS**

- A. Provide warning signs/labels for arc flash protection in accordance with NFPA 70E and NEMA Z535.4 for switchboards, panelboards, industrial control panels, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized. Provide field installed signs/labels to warn qualified persons of potential electric arc flash hazards when warning signs/labels are not provided by the manufacturer. The marking shall be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

1.16 **ELECTRICAL REQUIREMENTS**

- A. Electrical installation shall conform to IEEE C2, NFPA 70, and requirements specified herein.

1.17 INSTRUCTION TO GOVERNMENT PERSONNEL

- A. Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated Government personnel in the adjustment, operation, and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section.

1.18 WARRANTY

- A. Contractor's Warranty: Installation shall be complete in every detail as specified and ready for use. Unless otherwise indicated, any items supplied by Contractor developing defects of design, construction, or quality within one year of final acceptance by Architect shall be replaced by such new materials, apparatus or parts to make such defective portion of the complete system conform to the true intent and meaning of the Drawings and Specifications at no additional cost to the Owner. Lamps shall be warranted for fifty percent of rated lamp life.
- B. The Contractor's Warranty shall be countersigned by the General Contractor.

PART 2 - PRODUCTS**2.01 FACTORY APPLIED FINISH**

- A. Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test and the additional requirements specified in the technical sections.

PART 3 - EXECUTION**3.01 GENERAL**

- A. Install all electrical materials and equipment in accordance with manufacturer's recommendations and as accepted by the Architect for the seismic zone classification at the project site in accordance with the applicable Building Code.
- B. Cut, break, drill and patch as required, to install electrical system. Repair any surface damaged or marred by notching, drilling or any other process necessary for installation of electrical work. Patch any damaged surfaces to match the existing surface.

- C. All wiring and overcurrent devices for equipment furnished by other trades are sized for a contemplated equipment size. If equipment other than contemplated and indicated on the plan is provided, the Contractor shall be responsible for providing the required wiring, switches, and overcurrent devices at no cost to the Owner. The Contractor shall submit the proposed revisions to the electrical design to the Architect for acceptance.
- D. The Electrical Contractor shall coordinate his work with other trades to avoid conflicts with civil, mechanical, structural, and architectural elements of this project.

3.02 **JOBSITE CONDITIONS**

- A. These specifications are accompanied by construction drawings including building and site plans of all trades showing locations of all feeder runs, outlets, switches, devices, and other electrical equipment. The locations are approximate and before installing, study adjacent architectural details and make installation in most logical manner. Any device may be relocated within 10 feet before installation at the direction of the Architect without additional cost to the Owner.
- B. Before installing, verify all dimensions and sizes of equipment.
- C. Verify that electrical system may be installed in strict accordance with the original design, the Drawings and Specifications and the manufacturer's recommendations.
- D. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.03 **CONNECTIONS TO EQUIPMENT PROVIDED BY OTHER TRADES**

- A. Electrical Contractor shall provide conduit, wiring and all electrical connections from building wiring to motors for ventilation, air conditioning, and other equipment, including all switches, motor protection devices, and controllers/starters as specified by other trades.
- B. Electrical Contractor shall ascertain from other trades furnishing electrically-operated equipment, the exact size and type of all motors and other loads, the exact locations of such equipment and the proper point where electrical connections should be brought through the floors, ceiling or walls, as the case may be. Locations shown are diagrammatic only; coordination of the correct locations shall be the full responsibility of the Electrical Contractor.
- C. Examine Civil, Mechanical, Architectural, Structural and other Drawings and Specifications for information concerning electrically-operated equipment and control apparatus and diagrams.

- D. Install individually mounted controllers/starters furnished for motors under other Divisions. Provide and install safety switches as necessary for each such motor in accordance with the NEC.
- E. All control devices and control wiring shall be provided as described in the installation manuals of equipment and/or the Drawings and Specifications of other trades and disciplines.

3.04 **FIELD APPLIED PAINTING**

- A. Prime and paint all exposed raceways, boxes, fittings, support channels, mounting hardware, and accessories to match finish of adjacent surfaces. Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in SECTION 09900 - PAINTING.

3.05 **FIELD FABRICATED NAMEPLATE MOUNTING**

- A. Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of 2 sheet-metal screws or 2 rivets.

3.06 **DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEMS**

- A. Submit written certification that electrical systems are complete and operational. Submit certification with Contractor's request for final review.
- B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Provide labor, apparatus and equipment for systems' demonstration. The various tests shall be under the direction and supervision of the Architect.
- C. The Contractor shall provide all test equipment, materials, labor, and temporary power hook-ups to perform start-up and all tests as required, to obtain final field acceptance from the Owner. All tests shall be conducted in the presence of the Architect or his representative. All test procedures shall conform to this specification and applicable standards. (ANSI, IEEE, NEMA, OSHA, NFPA, NETA, etc.)
- D. The Contractor shall be responsible for all tests and test record. Testing shall be performed by and under the immediate supervision of the Contractor. Test record shall be kept for each piece of equipment. Copies shall be furnished to the Architect for his review and/or acceptance.
- E. A visual inspection of all electrical equipment, to check for foreign material, tightness or wiring and connection, proper grounding, matching nameplate charts with specification, etc., shall be made prior to actual testing.
- F. After demonstration of systems, submit to the Architect 6 sets of keys for electrical equipment locks.

3.07 **INSPECTION**

- A. Arrange for periodic inspection by the local authorities and deliver the certificate of final inspection to the Architect.

END OF SECTION

SECTION 16100 - ELECTRICAL WORK

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes, but is not limited to, electrical systems as indicated in the drawings.

1.02 REFERENCES

- A. The publications listed herein form a part of this specification to the extent referenced. The publications may be referred to in the text by the basic designation only. Unless otherwise indicated, the most recent edition of the publication with current revisions and amendments will be enforced.

1.03 RELATED WORK

- A. SECTION 16011 - GENERAL ELECTRICAL REQUIREMENTS applies to this section with additions and modifications specified herein.

