PHOTOVOLTAIC SYSTEM FOR BUILDING 300 AT DIAMOND HEAD OAHU, HAWAII

Job No. CA–1105-C

PREPARED FOR
Hawaii Army National Guard
Department of Defense
State of Hawaii

TECHNICAL SPECIFICATIONS

FINAL DESIGN

June 2012

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SECTION 01100 PROJECT REQUIREMENTS

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Project consists of providing a new photovoltaic system at Building 300 for the Hawaii Army National Guard.
   1. Project Location: Building 300, at Diamond Head Ft. Ruger, Honolulu, HI

   2. The Work includes
      a. Sitework

      b. Electrical: Roof mounted photovoltaic system on Building 300 (Mauka)

      c. Abatement: Lead, PCB, etc.

      d. Architectural: Roof patching.

      e. Structural: Provide support for new photovoltaic system.

B. 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.

C. 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.

D. Contractor shall not alter the Drawings and Specification. If an error or discrepancy is found, notify the Contracting Officer.

E. 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, 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 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 WORK SEQUENCE

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

1.04 USE OF PREMISES AND WORK RESTRICTIONS

A. General: Contractor shall have full use of construction area for construction operations, including use of project site, during construction period. Contractor's use of premises is limited by HIARNG's time of operation.

B. Contractor's use of premises is restricted as follows:
   1. Where construction activities impact HIARNG's time of operation:
      a. Coordinate with HIARNG for minimal obstruction to HIARNG's operation.

   2. Site Access and Parking:
      a. Parking: Parking for the Contractor's employees (or 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 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.

   3. Sanitation:
      a. Use of toilet facilities will be as directed by the Contracting Officer. Facilities shall be kept clean. Abuse of this condition may result in the Contractor providing their own toilet facilities at no additional cost to the State.

   4. Noise and Dust Control:
      a. In adjacent locations surrounding the project site, noise, dust and other disrupting activities, resulting from construction operations, are detrimental to the conduct of the HIARNG activities. Therefore, Contractor shall monitor its construction activities. Construct dust barriers where necessary to protect HIARNG's time of operation. 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. The Contracting Officer will require any construction activity that produces excessiveness of noise and dust to be performed during an agreed on period by HIARNG. The Contracting Officer shall make the final determination. Overtime

costs for the Contractor's employees and work force are the Contractor's responsibility.

5. Other Conditions:
   a. Arrange for construction debris and trash to be removed from project site weekly.

   b. Operate machinery and equipment with discretion and with minimum interference to driveways and walkways. Do not leave machinery and equipment unattended on roads and driveways.

   c. Store materials in the areas as designated by the 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. Contractor shall be responsible for Reporting and disposal of all Solid Waste during the construction period, and per City & County of Honolulu's Department of Environmental Services.

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 at Project facility.

1.05 WORK UNDER OTHER CONTRACTS

A. Separate Contract: The State may execute a separate contract for certain construction at the project site that was not known at the time Offers were submitted.

B. Cooperate fully with separate Contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

1.06 FUTURE WORK

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

PART 2 - **PRODUCTS (Not Used)**

PART 3 - **EXECUTION (Not Used)**

END OF SECTION

SECTION 01105 - SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes special procedures for Bldg 300 new photovoltaic system.

1.02 GENERAL REQUIREMENTS

A. Contractor's Examination of the Site: By executing the contract, the Contractor and Subcontractors shall warrant that they have made due allowances for difficulties and contingencies to be encountered. Additionally, they have compared the Contract Documents with the work in place and work to be executed, informed themselves of existing conditions, and requirements of the plans and specifications.

B. The Contractor shall accept the site and existing buildings in the condition in which they exist at the time the Contractor was given access to begin work.
   1. The existing building/site layout and conditions indicated on the drawings were compiled from available drawings and field surveys conducted at the site.

   2. The Contractor shall verify all existing conditions and dimensions indicated and other dimensions not indicated but necessary to accomplish the work.

1.03 SPECIAL REQUIREMENTS

A. The existing electrical system shall remain in operation while the new photovoltaic system is installed. Outages and downtime shall be minimized and coordinated with HIARNG contracting officer, prior to switchover.

B. Existing Systems: Contractor shall test existing systems as applicable before and after any work that will affect their function. Report all discrepancies to the Contracting Officer. Contractor will be held responsible for discrepancies that result from their work and shall correct the discrepancies as directed by the Contracting Officer at no cost to the State.

C. Existing Air Conditioning Systems: Contractor shall turn off and secure all air conditioning systems serving areas being renovated. In the case of work in parts of air conditioned buildings where the air conditioning cannot be turned off, separate the work area from the remaining parts of the building by dust barriers. All supply and return air grilles and registers shall be sealed to prevent construction dust and debris from entering into the air conditioning system(s). Where the ceiling space is a return air plenum, temporarily separate it from the remaining plenum, and seal all ceiling penetrations prior to start of dust producing work. Upon completion of work, vacuum and clean work spaces and isolated plenum and remove dust barriers. Where Contractor's dust and debris has contaminated plenums, ducts, and ventilation and air conditioning equipment and filters, the Contractor shall clean components and spaces and replace filters as directed by the Contracting Officer at no additional cost to the State.

D. Waste Receptacle Bins: Contractor shall not use facility's waste receptacle bins. The Contractor shall provide a 40 cubic yard waste receptacle bin at a location as directed by the Contracting Officer for the exclusive use by the construction. The Contractor shall include in their bid as many times as necessary emptying of the bin when full during the

project duration including all costs for transportation, refuse tipping charges, rental, etc. excluding any hazardous waste which will not be allowed.

PART 2 - **PRODUCTS (Not Used)**

PART 3 - **EXECUTION (Not Used)**

END OF SECTION

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.

2. Project meetings.

1.02 PERFORMANCE AND COORDINATION

A. Contractor is in charge of the Work within the Project Contract Limits, and shall direct and schedule the Work. Include general supervision, management and control of the Work of this project, in addition to other areas more specifically noted throughout the Specifications. Final responsibility for performance, interface, and completion of the Work and the Project is the Contractor's.

B. The Contractor is responsible for jobsite Administration. Provide a competent superintendent on the job and provide an adequate staff to execute the Work. In addition, all workers shall dress appropriately and conduct themselves properly at all times. Loud abusive behavior, sexual harassment and misconduct will not be tolerated. Workers found in violation of the above shall be removed from the job site as directed by the 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 concrete foundations, pads, supports, bases, and grouting for trades as needed to install their work.

4. 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.

5. 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.

6. 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.

7. 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 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 AND TRAINING

A. General: Schedule and conduct meetings and conferences as directed by the Contracting Officer.
   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. 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; HIARNG-ENV Compliance Manager; 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.

I. Progress cleaning.

m. Working hours.

C. Progress Meetings: Conduct progress meetings at bi-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 (and Design Consultant as needed), 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 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, 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 State 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 3 sets of the list of the required submittals, by Specification Section, within 15 days afteraward 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 3 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 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 but no later than 5 working days before the last day of the month.

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, list of subcontracts, Submittals Schedule, progress reports, payment requests, 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,

   b. Submittals Schedule.

PART 2 - PRODUCTS

2.01 SUBMITTALS SCHEDULE

A. Comply with the GENERAL CONDITIONS "SHOP DRAWINGS AND OTHER SUBMITTALS" section. 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.

B. Preparation: Furnish a schedule of submittals, arranged in chronological order by dates required by the construction schedule. Include time required for review, resubmittals, ordering, manufacturIng, fabrication, and delivery when establishing dates.
   1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Prices, and Contractor's Construction Schedule.

   2. The schedule shall accommodate a minimum of 21 calendar days for the State's review.

   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 - 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. The description of the activity and the duration of time in calendar days.
   a. For each activity indicate the early start, early finish, late start, late finish dates and total float time.

   b. For this project, a critical activity shall be any activity with less than 5 days of total float.

7. The party responsible for the accomplishment of the activity. As a minimum, indicate responsibility for each listed Subcontractor and major vendor.

8. Contract-required dates for completion of all or parts of the Work.

9. Non-work days such as holidays, or exclusionary non-work days.

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 3 sets of the revised schedule within 15 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 State 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 that 7 calendar days from Contracting Officer's notification.

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

2.03 SCHEDULE OF PRICES

A. Format and Content: Use the Specifications table of contents as a guide to establish line items for the Schedule of Prices. Provide at least one line item for each Specification Section.

1. Provide a separate line item in the schedule for each allowance. Show line- item value of unit-cost allowances, as a product of the unit cost, multiplied by measured

quantity. Use information indicated in the Contract Documents to determine quantities.

B. Sub-Schedules: Provide a separate Schedule of Prices for each building.

C. Identification: Include the following Project identification on the Schedule of Prices:
   1. Project name and location.
   2. Job number.
   3. Contractor's name and address.
   4. Date of submittal.

D. Arrange the Schedule of Prices in tabular form with separate columns to indicate the following for each item listed:
   1. Related Specification Section or Division.
   2. Description of the Work.
   3. Name of Subcontractor.
   4. Name of manufacturer or fabricator.
   5. Name of supplier.
   6. Dollar value. Also provide the percentage of the Contract Price to nearest one-hundredth percent, adjusted to total 100 percent.

E. 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.

F. 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,

G. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Prices or distributed as general overhead expense, except that closeout procedures, especially record documents shall be itemized as a separate line item.

2.04 PAYMENT APPLICATION

A. Use the Schedule of Prices to produce the Payment Application and 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. 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.

H. Retainage: The Department will withhold retainage in compliance with the GENERAL CONDITIONS.

I. Transmittal: Submit the signed original and 3 copies of each Payment Application for processing. Send the payment application with a transmittal form.

PART 3 - **EXECUTION (Not Used)**

END OF SECTION

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Comply with the GENERAL CONDITIONS ARTICLE 5.4 - “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 01310 - PROJECT MANAGEMENT AND COORDINATION for submitting Coordination Drawings.