1.04 SUBMITTALS

- A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.
- B. Submit shop drawings and catalog cuts of the following equipment for approval. Each submittal shall be prepared with a summary sheet attached to each copy identifying all items included in the submittal. Incomplete submittals and those without summary sheets will be returned without review.
- C. Manufacturer's Catalog Data:
 - 1. Overcurrent protection devices.
 - 2. Safety switches.
 - 3. Wiring Devices and associated Device Plates.
- D. Reports: Submit test results for approval in report form:
 - 1. 600 volt wiring test.
 - 2. Grounding system test.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" or "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Architect. Provide equipment, materials, installation, and workmanship in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.
- B. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar sizes. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where 2 or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.
- C. Alternative Qualifications: Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.
- D. Material and Equipment Manufacturing Date: Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Materials shall be new, and those items listed by the Underwriters' Laboratories shall bear "UL" label of approval.
- B. Brand names, manufacturer's names and catalog numbers indicate the standard of design and quality required. Acceptable manufacturers for electrical apparatus include General Electric, Square D, Siemens-ITE, and Cutler-Hammer. All apparatus supplied shall bear the name of the approved manufacturer on its nameplates. Substitute materials may be used if pre-qualified prior to bidding by the Architect.
- C. Electrical equipment and luminaires shall be supplied through the manufacturer's designated representative by a local distributor.
- D. Proof of compliance shall be furnished when shop drawings are submitted.

- E. Where 2 or more similar type items are furnished, all shall be of the same manufacture, e.g., safety switches shall be of the same manufacturer unless otherwise noted.
- F. Where electrical apparatus is to be installed outdoors, NEMA 4X stainless steel housings shall be provided, unless noted otherwise.

2.02 **RACEWAYS**

- A. Rigid Steel Conduit: Rigid steel, zinc-coated inside and outside, for use with threaded fittings. ANSI C80.1, UL 6.
- B. Intermediate Metal Conduit (IMC): Rigid steel, zinc- and chromate-coated inside and outside, for use with threaded fittings. UL 1242.
- C. Plastic-Coated Rigid Steel and IMC Conduit: NEMA RN1, Type 40 (40 mils thick).
- D. Electrical Metal Tubing (EMT): Thin-walled steel tubing, zinc-coated. UL 797, ANSI C80.3.
- E. Flexible Metal Conduit: Flexible steel conduit; zinc-coated inside and outside, smooth inside walls, liquid-tight with factory fittings for liquid-tight installation. Provide bushings with bonding jumper lugs for flexible conduit in excess of 6 feet in length. UL 1, UL 360.
- F. Fittings for Metal Conduit, EMT, and Flexible Metal Conduit: UL 514B. Ferrous fittings shall be cadmium- or zinc-coated in accordance with UL 514B.
- G. Fittings for Rigid Metal Conduit and IMC: Threaded-type. Split couplings unacceptable.
- H. Fittings for EMT: Steel compression type.

2.03 **OUTLET BOXES AND COVERS**

- A. Outlet and Small Junction Boxes: UL 514A, galvanized, if ferrous metal. UL 514C, if nonmetallic.
 1. Nominal 4-inches square, 2-1/8 inches deep exclusive of plaster ring, pressed steel.
 2. Boxes for Telecommunications outlets shall be a nominal 4-11/16 inches square, 2-1/8 inches deep exclusive of plaster ring. Verify depth is large enough to allow manufacturers' recommended conductor bend radii.
 3. For Telecommunications outlets, include a minimum 3/8-inch deep single or 2 gang plaster ring unless otherwise specified.
 4. Mount outlet boxes flush in finished walls.

5. Surface mounted boxes and boxes exposed to the weather shall be cast steel, type FD, prime painted and enamel finished with neoprene gasketed covers, threaded hubs for conduit connections and stainless steel screws.

2.04 **CABINETS, JUNCTION BOXES, AND PULL BOXES**

- A. Volume greater than 100 cubic inches, UL 50, hot-dip, zinc-coated, if sheet steel. Where exposed to wet, damp, or corrosive environments, NEMA Type 4X stainless steel.

2.05 **WIRES AND CABLES**

- A. Wires and cables shall meet applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated. Wires and cables manufactured more than 12 months prior to date of delivery to site shall not be used.

B. Conductors:

1. Conductors No. 8 AWG and larger diameter shall be stranded.
2. Conductors No. 10 AWG and smaller diameter shall be solid.
3. Conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3, shall be stranded unless specifically indicated otherwise.
4. Conductor sizes and capacities shown are based on copper, unless indicated otherwise. All conductors shall be copper.
5. Equipment Manufacturer Requirements: When manufacturer's equipment requires copper conductors at the terminations or requires copper conductors to be provided between components of equipment, provide copper conductors or splices, splice boxes, and other work required to satisfy manufacturer's requirements.
6. Minimum Conductor Sizes:
 - a. Minimum size for branch circuits shall be No. 12 AWG.
 - b. Class 1 remote-control and signal circuits: No. 14 AWG.
 - c. Class 2 low-energy, remote-control and signal circuits: No. 16 AWG.
 - d. Class 3 low-energy, remote-control, alarm and signal circuits: No. 22 AWG.
 - e. Digital low voltage lighting control (DLVLC) system at 24 Volts or less: Category 5 UTP cables in accordance with DLVLC system manufacturer requirements.

- C. Color Coding: Provide for service, feeder, branch, control, and signaling circuit conductors.

1. Color of ground and neutral conductors shall be as follows:
 - a. Grounding Conductors: Green.
 - b. Neutral Conductors: White.

- c. Exception, where neutrals of more than one system are installed in same raceway or box, other neutrals shall be white with a different colored (not green) stripe for each.
 - 2. Color of ungrounded conductors in different voltage systems shall be as follows:
 - a. 208/120 Volt, 3-phase:
 - 1) Phase A - black.
 - 2) Phase B - red.
 - 3) Phase C - blue.
 - b. 480/277 Volt, 3-phase:
 - 1) Phase A - brown.
 - 2) Phase B - orange.
 - 3) Phase C - yellow.
- D. Insulation: Unless specified or indicated otherwise or required by NFPA 70, power and lighting wires shall be 600-volt, Type THWN/THHN conforming to UL 83 or Type XHHW or RHW conforming to UL 44, except that grounding wire may be type TW conforming to UL 83; remote-control and signal circuits shall be Type TW or TF, conforming to UL 83. Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.
- E. Bonding Conductors: ASTM B1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.06 **SPLICES AND TERMINATION COMPONENTS**

- A. UL 486A-486B for wire connectors and UL 510 for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires shall be insulated, pressure-type in accordance with UL 486A-486B or UL 486C (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.07 **DEVICE PLATES**

- A. Provide UL listed, one-piece device plates for outlets to suit the devices installed.
 - 1. For metal outlet boxes, plates on unfinished walls shall be of zinc-coated sheet steel or cast metal having round or beveled edges.
 - 2. For nonmetallic boxes and fittings, other suitable plates may be provided.
 - 3. Plates on finished walls shall be nylon or lexan, minimum 0.03-inch wall thickness. Plates shall be same color as receptacle or toggle switch with which they are mounted.

4. Plates on finished walls shall be satin finish stainless steel or brushed-finish aluminum, minimum 0.03-inch thick.
5. Screws shall be machine-type with countersunk heads in color to match finish of plate.
6. Sectional type device plates will not be permitted.
7. Plates installed in wet locations shall be gasketed and UL listed for "wet locations".

2.08 **SWITCHES**

- A. Toggle Switches: NEMA WD 1, UL 20, single pole totally enclosed with bodies of thermoplastic or thermoset plastic and mounting strap with grounding screw.
 1. Handles shall be white thermoplastic.
 2. Wiring terminals shall be screw-type, side-wired or of the solderless pressure type having suitable conductor-release arrangement.
 3. Contacts shall be silver-cadmium and contact arm shall be one-piece copper alloy.
 4. Switches shall be rated quiet-type ac only, 120/277 volts, with current rating and number of poles indicated.
- B. Disconnect (Safety) Switches: NEMA KS 1. Provide heavy duty-type switches. Switches serving as motor-disconnect means shall be horsepower rated. Provide switches in NEMA 1, enclosure per NEMA ICS 6.

2.09 **RECEPTACLES**

- A. General: UL 498, general purpose specification grade, grounding-type.
 1. Ratings and configurations shall be as indicated.
 2. Bodies shall be of white as per NEMA WD 1.
 3. Face and body shall be thermoplastic supported on a metal mounting strap.
 4. Dimensional requirements shall be per NEMA WD 6.
 5. Provide screw-type, side-wired wiring terminals or of the solderless pressure type having suitable conductor-release arrangement.
 6. Connect grounding pole to mounting strap.
 7. The receptacle shall contain triple-wipe power contacts and double or triple-wipe ground contacts.
- B. Weatherproof Receptacles: Provide weather-resistant type, UL listed for use in wet locations with integral GFCI protection. Include cast metal box with gasketed, hinged, lockable and weatherproof while-in-use, polycarbonate, UV resistant/stabilized cover plate.
- C. Ground-Fault Circuit Interrupter Receptacles: UL 943, duplex type for mounting in standard outlet box. Device shall be capable of detecting current leak of 6 milliamperes or greater and tripping per requirements of UL

943 for Class A GFCI devices. Provide screw-type, side-wired wiring terminals or pre-wired (pigtail) leads.

2.10 **PANELBOARDS**

- A. **Circuit Breakers**: UL 489, thermal magnetic-type and solid state-type having a minimum short-circuit current rating equal to the short-circuit current rating of the panelboard in which the circuit breaker shall be mounted. Breaker terminals shall be UL listed as suitable for type of conductor provided. Where indicated on the drawings, provide circuit breakers with shunt trip devices. Provide breakers with adjustable trip parameters.
1. **Multipole Breakers**: Provide common trip-type with single operating handle. Breaker design shall be such that overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any 3 adjacent breaker poles are connected to Phases A, B, and C, respectively.

2.11 **ENCLOSED CIRCUIT BREAKERS**

- A. UL 489. Individual molded case circuit breakers with voltage and continuous current ratings, number of poles, overload trip setting, and short circuit current interrupting rating as indicated. Enclosure type as indicated. Provide solid neutral.

2.12 **MOTORS**

- A. Provide motors in accordance with the following:
1. NEMA MG 1.
 2. Hermetic-type sealed motor compressors shall also comply with UL 984.
 3. Provide the size in terms of HP or kVA, or full-load current, or a combination of these characteristics, and other characteristics, of each motor as indicated or specified.
 4. Determine specific motor characteristics to ensure provision of correctly sized starters and overload heaters.
 5. Motors for operation on 208-volt, 3-phase circuits shall have terminal voltage rating of 200 volts, and those for operation on 480-volt, 3-phase circuits shall have terminal voltage rating of 460 volts.
 6. Motors shall be designed to operate at full capacity with voltage variation of plus or minus 10 percent of motor voltage rating.
 7. Unless otherwise indicated, motors rated 1 HP and above shall be continuous duty type.
 8. Where fuse protection is specifically recommended by the equipment manufacturer, provide fused switches in lieu of non-fused switches indicated.
- B. **High Efficiency Single-Phase Motors**: Single-phase fractional-horsepower alternating-current motors shall be high efficiency types corresponding to the

applications listed in NEMA MG 11. In exception, for motor-driven equipment with a minimum seasonal or overall efficiency rating, such as a SEER rating, provide equipment with motor to meet the overall system rating indicated.

- C. Premium Efficiency Polyphase Motors and Single-Phase Motors: Select polyphase and continuous-duty single phase motors based on high efficiency characteristics relative to typical characteristics and applications as listed in NEMA MG 10 and NEMA MG 11. In addition, continuous rated, polyphase squirrel-cage medium induction motors must meet the requirements for premium efficiency electric motors in accordance with NEMA MG 1, including the NEMA full load efficiency ratings. In exception, for motor-driven equipment with a minimum seasonal or overall efficiency rating, such as a SEER rating, provide equipment with motor to meet the overall system rating indicated.
- D. Motor Sizes: Provide size for duty to be performed, not exceeding the full-load nameplate current rating when driven equipment is operated at specified capacity under most severe conditions likely to be encountered. When motor size provided differs from size indicated or specified, make adjustments to wiring, disconnect devices, and branch circuit protection to accommodate equipment actually provided. Provide controllers for motors rated 1 HP and above with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage. Provide protection for motors from immediate restart by a time adjustable restart relay.
- E. Wiring and Conduit: Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide power wiring and conduit for field-installed equipment using adjustable speed drive (ASD) manufacturer required wiring type and length, and motor control equipment forming part of motor control centers or switchgear assemblies, the conduit and wiring connecting such centers, assemblies, or other power sources to equipment as specified herein. Power wiring and conduit shall conform to the requirements specified herein. Control wiring shall be provided under and conform to the requirements of the section specifying the associated equipment.