   2. SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION for submitting schedules and reports, including Contractor’s Construction Schedule and the Submittals Schedule.

   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 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 insure 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 corn ments.

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. Samples: Where not specified otherwise, provide no less than 3 samples. One sample will be kept by the Consultant, one sample will be kept by the State, and remaining sample(s) will be returned to the Contractor.

E. Submittal Certification Form (or stamp)

PART 2 - **PRODUCTS (Not Used)**

PART 3 - **EXECUTION**

3.01 SUBMITTAL REGISTER

A. 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.

SPECIFIER'S NOTE: Division 0 and 1 items have been filled-in as samples. Edit as necessary and add all technical sections as applicable to the project to this schedule.

Section No. – Title *(List in numerical order of the Specification section No.)*	Shop Drawings & Diagrams	Samples	Certificates (Material, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-Built Drawings	Others	Guaranty or Warranty	Manufacturer's Guaranty or Warranty (Greater than one year)
01210 – Allowances														■		
01310 – Project Management and Coordination											■			■		
01320 – Construction Progress Documenta-tion											■			■		
01322 – Web Based Construction Management														■		
01330 – Submittal Procedures			■											■		
01450 – Moisture Vapor and Alkalinity Testing							■							■		
01500 – Temporary Facilities and Controls							■							■		

Section No. – Title *(List in numerical order of the Specification section No.)*	Shop Drawings & Diagrams	Samples	Certificates (Material, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-Built Drawings	Others	Guaranty or Warranty	Manufacturer's Guaranty or Warranty (Greater than one year)
01575 – Temporary Controls – Air Quality Requirements			■		■											
01700 – Execution Requirements														■		
01715 – Existing Conditions														■		
01770 – Closeout Procedures	■								■				■	■	■	
03300 – Cast-In-Place Concrete			■	■												
05400 – Cold-Formed Metal	■			■												
07545 – Fluid Applied Elastomeric Roof Coating		■	■	■											■	■
07920 - Sealants		■		■	■										■	
09900 – Painting and Repainting		■	■	■										■		
13282 – Arsenic Control							■	■	■							
13284 – Lead Hazard Control							■	■	■							

Section No. – Title *(List in numerical order of the Specification section No.)*	Shop Drawings & Diagrams	Samples	Certificates (Material, Treatment, Applicator, etc.)	Product Data, Manufacturer's Technical Literature	MSDS Sheets	Calculations	Reports (Testing, Maintenance, Inspection, etc.)	Test Plan	O & M Manual	Equipment or Fixture Listing	Schedules (Project Installation)	Maintenance Service Contract	Field Posted As-Built Drawings	Others	Guaranty or Warranty	Manufacturer's Guaranty or Warranty (Greater than one year)
16052 – Electrical Photovoltaic System	■		■	■		■	■		■						■	■

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. Sanitary facilities, including toilets, wash facilities, and drinking water facilities.
   2. Ventilation.
   3. Electric power service.
   4. Lighting.

C. Support facilities include, but are not limited to, the following:
   1. Storage and fabrication sheds.
   2. Trash, refuse disposal.
   3. Erosion controls and site drainage.

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.
   5. Barricades, warning signs, and lights.

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. Occupants of Project.
   3. Testing agencies.
   4. 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 UBC Chapter 33, “Site Work, Demolition and Construction”, ANSI A10.6, NECA’s “Temporary Electrical Facilities”, and NFPA 241, “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. 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.

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 Contracting Officer. Provide materials suitable for use intended.

B. Plastic Enclosure Fence: Industry standard 4-feet high plastic fencing with metal (or wood) post supports at 10-feet on center connected with a top and bottom 12-gauge soft annealed galvanized tie wires securely connected to posts. Posts shall be capable of resisting a lateral load of 100 pounds measured at the top of the post.

C. Tarpaulins: Fire resistive labeled with flame spread rating of 15 or less.

D. Water: Potable.

2.02 EQUIPMENT

A. 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.

B. 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 including paper cup supply.

C. Electrical Outlets: Properly configured, NEMA polarized outlets to prevent insertion of 110 to 120 V plugs into higher voltage outlets; equipped with ground fault circuit interrupters, reset button, and pilot light.

D. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125 V ac, 20 A rating, and lighting circuits may be nonmetallic sheathed cable.

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.
   1. Secure approval from Contracting Officer before modifications are made to the State Inspector's Field Office.

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. Water Service: Make arrangements with the utility company for temporary use of water, and pay for all expenses. However, at the option of the Contractor, a temporary tap into the facility's existing water system is allowed, subject to the following conditions:
   1. Comply with the Department of Health's and County water provider's requirements when tapping into the existing water system.

   2. Reasonable amounts of water will be available without charge.

   3. Upon completion of the project and just prior to removal of the temporary, notify the Contracting Officer.

   4. Should the Contractor at any time fail to comply with any or all of the above conditions, the Contracting Officer may terminate the use of water. The Contractor shall remove the hookup within 48 hours of notification of such termination.

B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
   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.

C. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

D. 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. Use of State facilities electrical power services will be permitted as long as equipment is maintained in a condition acceptable to the Contracting Officer.

E. 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.

3.03 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access or where shown on Contract Drawings or as directed by the Contracting Officer.

   2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion.

B. 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.

C. Temporary Sign(s):
   1. Provide and install signs as listed. Sign designs are attached to Part 3 of this Section:
      a. Warning Sign

   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.

D. 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 8.5x1 1" 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/l lldump.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, botUes, 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. Environmental Protection
   1. With the exception of those measures set forth elsewhere in these Specifications, environmental protection shall consist of the prevention of environmental pollution as the result of construction operations under this Contract. For the purpose of this specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare, unfavorably alter ecological balances of importance to human life, affect other species of importance to man, or degree the utilization of the environment for aesthetic and recreational purposes.

   2. Applicable Regulations: In order to provide for abatement and control of environmental pollution arising from the construction activities of the Contractor and his subcontractors in the performance of this Contract, the work performed shall comply with the intent of the applicable Federal, State, and local laws and regulations concerning environmental pollution control and abatement, including, but not limited to, the following regulations:
      a. State of Hawaii, Department of Health, Hawaii Administrative Rules, Chapter 55, WATER POLLUTION CONTROL; Chapter 54, WATER QUALITY STANDARDS.

      b. State of Hawaii, Department of Health, Hawaii Administrative Rules, Chapter 59, AMBIENT AIR QUALITY; Chapter 60.1, AIR POLLUTION CONTROL LAW.

      c. State of Hawaii, Department of Health, Hawaii Administrative Rules, Chapter 42, VEHICULAR NOISE CONTROL; Chapter 46, COMMUNITY NOISE CONTROLS.

      d. State of Hawaii, Department of Health, Hawaii Administrative Rules, Chapters 260 TO 270, HAZARDOUS WASTE MANAGEMENT STANDARDS,

C. Site Maintenance: The Contractor shall keep the work site clean and free from rubbish and debris as specified in Section 01500. Materials and equipment shall be removed from the site when they are no longer necessary. Upon completion of the work and before final acceptance, the work site shall be cleared of equipment, unused materials, and rubbish to present a clean and neat appearance.

D. Air Pollution Control: The Contractor shall not discharge smoke, dust, and other contaminants into the atmosphere that violate the regulations of any legally constituted authority. Burning of any kind will not be permitted. The Contractor is responsible to obtain all applicable permits and approvals for dust abatement. He shall also abate dust nuisance by cleaning, sweeping, and sprinkling with water. The use of water, in amounts

which result in mud on public or treatment plant streets, is not acceptable as a substitute for sweeping or other methods.

E. Noise Control:
   1. The Contractor shall comply with the provisions of Chapter 46, Community Noise Control for Oahu, of the State Department of Health, Title 11 Administrative Rules. When required, the Contractor shall obtain a Community Noise Permit. Construction equipment and on-site vehicles or devices requiring an exhaust of gas or air shall have mufflers. The Contractor shall comply with conditional use of the permit as specified in the rules and the conditions issued with the permit. Should there be a baseyard or stockpile area located adjacent to residences, mitigative measures, such as barriers or berms, shall be dev&oped in the event that noise complaints are received.

   2. Construction activities shall not emit noise in excess of the maximum permissible sound levels for the hours before 7:00 am. and after 6:00 p.m. of the same day, Monday through Friday.

   3. Compliance with the provisions of this section by the subcontractors will be the responsibility of the Contractor.

   4. The Officer-in-Charge will notify the Contractor of any non-compliance with the foregoing provisions and the action to be taken. If the Contractor fails or refuses to comply promptly, the Officer-In-Charge may issue an order stopping all or part of the work until satisfactory corrective action has been taken, No extension of time or payment for excess costs or damages shall be made for the time lost due to such stop action.

F. Water Pollution and Soil Contamination:
   1. HIARNG-ENV approval is required for any fueling operations being conducted on-site.

   2. HIARNG-ENV approval is required for any aboveground storage tank staged onsite. For storage of oil exceeding the EPA threshold of 1.320 gallons shell capacity of oil in containers 55 gallons or greater, contractor is responsible for preparing a Spill Prevention, Control, and Countermeasures (SPCC) Plan in accordance with 40 CFR 112.

   3. The Contractor shall comply with all Federal, State and local laws and regulations which apply to water pollution and soil contamination. At no time shall the Contractor release or dump solvents, paints, gasoline or other fuels or oils into any portion of the sewers or process facilities.

   4. In order to minimize the possibility of water or soil contamination due to spills of crankcase oil, gasoline and other fuels, the Contractor shall designate an area for the storage and handling of lubricants, fuels and other supplies which is acceptable to the Officer-In-Charge. The Contractor shall comply with all applicable Federal, State and local rules and regulations related to the reporting and cleanup of spills.