2.13 **MOTOR CONTROLLERS**

- A. Provide motor controllers in accordance with the following:
 - 1. UL 508, NEMA ICS 1, and NEMA ICS 2.
 - 2. Controllers shall have thermal overload protection in each phase and shall have one spare normally open and one spare normally closed auxiliary contact.
 - 3. Provide controllers for motors rated 1HP and above with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage.
 - 4. Provide protection for motors from immediate restart by a time adjustable restart relay.

5. When used with pressure, float, or similar automatic-type or maintained-contact switch, controller shall have hand/off/automatic selector switch.
6. Connections to selector switch shall be such that only normal automatic regulatory control devices are bypassed when switch is in "hand" position.
7. Safety control devices, such as low and high pressure cutouts, high temperature cutouts, and motor overload protective devices, shall be connected in motor control circuit in "hand" and "automatic" positions.
8. Control circuit connections to hand/off/automatic selector switch or to more than one automatic regulatory control device shall be made in accordance with indicated or manufacturer's approved wiring diagram.
9. Provide a disconnecting means, capable of being locked in the open position, for the motor that is located in sight from the motor location and the driven machinery location. As an alternative, provide a motor controller disconnect, capable of being locked in the open position, to serve as the disconnecting means for the motor if it is in sight from the motor location and the driven machinery location.
10. Overload protective devices shall provide adequate protection to motor windings; be thermal inverse-time-limit type; and include manual reset-type pushbutton on outside of motor controller case.
11. Cover of combination motor controller and manual switch or circuit breaker shall be interlocked with operating handle of switch or circuit breaker so that cover cannot be opened unless handle of switch or circuit breaker is in "off" position.

B. Control Wiring:

1. Provide control wiring in accordance with the following:
 - a. All control wire shall be stranded tinned copper switchboard wire with 600-volt flame-retardant insulation Type SIS meeting UL 44, or Type MTW meeting UL 1063, and shall pass the VW-1 flame tests included in those standards.
 - b. Hinge wire shall have Class K stranding.
 - c. Current transformer secondary leads shall be not smaller than No. 10 AWG.
 - d. The minimum size of control wire shall be No. 14 AWG.
 - e. Power wiring for 480-volt circuits and below shall be of the same type as control wiring and the minimum size shall be No.12 AWG.
 - f. Special attention shall be given to wiring and terminal arrangement on the terminal blocks to permit the individual conductors of each external cable to be terminated on adjacent terminal points.

C. Control Circuits:

1. Control circuits shall have maximum voltage of 120 volts derived from control transformer in same enclosure. Transformers shall conform to UL 506, as applicable. Transformers, other than transformers in bridge circuits, shall have primaries wound for voltage available and secondaries wound for correct control circuit voltage. Size transformers

so that 80 percent of rated capacity equals connected load. Provide disconnect switch on primary side. Provide fuses in each ungrounded primary feeder. One secondary lead shall be fused; other shall be grounded. For designated systems, as indicated, provide backup power supply, including transformers connected to emergency power source. Provide for automatic switchover and alarm upon failure of primary control circuit.

- D. Enclosures for Motor Controllers: NEMA ICS 6.
- E. Pushbutton Stations: Provide with "start/stop" momentary contacts having one normally open and one normally closed set of contacts, and red lights to indicate when motor is running. Stations shall be heavy duty, oil-tight design.
- F. Pilot and Indicating Lights: Provide LED cluster lamps.

2.14 **MANUAL MOTOR STARTERS (MOTOR RATED SWITCHES)**

- A. Single pole designed for flush or surface mounting with overload protection

2.15 **LOCKOUT REQUIREMENTS**

- A. Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147. Mechanical isolation of machines and other equipment shall be in accordance with requirements of DIVISION 15 - MECHANICAL.

2.16 **TELECOMMUNICATIONS RACEWAY DISTRIBUTION SYSTEM**

- A. Provide a system of telecommunications cable-supporting structures, including conduits with pull wires, terminal boxes, outlet and junction boxes, and other accessories as required, to complete the raceway system in accordance with TIA-569.
- B. Outlet Boxes for Telecommunications System: Provide standard type 4-11/16 inches square by 2-1/8 inches deep. Depth of boxes shall be large enough to allow manufacturers' recommended conductor bend radii.
- C. Cover Plates: Blank device cover plate of finish specified for receptacles and switch cover plates.
- D. Conduit Sizing: Unless otherwise indicated, conduit for single outlets shall be a minimum of one inch. Size conduits for horizontal distribution and risers to cabinets, junction boxes, distribution center, and telecommunications service, as indicated.

2.17 **MANUFACTURER'S NAMEPLATE**

- A. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.18 **FIELD FABRICATED NAMEPLATES**

- A. Provide field fabricated nameplates in accordance with the following:
 - 1. ASTM D709.
 - 2. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings.
 - 3. Each nameplate inscription shall identify the function and, when applicable, the position.
 - 4. Nameplates shall be melamine plastic, 0.125-inch thick, white with black center core.
 - 5. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core.
 - 6. Minimum size of nameplates shall be one inch by 2.5-inches.
 - 7. Lettering shall be a minimum of 0.25-inch high normal block style.

2.19 **WARNING SIGNS**

- A. Provide warning signs for flash protection in accordance with NFPA 70E and NEMA Z535.4 for switchboards, panelboards, industrial control panels, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized. Provide field installed signs to warn qualified persons of potential electric arc flash hazards when warning signs are not provided by the manufacturer. The marking shall be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

2.20 **FIRESTOPPING MATERIALS**

- A. Provide firestopping around electrical penetrations. Utilize UL-listed firestopping systems or assemblies suitable for the penetration being sealed.

2.21 **FACTORY APPLIED FINISH**

- A. Provide factory-applied finish on electrical equipment in accordance with the following:
 - 1. NEMA 250 corrosion-resistance test and the additional requirements as specified herein.
 - 2. Interior and exterior steel surfaces of equipment enclosures shall be thoroughly cleaned and then receive a rust-inhibitive phosphatizing or equivalent treatment prior to painting.
 - 3. Exterior surfaces shall be free from holes, seams, dents, weld marks, loose scale or other imperfections.

4. Interior surfaces shall receive not less than one coat of corrosion-resisting paint in accordance with the manufacturer's standard practice.
5. Exterior surfaces shall be primed, filled where necessary, and given not less than 2 coats baked enamel with semi-gloss finish.
6. Equipment located indoors shall be ANSI Light Gray, and equipment located outdoors shall be ANSI Light Gray.
7. Provide manufacturer's coatings for touch-up work and as specified in item entitled "FIELD APPLIED PAINTING" hereinbelow.

2.22 **HARDWARE, SUPPORTS, BACKING, ETC.**

- A. Provide all hardware, supports, backing and other accessories necessary to install electrical equipment. Wood materials shall be treated against termites, iron or steel materials shall be galvanized for corrosion protection, and non-ferrous materials shall be brass or bronze. Provide other specialty materials where indicated.
- B. Bolts, nuts, washers, and screws used for exterior use shall be high quality stainless steel or brass.

PART 3 - EXECUTION

3.01 **INSTALLATION**

- A. Electrical installations, including weatherproof and hazardous locations and ducts, plenums and other air-handling spaces, shall conform to requirements of NFPA 70 and IEEE C2 and to requirements specified herein.
- B. Wiring Methods: Provide insulated conductors installed in rigid steel conduit, IMC, rigid nonmetallic conduit, or EMT, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Utilize non-wax type lubricants for pulling, chemically neutral to insulation and sheath. Mechanical means for pulling to be tongue-limiting type and not be used for #2 AWG wires and smaller. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Minimum conduit size shall be 3/4-inch in diameter for low voltage lighting and power circuits. Conduit which penetrates fire-rated walls, fire-rated partitions, or fire-rated floors shall be firestopped.
 1. Pull Wire: Install pull wires in empty conduits. Pull wire shall be plastic having minimum 200-pound force tensile strength. Leave minimum 36-inches of slack at each end of pull wire.
- C. Conduit Installation: Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6-inches away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

1. Restrictions Applicable to EMT:
 - a. Do not install underground.
 - b. Do not encase in concrete, mortar, grout, or other cementitious materials.
 - c. Do not use in areas subject to severe physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT.
 - d. Do not use in hazardous areas.
 - e. Do not use outdoors, including under open-sided covered lanais, patios, walkways or other similar locations.
 - f. Do not use in fire pump rooms.
 - g. Do not use exposed below +8 feet above the finished floor, except in dedicated Electrical Rooms.
2. Restrictions Applicable to Flexible Conduit: Use only as specified in subparagraph entitled "Flexible Connections" hereinbelow.
3. Stub-Ups: Provide conduits stubbed up through concrete floor for connection to free-standing equipment with adjustable top or coupling threaded inside for plugs, set flush with finished floor. Extend conductors to equipment in rigid steel conduit, except that flexible metal conduit may be used 6-inches above floor. Where no equipment connections are made, install screwdriver-operated threaded flush plugs in conduit end.
4. Conduit Support: Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Plastic tie-wraps are not allowed for securing or supporting of electrical conduit. Load applied to fasteners shall not exceed 1/4 proof test load. Fasteners attached to concrete ceiling shall be vibration resistant and shock-resistant. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4-inch in concrete joints shall not cut main reinforcing bars. Fill unused holes. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Conduit and box systems shall be supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Installation shall be coordinated with above-ceiling mechanical systems to assure maximum accessibility to all systems. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations. Where conduit crosses building expansion joints, provide suitable watertight expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means. For conduits greater

- than 2-1/2 inches inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.
5. Directional Changes in Conduit Runs: Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.
 6. Locknuts and Bushings: Fasten conduits to sheet metal boxes and cabinets with 2 locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits and provide insulating type where required by NFPA 70.
 7. Flexible Connections: Provide flexible steel conduit between 3 feet and 6 feet in length for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size shall be 1/2-inch diameter. Provide liquid-tight flexible conduit in wet and damp locations for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.
- D. Boxes, Outlets, and Supports: Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, when surface mounted on interior walls exposed up to 8 feet above floors and walkways, and when specifically indicated. Boxes in other locations shall be sheet steel, except that nonmetallic boxes may be used with nonmetallic conduit system. Each box shall have volume required by NFPA 70 for number of conductors enclosed in box. Boxes for mounting lighting fixtures shall be minimum 4-inches square, or octagonal, except that smaller boxes may be installed as required by fixture configurations, as approved. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature; fixtures shall be readily removable for access to boxes unless ceiling access panels are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of ceiling supports. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers. Where bar

hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24-inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

1. **Boxes:** For use with raceway systems shall be a minimum 1-1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets: minimum 4-inches square, except that 4 by 2-inches boxes may be used where only one raceway enters outlet. Telecommunications outlets: a minimum of 4-11/16 inches square by 2-1/8 inches deep. Mount outlet boxes flush in finished walls.
 2. **Pull Boxes:** Construct of at least minimum size required by NFPA 70 of code-gauge galvanized sheet steel or stainless steel where indicated, except where cast-metal boxes are required in locations specified herein. Provide boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.
 3. ***Extension Rings: Extension rings are not permitted for new construction. Use only on existing boxes in concealed conduit systems where wall is furred out for new finish.***
- E. **Mounting Heights:** Mount panelboards, enclosed circuit breakers, motor controllers and disconnecting switches so height of any operating handle at its highest position is a maximum 78-inches above finished floor. Mount lighting switches so height of the operating handle at its highest position is a maximum of 48-inches above finished floor. Mount receptacles and telecommunications outlets 18-inches above finished floor. Mount other devices as indicated. Measure mounting heights of wiring devices and outlets to center of device or outlet, unless otherwise indicated.
- F. **Conductor Identification:** Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, color coding shall be by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, color coding shall be by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves. Identify control circuit terminations in accordance with manufacturer's recommendations.
1. **Marking Strips:** Provide marking strips in accordance with the following:
 - a. White or other light-colored plastic marking strips, fastened by screws to each terminal block, shall be provided for wire designations.
 - b. The wire numbers shall be made with permanent ink.
 - c. The marking strips shall be reversible to permit marking both sides, or 2 marking strips shall be furnished with each block.
 - d. Marking strips shall accommodate the 2 sets of wire numbers.
 - e. Each device to which a connection is made shall be assigned a device designation in accordance with NEMA ICS 1 and each