   5. Prevent oil or hazardous substances from entering the ground, drainage area or navigable waters. In accordance with 40 CFR 112, surround all temporary fuel oil or

petroleum storage tanks with a temporary berm or containment of sufficient size and strength to contain the contents of the tank, plus 10 percent freeboard for precipitation.

6. Take precautions to prevent spills of oil and hazardous material. In the event of a spill, immediately notify the Contracting Officer and HIARNG-ENV. Spill response shall be in accordance with 40 CFR 300 and applicable State Department of Health regulations.

7. Contractor shall immediately clean up all spills lAW federal and state guidelines and to the satisfaction of the HIIARNG-ENV. Contractor shall maintain adequate spill supplies commensurate with the potential spills, and will contract our spill cleanup beyond their capabilities. Contractor shall accomplish all regulatory verbal and written notifications to the State Emergency Response Commission, Local Emergency Planning Committee (LEPC), National Response Center (NCR), Environmental Protection Agency (EPA), as applicable and provide HIARNG-ENV copies of all spill reports.

G. 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.

H. Erosion Control:
   1. During grading operations, maintain the grade to prevent damage to adjoining property from water and eroding soil.

   2. Install temporary silt fences, 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 facilities where shown on the Drawings and when required to minimize erosion and pollution of waterways during construction.

I. 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.

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: Erect temporary construction barricade(s) to prevent unauthorized persons from entering the project area and to the extent required by the Contracting Officer.
   1. 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.

   2. Construction:
      a. Plastic fencing.

B. Opening Protection:
   1. Vertical Openings: Close openings with plywood or similar materials.

   2. Where temporary wood or plywood enclosure exceeds 100 sq ft. in area, use fire retardant treated material for framing and main sheathing.

C. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
   1. Construct dustproof partitions of not less than nominal 4 inch studs, 5/8 inch gypsum wallboard with joints taped on occupied side, and 1/2 inch fire retardant plywood on construction side.

3.07 OPERATION, TERMINATION, AND REMOVAL

A. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by heat [or freezing] 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.

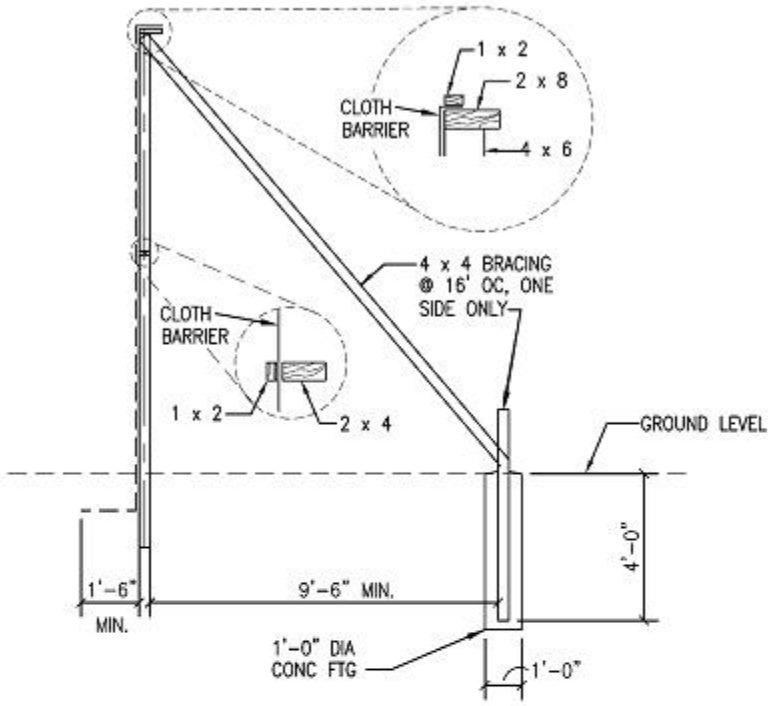
3.08 ATTACHMENTS

A. Dust Control Fence Drawings: Standard Detail for Dust Control Fence - DETAILS D and EITG 01500.

B. Warning Sign: Requirements for Warning Sign.

C. Department of Health — Illegal Dumping Notice

END OF SECTION



SECTION

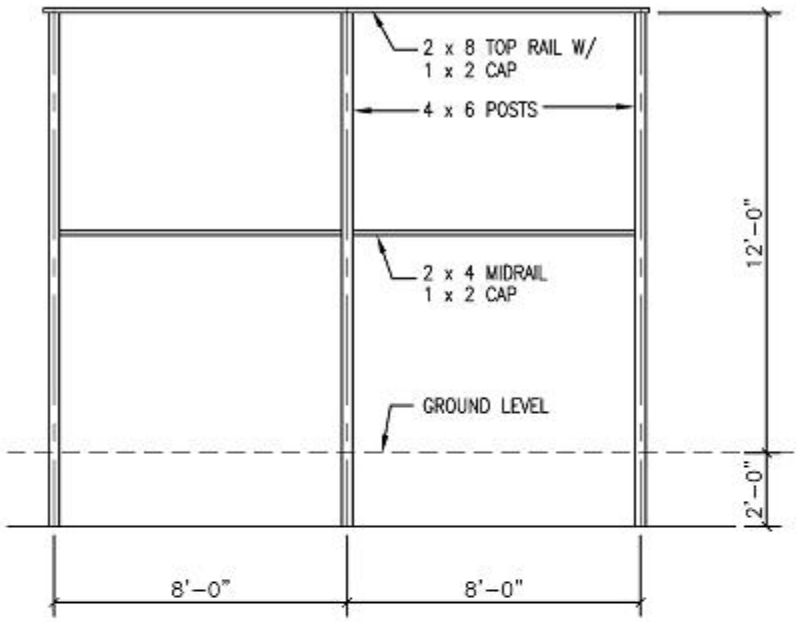
NOTES:

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.

D
TG 01500

STANDARD DETAIL FOR DUST CONTROL FENCE

SCALE: NTS



ELEVATION

NOTES:

1. CLOTH BARRIER NOT SHOWN IN FRONT VIEW.
2. CLOTH BARRIER TO BE "GEOTEXTILE" OR "NURSERY SHADE".
3. LUMBER SIZES ARE NOMINAL INCHES.
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10. ALL JOINTS TO BE SECURELY FASTENED BY MECHANICAL MEANS.

E
TG 01500

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 01575 - TEMPORARY CONTROLS - AIR QUALITY

PART 1 - GENERAL REQUIREMENTS

1.01 SUMMARY

A. This section describes the steps that the Contractor shall perform to control odors or dusts generated by the equipment, materials, or actions of the construction process that may affect the quality of air to non-Contractor personnel.

1.02 REFERENCES

A. "Indoor Air Quality" published by the Sheetmetal and Air Conditioning Contractor's National Association (SMACNA).

B. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) standards as follows: 62; 55; 52; and 1.

C. "Indoor Air Quality in Public Buildings", Volumes I and II, by Sheldon L, Handy RW, Hartwell TD, et al:, (Public Access Buildings Study).

D. National Particleboard Association (NPA) Standard for Formaldehyde Emission for Particleboard: NPA6.

1.03 DEFINITIONS

A. "A/C" (Air Cond.) means any or all of the equipment used to air condition a building or space.

B. "Air changes per hour' shall mean a number calculated by the maximum work area length in feet times the maximum work area width in feet times the maximum work area height in feet divided by 60 times the cubic feet per minute of air movement (L x Wx H)/(60x CFM).

C. "Odor" means something that can be detected by a person's sense of smell whether objectionable or not to the person.

D. "Perceivable" means able to attain an awareness solely through the use of the human senses such as smell, sight, hearing, taste, and touch.

E. "VOC" means volatile organic compound, a compound containing a chemical constituent with a boiling point of less than 100 Deg C (volatile) and that contains carbon (organic).

F. VOC emission rate" means the total amount of hydrocarbons emitted per area and unit of time as determined from the product and test method data supplied by the manufacturer or from data in the EPA Public Access Buildings Study.

1.04 SUBMITTALS

A. Submit a certification, which may be a copy of the product label or Material Safety Data Sheets (MSDS), of the VOC emission rate for all VOC containing products. MSDS sheets and labels are acceptable only if the VOC data is available and highlighted.

B. Submit VOC emission rates for all products containing any VOC compounds. Maintain a copy of the VOC certifications and emission rates (in a 3-ring binder) at the job site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide temporary equipment including fans, blowers, tape, ducts, temporary wall materials and other similar items.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. If all VOC-containing materials have certified VOC emission rates less than 100 micrograms/m2h, the requirements of PART 3 - EXECUTION are not required for VOC control.

B. Ensure the all work areas are isolated from those areas in which persons not employed by the Contractor will be present during construction, including those interconnected by air conditioning systems, adjacent buildings, and public areas.
   1. Install isolation barriers so that odors and dust from the work areas are not perceivable in any surrounding occupied area, then remove the barriers before the final acceptance of the project; or

   2. Provide local fresh and exhaust air that will be adequate to ensure odors and dust from the work areas are not perceivable in any surrounding occupied area. Meet the following minimum criteria:
      a. At least 4 air changes per hour continued from the start of any emission producing work until four hours after the conclusion of any emission producing work; and

      b. Exhaust the ventilating air to the outside of the building, at least 25 feet downwind of any opening to the building, surrounding buildings, or similar occupied areas, and at least 100 feet downwind of any building air supply intakes.

C. Upon notification by the Contracting Officer of an odor or dust complaint, immediately stop all odors and dust producing tasks, and then execute the requirements of subparagraph 3.01. B. 2. within 4 hours after Contracting Officer's notification.
   1. Compliance with subparagraph 3.01 B. 1. is not considered sufficient isolation in this instance.

   2. If the items in subparagraph 3.01 B. 2. were previously implemented without satisfactory results, increase the air changes to 8 per hour.

   3. The requirements in paragraph 301 D. may be performed in lieu of the requirements stated in paragraph 3.01 C. with prior permission from the Contracting Officer or shall be performed if requested by the Contracting Officer.