- device terminal to which a connection is made shall be marked with a distinct terminal marking corresponding to the wire designation used on the Contractor's schematic and connection diagrams.
- f. The wire (terminal point) designations used on the Contractor's wiring diagrams and printed on terminal block marking strips may be according to the Contractor's standard practice; however, additional wire and cable designations for identification of remote (external) circuits shall be provided for the Government's wire designations.
 - g. Prints of the marking strips drawings submitted for approval will be so marked and returned to the Contractor for addition of the designations to the terminal strips and tracings, along with any rearrangement of points required.
- G. Splices: Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.
- H. Covers and Device Plates: Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of 1/16-inch. Use of sectional-type device plates are not permitted. Provide gasket for plates installed in wet locations.
- I. Electrical Penetrations: Openings around electrical penetrations (such as conduit penetrations or flush mounted equipment enclosures or junction boxes) through fire resistance-rated walls, partitions, floors, or ceilings shall be sealed to maintain fire resistive integrity. Use 3M CP25, Type MPP moldable putty or equivalent material or assemblies to maintain fire resistive integrity for conduit penetration and flush mounted outlet boxes. Use other approved construction methods for larger enclosures.
- J. Grounding and Bonding: Provide in accordance with NFPA 70. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, telecommunications system grounds, and neutral conductor of wiring systems. of motors and control equipment under this section of the specification. Except as otherwise specifically noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section of the specifications but shall be provided under the section specifying the associated equipment.
- K. Elevator: Provide circuit to line terminals of elevator controller, and disconnect switch on line side of controller, outlet for control power, and work light and outlet receptacle in elevator pit and as otherwise indicated on the drawings.

- L. Seismic Bracing: Contractor shall provide seismic bracing for all electrical equipment, apparatus, and raceways. Bracing shall, as a minimum, comply with the County Building Code.
- M. Repair of Existing Work: Repair of existing work, demolition, and modification of existing electrical distribution systems shall be performed as follows:
 - 1. Workmanship: Lay out work in advance. Exercise care where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings, piping, and equipment using skilled craftsmen of trades involved.
 - 2. Existing Concealed Wiring to be Removed: Existing concealed wiring to be removed shall be disconnected from its source. Remove conductors; cut conduit flush with floor, underside of floor, and through walls; and seal openings.
 - 3. Removal of Existing Electrical Distribution System: Removal of existing electrical distribution system equipment shall include equipment's associated wiring, including conductors, cables, exposed conduit, surface metal raceways, boxes, and fittings, back to equipment's power source as indicated.
 - 4. Continuation of Service: Maintain continuity of existing circuits of equipment to remain. Existing circuits of equipment shall remain energized. Circuits which are to remain but were disturbed during demolition shall have circuits wiring and power restored back to original condition.

3.02 **FIELD FABRICATED NAMEPLATE MOUNTING**

- A. Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of 2 sheet-metal screws or 2 rivets.

3.03 **WARNING SIGN MOUNTING**

- A. Provide the number of signs required to be readable from each accessible side. Space the signs in accordance with NFPA 70E.

3.04 **FIELD APPLIED PAINTING**

- A. Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Where field painting of enclosures for panelboards, load centers or the like is specified to match adjacent surfaces, to correct damage to the manufacturer's factory applied coatings, or to meet the indicated or specified safety criteria, provide manufacturer's recommended coatings and apply in accordance to manufacturer's instructions. Painting shall be as specified in SECTION 09901 - PAINTING.

3.05 FIELD QUALITY CONTROL

- A. Furnish test equipment and personnel and submit written copies of test results. Give Architect 5 working days' notice prior to each.
1. Devices Subject to Manual Operation: Each device subject to manual operation shall be operated at least 5 times, demonstrating satisfactory operation each time.
 2. 600-Volt Wiring Test: Test wiring rated 600 volt and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 250,000 ohms. Submit results to the Architect.
 3. Ground-Fault Receptacle Test: Test ground-fault receptacles with a "load" (such as a plug in light) to verify that the "line" and "load" leads are not reversed. Press the TEST button and then the RESET button to verify by LED status that the device is a self-test model as specified in UL 943.
 4. Grounding System Test: Test grounding system to ensure continuity and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Architect and indicate location of rods as well as resistance and soil conditions at time measurements were made.

END OF SECTION

SECTION 16510 - INTERIOR LIGHTING**PART 1 - GENERAL****1.01 SUMMARY**

- A. This section includes providing luminaires, lamps, drivers, switches, time switches and other control devices, contactors, emergency lighting accessories and battery-powered units and systems for interior use, including luminaires and accessories mounted on the exterior surfaces of buildings. Materials not normally furnished by manufacturers of these devices are specified in SECTION 16100 - ELECTRICAL WORK.

- B. Related Work Elsewhere:
 - 1. SECTION 16011 - GENERAL ELECTRICAL REQUIREMENTS applies to this section, with the additions and modifications specified herein.
 - 2. SECTION 16100 - ELECTRICAL WORK applies to this section, with additions and modifications specified herein.

1.02 REFERENCES

- A. The publications listed herein form a part of this specification to the extent referenced. The publications may be referred to in the text by the basic designation only. Unless otherwise indicated, the most recent edition of the publication with current revisions and amendments will be enforced.

1.03 SUBMITTALS

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

- B. Data, shop drawings, and reports shall employ the terminology, classifications, and methods prescribed by the Illuminating Engineering Society of North America, as applicable, for the lighting system specified.

- C. Submit shop drawings and catalog cuts of the following equipment for approval. Each submittal shall be prepared with a summary sheet attached to each copy identifying all items included in the submittal. Incomplete submittals and those without summary sheets will be returned without review.

- D. Manufacturer's Catalog Data:
 - 1. Luminaires, including light sources and LED drivers.
 - 2. Wall-box switch
 - 3. Time switch

- E. Operations and Maintenance (O and M) Manual: Submit Operations and Maintenance Manual as stipulated in item entitled "OPERATIONS AND MAINTENANCE MANUAL" hereinbelow.

- F. Manufacturer's Warranty: Submit manufacturer's warranty as stipulated in item entitled "MANUFACTURER'S WARRANTY" hereinbelow.

1.04 OPERATIONS AND MAINTENANCE MANUAL

- A. Submit operation and maintenance data showing all light fixtures and drivers, control modules, control zones, occupancy/vacancy sensors, ambient light level sensors, power packs, dimming drivers, schematic diagrams and all interconnecting control wire, conduit, and associated hardware. Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" or "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Architect. Provide equipment, materials, installation, and workmanship in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.
- B. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where 2 or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.
- C. Alternative Qualifications: Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.
- D. Material and Equipment Manufacturing Date: Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.06 MANUFACTURER'S WARRANTY

- A. Manufacturer's warranties and guarantees furnished for materials used in the work and instruction sheets and parts lists supplied with materials shall be delivered to the Architect prior to acceptance of the project.

B. Manufacturer's LED Luminaire Warranty:

1. Provide a written 5 year minimum replacement warranty for material, fixture finish, and workmanship. Provide written warranty document that contains all warranty processing information needed, including but not limited to, lighting distributor's purchase order number and/or manufacturer's sales order number, manufacturer's toll-free warranty telephone number, customer service point of contact, whether or not a return authorization number is required, return shipping information, and closest return location to the project location.
 - a. Finish warranty must include failure and substantial deterioration such as blistering, cracking, peeling, chalking, or fading.
 - b. Material warranty must include:
 - 1) All LED drivers and integral control equipment.
 - 2) Replacement when more than 15 percent of LED sources in any lightbar or subassembly(s) are defective or non-starting.

C. Warranty period must begin in accordance with the manufacturer's standard warranty starting date.**PART 2 - PRODUCTS****2.01 PROJECT COORDINATION**

- A. Products and materials not considered to be luminaires, luminaire controls, or associated equipment are specified in SECTION 16100 - ELECTRICAL WORK. Luminaires, luminaire controls, and associated equipment for exterior applications are specified in SECTION 16530 - EXTERIOR LIGHTING.

2.02 LUMINAIRES

- A. UL 1598, NEMA C82.77, and UL 8750. Provide luminaires as indicated in luminaire schedule or details on project plans. Provide luminaires complete with light sources of quantity, type, and wattage indicated. Provide all luminaires of the same type by the same manufacturer. Luminaires must be specifically designed for use with the driver and light source provided.
- B. LED Luminaires: Provide luminaires complete with power supplies (drivers) and light sources. Provide design information including lumen output and design life in luminaire schedule on project plans for LED luminaires. LED luminaires must also meet the following minimum requirements:
 1. Luminaires must have a minimum 5 year manufacturer's warranty.

2. Luminaires must have a minimum L70 lumen maintenance value of 50,000 hours as calculated by IES TM-21, with data obtained per IES LM-80 requirements.
3. Luminaire drive current value must be identical to that provided by test data for luminaire in question.
4. Luminaires must be tested to IES LM-79 and IES LM-80 standards.

2.03 **DRIVERS**

- A. **LED Drivers:** NEMA SSL 1, UL 8750. LED drivers must be electronic, UL Class 1, constant-current type and comply with the following requirements:
 1. Output power (watts) and luminous flux (lumens) as shown in luminaire schedule for each luminaire type.
 2. Power Factor (PF) greater than or equal to 0.9 over the full dimming range when provided.
 3. Current draw Total Harmonic Distortion (THD) of less than 20 percent.
 4. Class A sound rating.
 5. Operable at input voltage of 120-277 volts at 60 hertz.
 6. Minimum 5 year manufacturer's warranty.
 7. RoHS compliant.
 8. Integral thermal protection that reduces or eliminates the output power if case temperature exceeds a value detrimental to the driver.
 9. UL listed for dry or damp locations typical of interior installations.
 10. Provide dimming capability as indicated in the luminaire schedule on project plans. Dimmable drivers must dim down to 10 percent. Dimmable drivers must be controlled by a Class 2 low voltage 0-10VDC controller dimming signal protocol unless otherwise specified. LED drivers of the same family/series must track evenly across multiple luminaires at all light levels.

2.04 **LIGHT SOURCES**

- A. NEMA ANSLG C78.377, NEMA SSL 3. Provide type and wattage as indicated in luminaire schedule on project plans.
- B. **LED Light Sources:**
 1. Correlated Color Temperature (CCT) of 3500 degrees Kelvin.
 2. Minimum Color Rendering Index (CRI) R9 value of 80.
 3. High power, white light output utilizing phosphor conversion (PC) process.
 4. RoHS compliant.
 5. Provide light source color consistency by utilizing a binning tolerance within a 3-step McAdam ellipse.

2.05 **LIGHTING CONTROLS**

- A. ASHRAE 90.1 - IP ASHRAE 189.1. Provide network certification for all networked lighting control systems and devices, where appropriate. Provide

lighting control systems that do not switch off battery-operated or emergency backup luminaires or exit signs. Provide system with override of lighting controls devices controlling luminaires in path of egress with activation of fire alarm system. Provide lighting control system that operates the lighting system as described in the project plans. Submit Sequence of Operation for Lighting Control System describing the operation of the proposed lighting control system and devices.

- B. Localized Control Systems: Provide room or area-wide lighting control system capable of manual control, time-based control, or receiving input from photosensors and occupancy/vacancy sensors.
1. Local Area Lighting Controller: CEC Title 24 and ASHRAE 90.1 - IP compliant. Provide controller designed for single area or room with the following requirements:
 - a. 120-277 volt input, designed for LED lighting loads.
 - b. 1 zone, with one manual switch per zone.
 - c. Capable of 0-10V dimming.
- C. Devices:
1. Toggle Switches: Provide line-voltage toggle switches as specified in SECTION 16100 - ELECTRICAL WORK. When used for non-digital loads, devices must be rated at 20 Amps inductive load, and be compatible with the lighting control systems.
- D. Time Clocks: UL 917, NEMA ICS 6. House time clock in a surface-mounted, lockable, NEMA1 enclosure constructed of painted steel or plastic polymer. Provide electronic type time clock that meets the following criteria:
1. Astronomic programming function, providing a total of 56 on/off set points.
 2. 12 hour AM/PM type digital clock display format.
 3. Power outage back-up for time clock lithium battery which provides coverage for a minimum of seven days.
 4. Capable of controlling a minimum of 16 channels or loads.
 5. Contacts are rated for 30 amps at 120-277 VAC resistive load in a SPST configuration.
 6. Contains function that allows automatic control to be skipped on certain selected days of the week, manual bypass or remote override control and daylight savings time automatic adjustment.