D. When the conditions described in subparagraphs 3.01 B. 1., 3.01 B. 2., or paragraph 3.01 C., are unable to maintain an air quality acceptable to 80 percent of the surrounding occupants, perform the following at no extra cost to the State:
   1. Immediately discontinue the use of the offending product(s) upon notification by the Contracting Officer;

   2. Perform the odor or dust generating task(s) during a non-occupied time such as evenings, weekends and holidays;

   3. Thoroughly clean any odor or dust affected area and equipment prior to occupancy; and

   4. Complete the odor or dust generating task(s) at least 16 hours prior to occupancy.

3.02 VENTILATION AFTER CONSTRUCTION

A. In all work areas of air conditioned new buildings perform a ventilation activity after construction has been completed but prior to occupancy according to the following:
   1. Notify the Contracting Officer prior to starting the work involved with these steps or immediately if any step cannot be successfully completed;

   2. Perform the normal start up procedures for all ventilation equipment;

   3. Inspect areas adjacent to air intakes for the existence of air containing odors and eliminate the cause of any odors before proceeding;

   4. Ensure that the air conditioning or ventilation outside make-up air dampers are operable, then set them to remain in the wide open position to provide for the maximum possible flow of outside air into the building;

   5. Set the mechanical cooling equipment such as chilled water and air conditioning compressors as appropriate to off so that the temperature will stay as high as possible;

   6. Open windows and doors (interior) for maximum ventilation of the work area. Use care to maintain security and to prevent infiltration of dirt, debris, dust, or impact on surrounding occupied areas. Maintain protection from the elements of weather, and site cleanliness;

   7. Turn on all of the available lights and heat producing equipment;

   8. Run all of the air handling units and ventilation fans continuously for 72 hours; and

   9. Continue the ventilation procedure beyond the 72 hours if the Contracting Officer determines it necessary. Provide additional exhaust fans if directed by the Contracting Officer. Ventilation beyond 72 hours is considered additional work provided the Contractor followed the steps required in this paragraph 3.02 A.

10. When the Contracting Officer determines that the ventilation is sufficient, replace all air conditioning and ventilation air filters. Readjust the building's equipment to the design settings and perform the start up steps required after such adjustments are made.

END OF SECTION

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout. Field engineering.
   2. General installation of products.
   3. Progress cleaning.
   4. Protection of installed construction.
   5. Correction of the Work.

B. Related Sections
   1. SECTION 01770- CLOSEOUT PROCEDURES.

1.02 SUBMITTALS

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

1.03 NOTIFICATION

A. Contact the 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. Meet with HIARNG prior to start of construction to identify construction work which impacts HIARNG's time of operation and coordinate work by developing work plans including construction schedules acceptable to HIARNG.

C. Disruption of Utility Services: Pre arrange work related to the temporary disconnection of electrical and other utility systems with the Contracting Officer. Unless a longer notification period is required elsewhere in the Contract Documents, notify the Contracting Officer at least 15 days in advance of any interruption of existing utility service. Time and duration of interruptions are subject to the Contracting Officer's approval. Keep the utility interruptions and duration to a minimum so as not to cause inconvenience or hardship to the facility, If temporary electrical or other utility systems hook-up is required, provide the necessary services. Pay for temporary services as part of the contract, unless specifically noted otherwise.

D. Disruption of Air Conditioning Services: Coordinate and arrange work related to the temporary disconnection of the air conditioning system with the Contracting Officer.

Keep disruptions to a minimum. If temporary power and/or air conditioning is required, provide services and pay the cost as part of the contract. Schedule any major outage to the air conditioning system that affects the entire building and lasts 4 hours or more, on weekends or during non-regular working hours of the building occupants. Pay for overtime cost as part of the contract.

E. Contractor's Operations - Provide means and methods to execute the Work and minimize interruption or interference to the facility's operations. Rearrange the construction schedule when construction activities result in interruptions that hamper the operations of the facilities.

F. Maintain safe passageway to and from the facility's occupied buildings, rooms and other occupied spaces for the using agency personnel and the public at all times.

G. Contractor, Subcontractor(s) and their employees will not be allowed to park in zones assigned to Users or facility personnel. Subject to availability, the Contracting Officer may designate areas outside of the Contract Zone Limits to be used by the Contractor. Restore any lawn area damaged by construction activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EXAMINING THE SITE

A. Contractor and Subcontractors are expected to visit the site and make due allowances for difficulties and contingencies to be encountered. Compare contract documents with work in place. Become familiar, with existing conditions, the conditions to be encountered in performing the Work, and the requirements of the drawings and specifications.

B. Verify construction lines, grades, dimensions and elevations indicated on the drawings before any 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. Verity dimensions in the field.

E. Contractor shall accept the site and the existing building(s) 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.

3.02 SITE UTILITIES

A. 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.

B. 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.

C. 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.

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 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.

3.06 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 Drawings and Specifications, 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.

3.07 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 materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 degrees F.

   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

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

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

   2. 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.
   1. 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.

3.08 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.

3.09 CORRECTION OF THE WORK

A. Repair or replace defective construction. Restore damaged substrates and finishes.
   1. 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 01715 - EXISTING CONDITIONS - HAZARDOUS MATERIAL SURVEY

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section includes the results of a targeted hazardous material survey for Building 300. The content of this Section is provided for the Contractor's information. The survey included the identification of "hazardous materials," hereinafter referred to as lead-containing paint (LCP) and arsenic-containing material.

B. Building 300 is subject to a photovoltaic system installation. Upon completion of the design, the specifications will aid in the base effort required.

C. The Contractor must implement all appropriate engineering controls and safety measures to prevent workers, occupants, the public, and the environment from exposures to hazardous materials. All costs incurred due to the Contractor's negligence in controlling hazards shall be borne by the Contractor, including, but are not limited to, medical, legal, cleanup, monitoring, and reporting.

D. Related Sections are:

1. Section 13282 - LEAD HAZARD CONTROL for requirements of all work which disturbs LCP, which is defined as any paint containing a measurable level of lead. This Section and the project plans provide specific material descriptions and locations of LCPs to be controlled during any disturbance work of the subject building.

2. Section 13284 – ARSENIC HAZARD CONTROL for requirements of all work which disturbs arsenic-containing materials, which is defined as any material containing a measurable level of arsenic. This Section and the project plans provide specific material descriptions and location of arsenic-containing materials to be controlled during any disturbance work and of the subject building.

1.02 ASBESTOS

A. No Asbestos-Containing Material (ACM) was found during the survey. If any previously unknown ACM is discovered or suspected in the project area, the Contractor shall notify the State immediately, test and confirm the presence of asbestos, and implement engineering controls to prevent exposures to the workers, occupants, the public, and the environment.

1.03 LEAD-CONTAINING PAINT

A. The subject area was target-surveyed for the presence of LCP. A copy of the hazardous materials survey report covering the subject area is included at the end of this Section for the Contractor's information.

1. The survey report identified LCP in the subject area, ranging from 350 to 1,400 milligram per kilogram [mg/Kg or parts per million (ppm)]. None of the identified LCP exceeded the lead-based paint (LBP) threshold of 5,000 ppm, as defined by the Environmental Protection Agency. The Contractor shall refer to Section

13282 - LEAD HAZARD CONTROL, the project plans, and the attached survey report for LCP findings.

2. Section 13282 provides requirements and guidance for the Contractor to control lead hazards.

3. Lead testing was for design purposes only, and the results do not satisfy any of the requirements of State of Hawaii Department of Labor and Industrial Relations Division of Occupational Safety and Health regulations; Hawaii Administrative Rules (HAR) Chapter 148.1 Lead in Construction.

B. Notify employees, subcontractors, and all other affected persons engaged in the project of the presence of LCP in the work area. The Contractor will perform work in accordance with the requirements of HAR Chapter 12-148.1.

C. The Contractor shall protect workers, occupants, the public, and the environment from lead hazards. The Contractor will perform work in accordance with all applicable rules and regulations pertaining to the handling, removal, and disposal of lead-containing debris, materials, and wastes.

1.04 ARSENIC-CONTAINING MATERIAL

A. The subject area was surveyed for the presence of arsenic-containing material. A copy of the hazardous materials survey report covering the subject area is included at the end of this Section for the Contractor's information.
   1. The survey report identified one arsenic-containing material in the subject area of which analytical results were 350 and 1,400 ppm.
   2. The Contractor may perform further surveys at its own expense, if arsenic-containing material is suspected in the work area but not shown in the survey report. If additional arsenic-containing material is suspected or discovered, notify the State Representative immediately.

B. Arsenic-containing material exists in the subject building. As this project is limited to the photovoltaic system installation, any identified or suspect arsenic-containing materials not associated with the project area should not be disturbed.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 HAZARDOUS MATERIALS SURVEY (attached)

A. *Targeted Hazardous Material Survey Report for Building 300 Solar Photovoltaic Installation Hawaii Army National Guard Armory 3949 Diamond Head Road Honolulu, Hawaii 96816,* 49 pages, prepared by Myounghee Noh & Associates, L.L.C., dated September 5, 2011.

B. The Contractor must read and understand the project plans, as well as the specifications, including the survey report attached to this Section. The quantities of hazardous materials provided in the survey report are for estimating purposes only and should not be relied upon for bidding purposes; the Contractor shall

understand the scope of work involved in this project and verify the locations and quantities of all affected hazardous materials. This requirement includes, but are not limited to, all identified arsenic-containing material and LCP to be controlled during the installation of the photovoltaic system in accordance with State of Hawaii Department of Health Indoor and Radiological Health Branch regulations, HAR 12-148.1 CONSTRUCTION STANDARDS, LEAD, and OSHA 29 CFR 1910.1018 INORGANIC ARSENIC, 29 CFR 1910.1025 LEAD, and 29 CFR 1926.62 LEAD.