2.06 EMERGENCY LIGHTING EQUIPMENT

- A. UL 924, NFPA 101. Provide lamps in wattage indicated.
1. LED Emergency Driver: UL 924, NFPA 101. Provide LED emergency driver with automatic power failure detection, test switch and LED indicator (or combination switch/indicator) located on luminaire exterior,

and fully-automatic solid-state charger, battery and inverter integral to a self-contained housing. Provide self-diagnostic function integral to emergency driver. Integral nickel-cadmium battery is required to supply a minimum of 90 minutes of emergency power at 7 watts, 10-50 VDC, constant output. The driver must be RoHS compliant, rated for installation in plenum-rated spaces and damp locations, and be warranted for a minimum of 5 years.

2. Self-Diagnostic Circuitry for LED Drivers: UL 924, NFPA 101. Provide emergency lighting unit with fully-automatic, integral self-testing/diagnostic electronic circuitry. The circuitry must provide for a one minute diagnostic test every 28 days, and a 30 minute diagnostic test every 6 months, minimum. Any malfunction of the unit must be indicated by LED(s) visible from the exterior of the luminaire. A manual test switch must also be provided to perform a diagnostic test at any given time

2.07 EQUIPMENT IDENTIFICATION

- A. Manufacturer's Nameplate: Each item of equipment must have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.
- B. Labels: UL 1598. All luminaires must be clearly marked for operation of specific light sources and LED drivers. The labels must be easy to read when standing next to the equipment, and durable to match the life of the equipment to which they are attached. Note the following light source characteristics in the format "Use Only":
 1. Correlated color temperature (CCT) and color rendering index (CRI) for all luminaires.
 2. Driver and Dimming Protocol: All markings related to light source type must be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when light sources are in place. LED drivers must have clear markings indicating dimming type and indicate proper terminals for the various outputs.

2.08 FACTORY APPLIED FINISH

- A. Provide all luminaires and lighting equipment with factory-applied painting system that as a minimum, meets requirements of NEMA 250 corrosion-resistance test.

2.09 SURFACE MOUNTED LUMINAIRES

- A. Provide access to light source and LED driver from bottom of luminaire. Provide trim and lenses, where required, for the exposed surface of flush-mounted luminaires as indicated on project drawings and specifications. Luminaires recessed in ceilings which have a fire resistive rating of one hour or more must be enclosed in a box which has a fire resistive rating equal to

that of the ceiling. For surface mounted luminaires with brackets, provide flanged metal stem attached to outlet box, with threaded end suitable for supporting the luminaire rigidly in design position. Flanged part of luminaire stud must be of broad base type, secured to outlet box at not fewer than 3 points.

2.10 LUMINAIRE SUPPORT HARDWARE

- A. Wires: ASTM A641/A641M, galvanized regular coating, soft temper, 0.11-inch in diameter or galvanized, braided steel, minimum 0.08-inch in diameter.
- B. Wires, for Humid Spaces:
 - 1. ASTM A580/A580M. Composition 302 or 304, annealed stainless steel 0.11-inch in diameter.
 - 2. ASTM B164, UNS NO4400, annealed nickel-copper alloy 0.11-inch in diameter.
- C. Rods: Threaded steel rods, 3/16-inch diameter, zinc or cadmium coated.
- D. Straps: Galvanized steel, one by 3/16-inch, conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Electrical installations shall conform to IEEE C2, NFPA 70, and to the requirements specified herein. Install luminaires and lighting controls to meet the requirements of ASHRAE 90.1 - IP and ASHRAE 189.1. To encourage consistency and uniformity, install luminaires of the same manufacture and model number when residing in the same facility or building.
- B. Light Source: When light sources are not provided as an integral part of the luminaire, deliver light sources of the type, wattage, lumen output, color temperature (CCT), color rendering index (CRI), and voltage rating indicated to the project site and install just prior to project completion, if not already installed in the luminaires from the factory.
- C. Lighting Fixtures: Set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved drawings. Mounting heights specified or indicated shall be to the bottom of fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Luminaire catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a luminaire may be installed. Obtain approval of the exact mounting for lighting fixtures on the job before

commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Provide wires, straps or threaded rods for lighting fixture support in this section. Install luminaires with vent holes free of air blocking obstacles.

- D. LED Drivers: Provide LED drivers integral to luminaire as constructed by the manufacturer.

3.02 FIELD APPLIED PAINTING

- A. Paint lighting equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in SECTION 09901 - PAINTING.

3.03 GROUNDING

- A. Ground noncurrent-carrying parts of equipment as specified in SECTION 16100 - ELECTRICAL WORK. Where the copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

3.04 FIELD TESTS

- A. Operating Test: Upon completion of the installation, conduct an operating test to show that the equipment operates in accordance with the requirements of this section. Make adjustments and add and/or replace light fixtures and other equipment as required to correct deficiencies.
- B. Lighting Control Test: Conduct operational control of installed and energized luminaires. Set time delays as directed by Architect.
- C. Lighting System Controls Functional Testing: Provide all materials and labor required to test the lighting system controls to ensure that the control hardware and software are calibrated, adjusted, programmed, and in proper working condition in accordance with the contract documents. The Contractor shall perform and document the functional testing which shall be in accordance with the applicable paragraphs of the State's Energy Code. The Designer of Record shall witness the functional testing. The testing documentation shall be provided to the Designer of Record for review and approval prior to project close-out.
- D. Ground Resistance Tests: Perform as specified in SECTION 16100 - ELECTRICAL WORK.

END OF SECTION