3.02 POST WORK SUBMITTALS

A. The Contractor shall submit the following documents to the State after the completion of project activities:

1. Daily entry logs showing all persons entering the hazardous materials control areas on site.

2. All air monitoring results or Negative Exposure Assessments and final clearance results.

3. Proof of testing of the waste stream and waste disposal documents, such as manifest and landfill receipts.

4. Certification that the respiratory protection used by the Contractor during the project was adequate.

   Documentation of visual inspections conducted, observations of waste management practices, and observations of housekeeping in work area.

This survey report is prepared for:

InSynergy Engineering, Inc.
828 Fort Street Mall, Suite 500
Honolulu, HI 96813

TARGETED HAZARDOUS MATERIAL SURVEY REPORT FOR BUILDING 300 SOLAR PHOTOVOLTAIC INSTALLATION HAWAI'I ARMY NATIONAL GUARD ARMORY 3949 DIAMOND HEAD ROAD HONOLULU, HI 96816

MNA Project 21232

September 5, 2011

Michael Cyr
Certified Building Inspector (HIASB-3357)

Myounghee Noh
Principal (HIASB-0606)

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EXECUTIVE SUMMARY

In August 2011, Myounghee Noh & Associates, L.L.C., was retained by InSynergy Engineering, Inc., to conduct a targeted hazardous material survey of the ~~targeted~~ areas in the interior and exterior of Building 300, Hawai'i National Guard Armory, located at 3949 Diamond ~~-~~Head Road, Honolulu, HI 96816. The purpose of the survey was to identify the existence (if any), extent, and condition of hazardous materials which may be expected to be disturbed during the planned installation of the solar photovoltaic system.

MNA conducted the survey on August 9, 2011, and identified 17 building materials. Based on the survey and analysis of 21 asbestos samples, 16 lead samples, and 2 arsenic samples, MNA provides the following summary:

- Six (6) lead-containing paints (LCP) were identified on the subject building. The identified LCP were:
  - Off-white paint on concrete brick wall, ~~on the~~ exterior throughout the building.
  - Off-white paint on wood roof underside, exterior of throughout the building.
  - White paint on concrete brick walls in Rooms 35 - 47A and in Hallway 2 (East Wing?).
  - Off-white paint on concrete wall in Hallway 2.
  - White paint on concrete walls in Room 46, Hallway 1 (Northwest Wing?), and Hallway 2.
  - Off-white paint on drywall walls and ceilings in Rooms 8 – 15 and in Rooms 35 – 42.

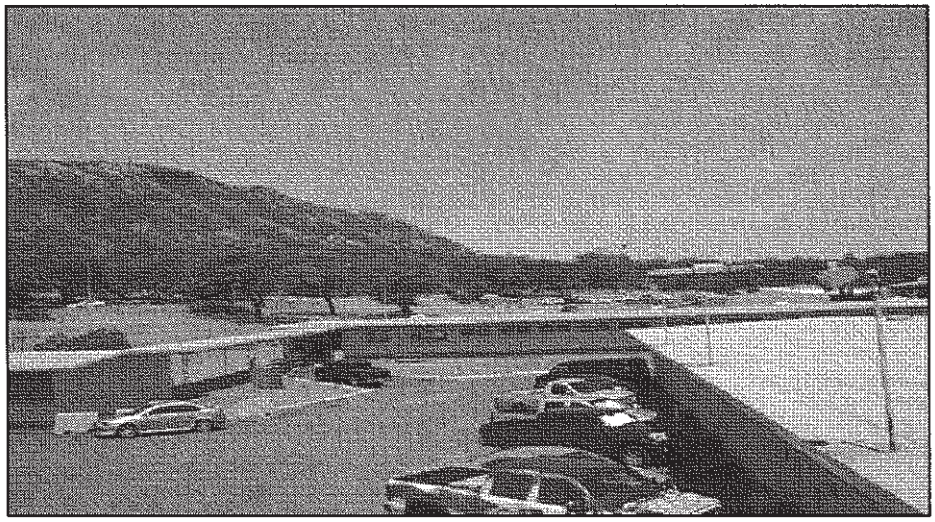
- One (1) arsenic-containing material was found; approximately 1,500 square feet of white 2' x 2' acoustic ceiling and wall tiles ~~of~~ in Room 50.

- No asbestos-containing materials were identified during this survey.

Based on the survey findings, contractors are required to conduct work in accordance with 29 CFR 1926.1118, the OSHA Inorganic Arsenic Construction Standard, and 29 CFR 1926.62, the OSHA Lead Construction Standard~~.~~

1.0 INTRODUCTION

Myounghee Noh & Associates, L.L.C., under contract with InSynergy Engineering, Inc., conducted a targeted hazardous material survey of the ~~targeted~~ areas in the interior and exterior of Building 300, Hawai'i Army National Guard Armory, located at 3949 Diamond Head Road, Honolulu, HI 96816. Figure 1 presents a general vicinity map. The purpose of the survey was to identify the existence (if any), extent, and condition of suspect building materials which may be expected to be disturbed during the planned installation of the solar photovoltaic system. The survey targeted building materials due to the presence of asbestos, lead, or arsenic.



A View of Building 300 toward west
Hawai'i Army National Guard Armory (August 2011)

2.0 SAMPLING AND SURVEY METHODS

On August 9, 2011, State of Hawai'i-certified building inspectors, Akari Ihara and Phillip Cabanila, conducted the survey. The inspectors performed a visual inspection of all targeted interior and exterior areas and identified homogeneous materials suspected of containing asbestos, lead, or arsenic and collected samples of these materials. Inspector state certifications are presented in Appendix A.

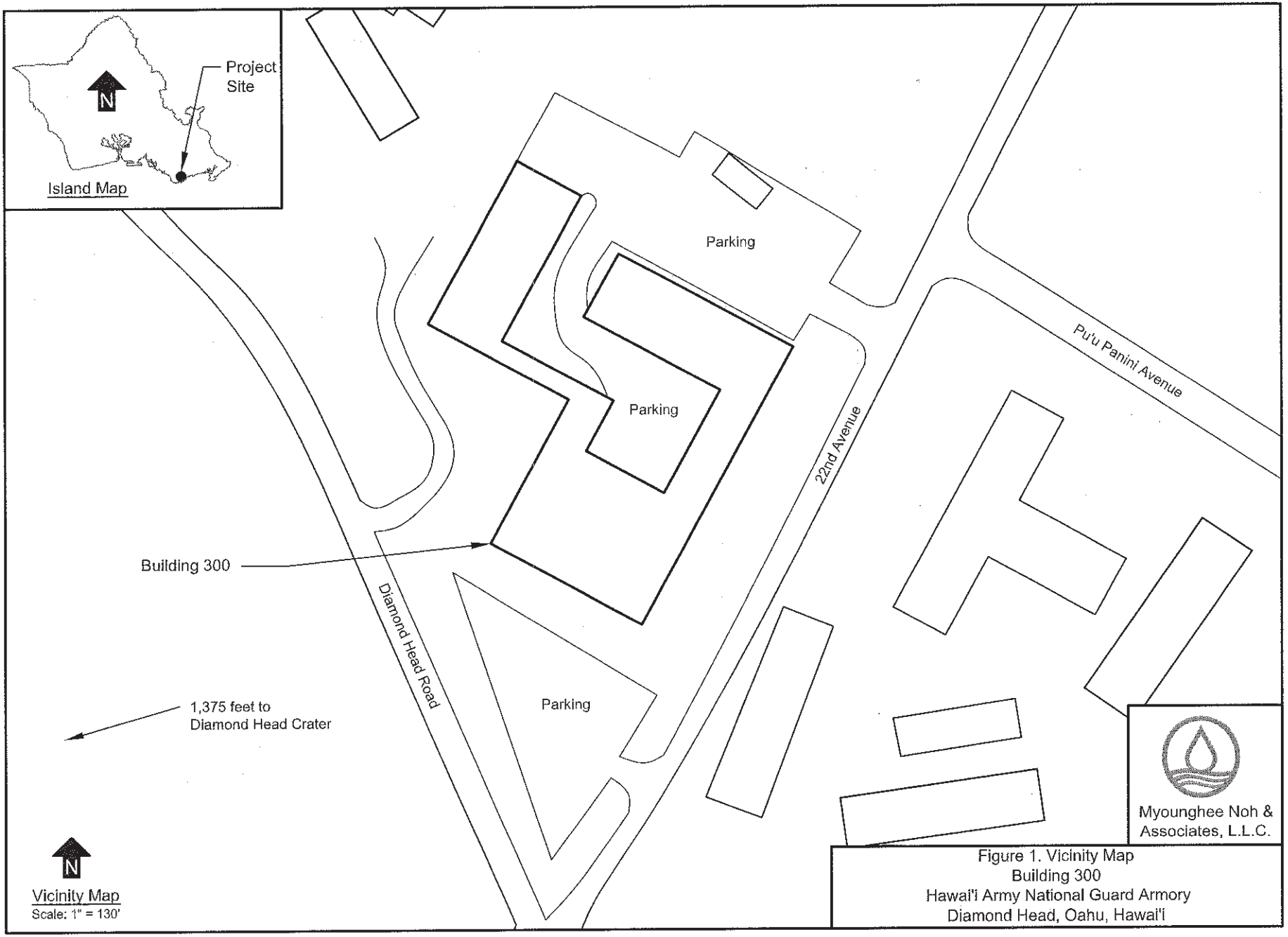


Figure 1. Vicinity Map
Building 300
Hawai'i Army National Guard Armory
Diamond Head, Oahu, Hawai'i

2.1 Identifying Homogeneous Materials

The survey identified building materials with the same appearance, color, and substrate as homogeneous materials. Homogeneous materials were considered unique per building and building floor. Building materials with the same characteristics (appearance, color, and substrate) as an identified homogeneous material should be considered to possess the same hazardous characteristics unless specifically identified as a different material in the report. As an example, if white paint on concrete wall is identified as lead-containing paint (LCP), then all similar white paint on concrete wall should be treated as LCP. Table 1 provides an overview of sampling and a summary of hazardous materials identified.

Table 1. Summary of Sampling and Results

Materials Sampled	Samples Submitted/ Inspected	Suspect Material Locations	Identified Hazardous Materials
Asbestos in paint filler and bulk material	21	Walls, ceilings, roof	None Detected
Lead in paint	16	Walls, ceilings, roof underside	6 LCPs (430 - 1,500 mg/kg)
Arsenic in bulk material	2	Walls, ceiling	1 Arsenic-Containing Material (940 - 1,500 mg/kg)

ACM – Asbestos-Containing Material
LCP – Lead-Containing Paint
mg/kg – milligrams per kilogram (equivalent to parts per million)

2.2 Asbestos, Lead, and Arsenic Sampling

Bulk and paint/filler samples were collected using a decontaminated chisel, razor, or hammer in a manner that minimized airborne dust. The inspector collected a triplicate sample for asbestos and a duplicate sample for lead and arsenic. Samples were placed in plastic bags, labeled with a unique identification number, and recorded on a chain-of-custody. For each sample, the date, sample appearance, analyte, and sample location were recorded on a field data form. All samples were transported under chain of custody to the designated laboratory for analysis. Asbestos and lead samples were sent by FedEx to LA Testing in South Pasadena, California. Arsenic samples were sent by FedEx to LA Testing in South Pasadena, California, which sent the samples to EMSL Analytical in Westmont, New Jersey.

3.0 LABORATORY INFORMATION

LA Testing/EMSL analyzed the samples as follows:

- Asbestos samples by polarized light microscopy using the Environmental Protection Agency (EPA) Method 600/R-93/116.
- Lead samples by flame atomic absorption spectroscopy using the EPA Method 7420.
- Arsenic samples by flame atomic absorption spectroscopy using the EPA Method 3015M/7000B.

LA Testing, South Pasadena, is certified by:

- National Voluntary Laboratory Accreditation Program (NVLAP), certification 200232-0.
- State of Hawai'i Department of Health (HDOH), certification L-01-034.
- American Industrial Hygienist Association (AIHA) Environmental Lead Laboratory Accreditation Program (ELLAP), certification 102814.

EMSL Analytical, Inc., Westmont, is certified by the National Environmental Laboratory Accreditation Program (NELAP), certification 04653.

4.0 ASBESTOS RESULTS

Materials determined to contain greater than, or equal to, 1% asbestos fibers are considered regulated asbestos-containing materials (ACM) under the National Emission Standards for Hazardous Air Pollutants (NESHAP) as specified in 40 Code of Federal Regulations (CFR) Part 61 Subpart M. The U.S. Occupational Safety and Health Administration (OSHA) Asbestos General Industry and Construction Standards also define ACMs as 1% or more by volume under 29 CFR 1910.1001 and 29 CFR 1926.1101, respectively.

Seven (7) homogeneous materials suspected of containing asbestos were identified and sampled, generating 21 samples for the analysis of asbestos content. None of the samples contained a measurable level of asbestos. All suspect ACM descriptions and identifiers are provided in Appendix B. Sample location maps are provided in Appendix C. Photographs of suspect materials are presented in Appendix D. Laboratory analytical reports, chains of custody, and field data forms are provided in Appendix E.

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5.0 LEAD RESULTS

The U.S. Department of Housing and Urban Development (HUD) and the EPA define paint containing 5,000 milligrams per kilogram (mg/kg), or 0.5% by weight, or more of lead to be lead-based paint (LBP). OSHA considers paint containing any measurable concentration of lead to be lead-containing paint (LCP). When lead is detected in a multi-layer sample, it is assumed that all layers represented by the sample contain lead at the same concentration.

Eight (8) paints or coatings suspected of containing lead were identified and sampled, generating 16 paint samples. Six (6) of the 16 samples contained measurable levels of lead ranging from 430 to 1,500 mg/kg. None of the 16 samples collected contained lead concentrations of 5,000 mg/kg or greater, the threshold for LBP. As a result, none of the 8 LCPs identified was LBP (Table 2).

All suspect LCP descriptions and identifiers are provided in Appendix B. Sample and hazardous material location maps are provided in Appendix C. Photographs of suspect materials are presented in Appendix D. Laboratory analytical reports, chains of custody, and field data forms are provided in Appendix E.

6.0 ARSENIC RESULTS

The disturbance of arsenic-containing materials is regulated by the OSHA Inorganic Arsenic General Industry Standard under 29 CFR 1910.1018. One material suspected to contain arsenic were identified and sampled, generating two samples for the analysis of arsenic content. Two (2) samples collected from white acoustic ceiling and wall tiles in Room 50 were found to contain measurable levels of arsenic, 940 mg/kg and 1,500 mg/kg.

Suspect arsenic-containing material descriptions and identifiers are provided in Appendix B. Sample and hazardous material location maps are provided in Appendix C. Photographs of suspect materials are provided in Appendix D. Laboratory analytical reports, chains of custody, and field data forms are provided in Appendix E.

Table 2. Lead Determination Table

Rooms	Locations	HM ID	Color	Material	Substrate	Pb	Results	Condition	Estimated Quantity
Exterior	**Roof underside**	**4**	**Off-white**	**Paint**	**Wood**	**X**	**LCP 1,300 - 1,400 mg/kg**	**Good**	**4,000 sq.ft.**
Exterior	Wall	17	Off-white	Paint	Concrete brick	X	<100 mg/kg	Good	
Hallway 2	**Wall**	**9**	**Off-white**	**Paint**	**Concrete**	**X**	**LCP <100 - 490**	**Good**	**200 sq.ft.**
Room 3, Room 4, Room 5, Room 6, Room 7, Room 8, Room 9, Room 10, Room 12, Room 12A, Room 12B, Room 13, Room 14, Room 15, Room17, Room 17A, Room 18, Room 19, Room 20, Room 21, Room 23, Room 24, Room 25, Room 26, Room 26A, Room 27, Room 28, Room 29, Room 30, Room 31A, Room 31B, Room 31C, Room 32, Room 33, Room 34, Room 35, Room 36, Room 37, Room 38, Room 39, Room 39A, Room 40, Room 41, Room 42, Room 43, Room 44, Room 45, Room 46A, Room 46B, Room 46C, Room 47, Room 47A, Room 50, Room 51, Room 52, Room 53, Room 54, Room 55, Room 56, Room 57, Room 58, Room 59, Room 60, Room 61, Room 61A, Room 62, Room 63, Room 63A, Room 64, Room 65, Room 66, Gym	**Walls**	**2**	**Off-white**	**Paint**	**Concrete brick**	**X**	**LCP <140 - 920 mg/kg**	**Good**	**7,500sq. Ft.**
Room 35, Room 36, Room 37, Room 38, Room 39, Room 40, Room 41, Room 42, Room 43, Room 44, Room 45, Room 46A, Room 46B, Room 46C, Room 47, Room 47A, Hallway 2	**Walls**	**7**	**White**	**Paint**	**Concrete brick**	**X**	**LCP 350 - 430 mg/kg**	**Good**	**900 sq. ft.**
Room 46, Hallway 1, Hallway 2	**Walls**	**14**	**White**	**Paint**	**Concrete**	**X**	**LCP <100 - 360 mg/kg**	**Good**	**200 sq. ft.**

Table 2. Lead Determination Table

Room 50, Room 51, Room 52, Room 53, Room 54, Room 55, Room 56, Room 57, Room 58, Room 59, Room 60, Room 61, Room 61A, Room 62, Room 63, Room 63A, Room 64, Room 65, Room 66, Hallway 1, Hallway 2	Ceiling, beams, purlins	13	White	Paint	Wood	X	<100 - <150 mg/kg	Good	
Room 8, Room 9, Room 12, Room 12A, Room 12B, Room 13, Room 14, Room 15, Room 35, Room 36, Room 37, Room 38, Room 39, Room 39A, Room 39B, Room 40, Room 41, Room 42	**Walls, ceilings**	**16**	**Off-white**	**Paint**	**Drywall**	**X**	**LCP 520 - 610 mg/kg**	**Good**	**2,500 sq. ft.**

Bold values indicate results above the detection limit.

Good - Surfacing is in an "as installed" condition. It is usable as is, may show cosmetic wear and tear or fading.

Fair - Surfacing is functional for its installed purpose but shows initial signs of deterioration beyond the cosmetic. Paint n

Poor - Surfacing shows significant deterioration and may not be functional for its installed purpose. Paint is bubbling or

Abbreviations and Acronyms

HM ID - Hazardous Material Identifier

LCP - Lead-Containing Paint

Sq. ft. - Square Feet

7.0 SUMMARY OF SURVEY RESULTS

In August 2011, Myounghee Noh & Associates, L.L.C., performed the targeted hazardous material survey of the ~~targeted~~ areas of the interior and exterior of Building 300 in support of the planned installation of the solar photovoltaic system.

MNA conducted the survey on August 9, 2011, and identified 17 building materials. Based on the survey and analysis of 21 asbestos samples, 16 lead samples, and 2 arsenic samples, MNA provides the following summary:

- Six (6) lead-containing paints (LCP) were identified on the subject building. The identified LCP were:
  - Off-white paint on concrete brick wall, ~~on the~~ exterior throughout the building.
  - Off-white paint on wood roof underside, exterior of throughout the building.
  - White paint on concrete brick walls in Rooms 35 - 47A and in Hallway 2.
  - Off-white paint on concrete wall in Hallway 2.
  - White paint on concrete walls in Room 46, Hallway 1, and Hallway 2.
  - Off-white paint on drywall walls and ceilings in Rooms 8 – 15 and in Rooms 35 – 42.

- One (1) arsenic-containing material; 1,500 square feet of white 2' x 2' acoustic ceiling and wall tiles ~~of~~ in Room 50.

- No asbestos-containing materials were identified during this survey.

8.0 RECOMMENDATIONS FOR RENOVATION AND CONSTRUCTION WORK

OSHA requires that only properly trained employees perform construction work and demolition that disturbs hazardous materials. The following recommendations address OSHA and other applicable federal requirements. These recommendations provide guidance for the management of hazardous building materials and control of occupational and environmental hazards associated with operations, maintenance, renovation, and demolition. These recommendations are based on information gathered during the hazardous materials survey. These recommendations are not intended to constitute a formal work plan but are intended to provide a starting point for the development of a work plan.

8.1 Asbestos-Containing Materials

Based on the sampling and analysis of ~~twenty-one (21)~~ suspect samples, no special control measures are warranted as the analysis did not detect asbestos fibers in materials in the targeted areas.

8.2 Lead-Containing Paints

Employees involved in renovation or construction activities that disturb LCP or LBP must conduct work in accordance with 29 CFR 1926.62, the OSHA Lead Construction Standard. Work practices that would trigger these requirements include, but are not limited to, sanding, blasting, welding, cutting, or scraping. For each project, the contractor shall determine the appropriate safety measures based on the area to be disturbed, the lead concentration, and the paint condition. Applicable work practice guidelines involving the disturbance of LCP or LBP are summarized, but are not limited to:

- Employees must utilize appropriate engineering controls and PPE. The PPE includes disposable coveralls, gloves, eye protection, steel-toed boots, a hard hat, and a NIOSH approved appropriate respirator.
- Employees must utilize respiratory protection until the initial air monitoring assessment documents safe working levels of airborne lead (29 CFR 1926.62[d][1] and [2][i][A]).
- An exposure assessment should be carried out when employees are disturbing LBP or LCP to ensure that they are not exposed to airborne lead concentrations greater than the PEL of 50 micrograms per cubic meter ($\mu g/m^3$) averaged over an 8-hour period. Additional periodic exposure monitoring may be required if the lead OSHA Action Level of 30 $\mu g/m^3$ averaged over an 8-hour period is exceeded.
- Employees must implement stringent dust control procedures to minimize lead concentrations in any airborne dust.
- Employees must clean the work area thoroughly using wet methods and a HEPA vacuum. Dry sweeping or air blowing of lead debris and dust must be avoided.
- Lead-containing debris should be segregated from other wastes, collected, and containerized. Wastes should be fully characterized, including a determination of the waste as hazardous or

non-hazardous. Lead-containing wastes should be disposed of in accordance with applicable requirements.

- Visually inspect the work area to ensure all lead-containing debris and dust has been properly removed.
- Conduct clearance in accordance with contract specifications.

8.3 Arsenic-Containing Materials

Employees involved in renovation or construction activities that disturb arsenic-containing materials must conduct work in accordance with 29 CFR 1926.1118, the OSHA Inorganic Arsenic Construction Standard. The requirements applicable to construction work under this standard are identical to those set forth in 29 CFR 1910.1018, the OSHA Inorganic Arsenic General Industry Standard. Work practices that would trigger these requirements include, but are not limited to, repair, maintenance, renovation, or demolition of structures containing arsenic, as well as removal or encapsulation of materials containing arsenic. For each project, the contractor should determine the appropriate safety measures based on the area to be disturbed, arsenic concentration, and the volume and condition of arsenic-containing materials. Applicable work practice guidelines involving the disturbance of arsenic-containing materials are summarized, but are not limited to:

- Employees must utilize appropriate PPE. The PPE includes a disposable coverall, gloves, eye protection, steel-toed boots, a hard hat, and a NIOSH approved appropriate respirator.
- An exposure assessment should be carried out when employees disturb arsenic-containing materials to ensure that workers are not exposed to airborne arsenic concentrations greater than the PEL of 10 $\mu g/m^3$ averaged over an 8-hour period (29 CFR 1910.1018[c] and [e]). Additional periodic exposure monitoring may be required if the arsenic OSHA Action Level of 5 $\mu g/m^3$ averaged over an 8-hour period is exceeded.
- Employees must implement stringent dust control procedures to minimize arsenic concentrations in any airborne dust.
- The work site must be maintained as a controlled regulated area if the PEL is likely to be exceeded.
- Employees must clean the work area thoroughly using wet methods and a HEPA vacuum. Dry sweeping or air blowing of arsenic debris and dust must be avoided.

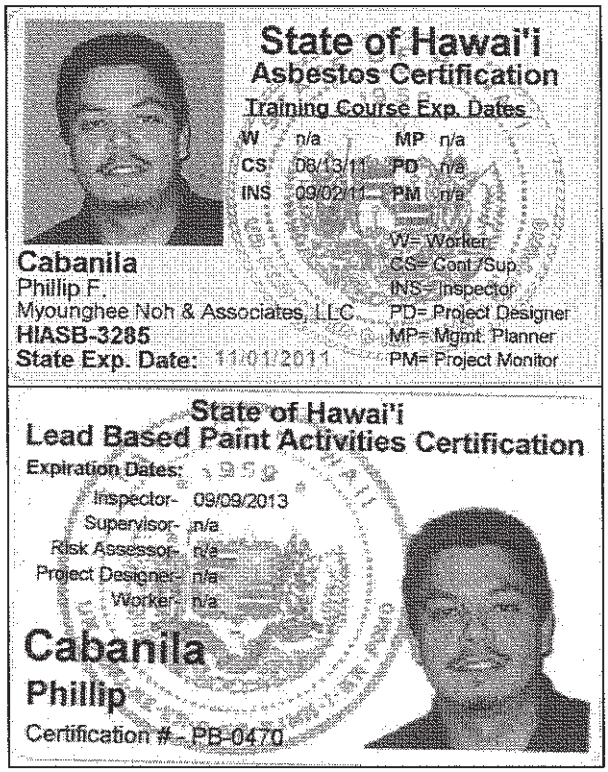
- Arsenic-containing debris should be segregated from other wastes, collected, and containerized. Arsenic-containing wastes should be disposed of in accordance with applicable requirements. Wastes should be fully characterized, including a determination of the waste as hazardous or non-hazardous. A hazardous waste exclusion for wood products may be considered applicable to certain arsenic-contain building materials. Landfill acceptance criteria should be evaluated prior to transportation for disposal.
- Visually inspect the work area to ensure all arsenic-containing debris and dust has been properly removed.
- Conduct clearance in accordance with contract specifications.

9.0 LIMITATIONS

Every reasonable effort was made to identify hazardous materials within the targeted areas during the survey. However, this does not imply a guarantee that all hazardous materials were identified by this assessment because certain building materials and/or surfaces may be hidden by walls, flooring, partitions, or other building components. If suspect materials previously unknown become uncovered, additional survey work may be required prior to demolition or renovation. Estimated quantities of hazardous materials provided in this report are visual estimates only and should not be used for bidding purposes. Contractors are required to verify the location and quantities.

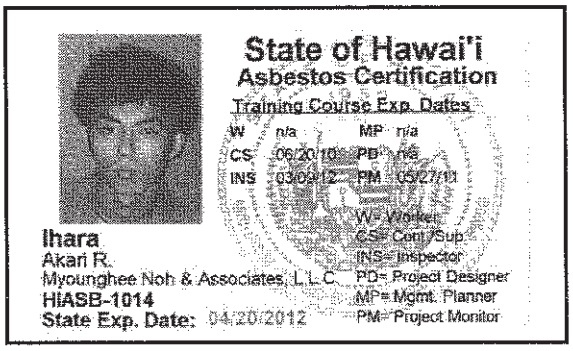
APPENDIX A

INSPECTOR CERTIFICATIONS

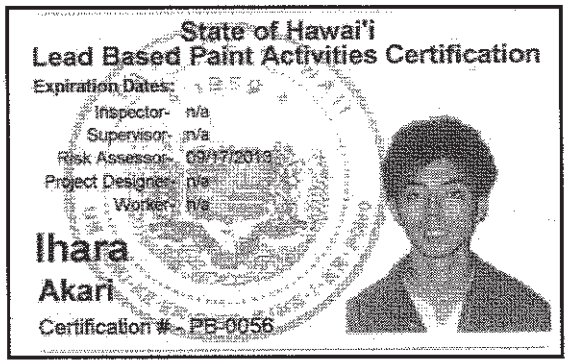


State of Hawai'i
Asbestos Certification
Training Course Exp. Dates
W n/a MP n/a
CS 06/13/11 PD n/a
INS 09/02/11 PM n/a
W= Worker
CS= Cont./Sup.
INS= Inspector
PD= Project Designer
MP= Mgmt. Planner
PM= Project Monitor
Cabanila
Phillip F.
Myounghee Noh & Associates, LLC
HIASB-3285
State Exp. Date: 11/01/2011

State of Hawai'i
Lead Based Paint Activities Certification
Expiration Dates:
Inspector- 09/09/2013
Supervisor- n/a
Risk Assessor- n/a
Project Designer- n/a
Worker- n/a
Cabanila
Phillip
Certification # PB-0470



State of Hawai'i
Asbestos Certification
Training Course Exp. Dates
W n/a MP n/a
CS 06/20/10 PB n/a
INS 03/09/12 PM 05/27/11
W= Worker
CS= Cont./Sup.
INS= Inspector
PD= Project Designer
MP= Mgmt. Planner
PM= Project Monitor
Ihara
Akari R.
Myounghee Noh & Associates, L.L.C.
HIASB-1014
State Exp. Date: 04/20/2012



State of Hawai'i
Lead Based Paint Activities Certification
Expiration Dates:
Inspector- n/a
Supervisor- n/a
Risk Assessor- 09/17/2013
Project Designer- n/a
Worker- n/a
Ihara
Akari
Certification #- PB-0056

APPENDIX B

HOMOGENEOUS MATERIALS IDENTIFIED

AND SAMPLE TYPES COLLECTED

Homogenous Materials Identifed and Sample Types Collected

HM ID	Rooms	Locations	Color	Material	Substrate	Asb	Pb	Ars	Results
1	Exterior	Wall	Off-white	Paint filler	Concrete brick	X			ND
2	**Room 3, Room 4, Room 5, Room 6, Room 7, Room 8, Room 9, Room 10, Room 12, Room 12A, Room 12B, Room 13, Room 14, Room 15, Room17, Room 17A, Room 18, Room 19, Room 20, Room 21, Room 23, Room 24, Room 25, Room 26, Room 26A, Room 27, Room 28, Room 29, Room 30, Room 31A, Room 31B, Room 31C, Room 32, Room 33, Room 34, Room 35, Room 36, Room 37, Room 38, Room 39, Room 39A, Room 40, Room 41, Room 42, Room 43, Room 44, Room 45, Room 46A, Room 46B, Room 46C, Room 47, Room 47A, Room 50, Room 51, Room 52, Room 53, Room 54, Room 55, Room 56, Room 57, Room 58, Room 59, Room 60, Room 61, Room 61A, Room 62, Room 63, Room 63A, Room 64, Room 65, Room 66, Hallway 2, Gym**	**Walls**	**Off-white**	**Paint**	**Concrete brick**		**X**		**LCP <140 - 920 mg/kg**
4	**Exterior**	**Roof underside**	**Off-white**	**Paint**	**Wood**		**X**		**LCP 1,300 - 1,400 mg/kg**
5	Room 8, Room 9, Room 12, Room 12A, Room 12B, Room 13, Room 14, Room 15, Room 17, Room 35, Room 36, Room 37, Room 38, Room 39, Room 39A, Room 39B, Room 40, Room 41, Room 42	Walls, ceiling	Off-White	Drywall	NA	X			ND
6	Exterior	Roof	White	Built-up roofing	NA	X			ND
7	**Room 35, Room 36, Room 37, Room 38, Room 39, Room 40, Room 41, Room 42, Room 43, Room 44, Room 45, Room 46A, Room 46B, Room 46C, Room 47, Room 47A, Hallway 1, Hallway 2**	**Walls**	**White**	**Paint**	**Concrete brick**		**X**		**LCP 350 - 430 mg/kg**
8	Hallway 2	Wall	Off-white	Paint filler	Concrete	X			ND
9	**Hallway 2**	**Wall**	**Off-white**	**Paint**	**Concrete**		**X**		**LCP <100 - 490 mg/kg**
10	**Room 50**	**Wall, ceiling**	**White**	**2' x 2' Acoustic ceiling tile**	**Wood**			**X**	**ARS 940 - 1,500 mg/kg**

Homogenous Materials Identifed and Sample Types Collected

HM ID	Rooms	Locations	Color	Material	Substrate	Asb	Pb	Ars	Results
11	Room 3, Room 4, Room 5, Room 6, Room 7, Room 8, Room 9, Room 10, Room 12, Room 12A, Room 12B, Room 13, Room 14, Room 15, Room17, Room 17A, Room 18, Room 19, Room 20, Room 21, Room 23, Room 24, Room 25, Room 26, Room 26A, Room 27, Room 28, Room 29, Room 30, Room 31A, Room 31B, Room 31C, Room 32, Room 33, Room 34, Room 35, Room 36, Room 37, Room 38, Room 39, Room 39A, Room 40, Room 41, Room 42, Room 43, Room 44, Room 45, Room 46A, Room 46B, Room 46C, Room 47, Room 47A, Room 50, Room 51, Room 52, Room 53, Room 54, Room 55, Room 56, Room 57, Room 58, Room 59, Room 60, Room 61, Room 61A, Room 62, Room 63, Room 63A, Room 64, Room 65, Room 66, Hallway 2, Gym	Walls	Off-white	Paint filler	Concrete brick	X			ND
12	Room 35, Room 36, Room 37, Room 38, Room 39, Room 40, Room 41, Room 42, Room 43, Room 44, Room 45, Room 46A, Room 46B, Room 46C, Room 47, Room 47A, Hallway 1	Walls	White	Paint filler	Concrete brick	X			ND
13	Room 50, Room 51, Room 52, Room 53, Room 54, Room 55, Room 56, Room 57, Room 58, Room 59, Room 60, Room 61, Room 61A, Room 62, Room 63, Room 63A, Room 64, Room 65, Room 66, Hallway 1, Hallway 2	Ceiling, beams, purlins	White	Paint	Wood		X		<100 - <150 mg/kg
14	**Room 46, Hallway 1, Hallway 2**	**Walls**	**White**	**Paint**	**Concrete**		**X**		**LCP <100 - 360 mg/kg**
15	Room 46A, Hallway 1, Hallway 2	Walls	White	Paint filler	Concrete	X			ND
16	**Room 8, Room 9, Room 12, Room 12A, Room 12B, Room 13, Room 14, Room 15, Room 17, Room 35, Room 36, Room 37, Room 38, Room 39, Room 39A, Room 39B, Room 40, Room 41, Room 42**	**Walls, ceilings**	**Off-white**	**Paint**	**Drywall**		**X**		**LCP 520 - 610 mg/kg**
17	Exterior	Wall	Off-white	Paint	Concrete brick		X		<100 mg/kg

Bold values indicate results above the detection limit.

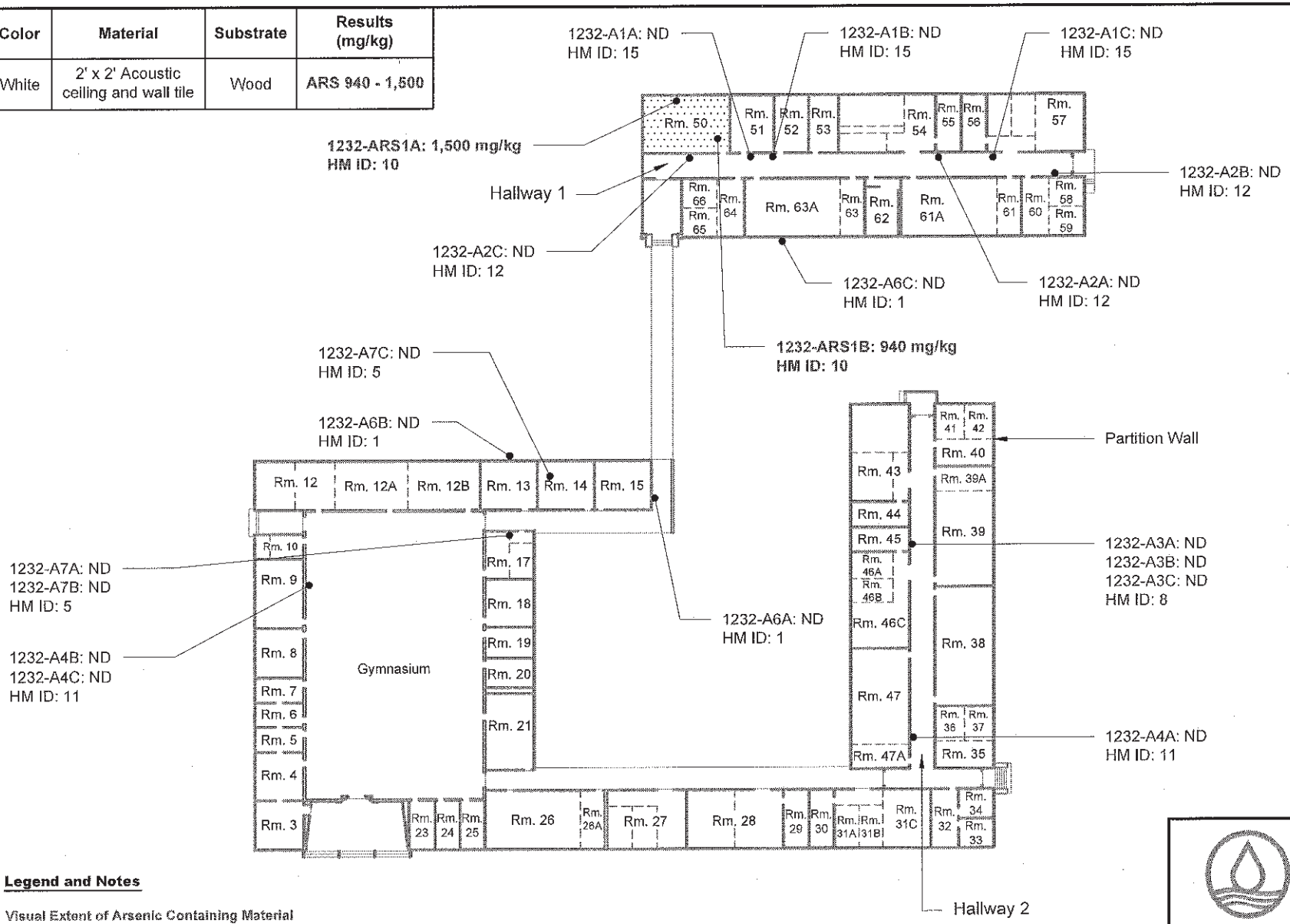
Abbreviations and Acronyms

Ars - Arsenic
Asb - Asbestos
HM ID - Homogeneous Material Identifier
LCP - Lead-Containing Paint
Pb - Lead
Sq. ft. - Square Feet

APPENDIX C

SAMPLE AND HAZARDOUS MATERIAL LOCATION MAPS

HM ID	Color	Material	Substrate	Results (mg/kg)
10	White	2' x 2' Acoustic ceiling and wall tile	Wood	**ARS 940 - 1,500**



Legend and Notes

Visual Extent of Arsenic Containing Material

Bold values indicate results above the detection limit.

ARS- Arsenic

HM ID- Homogeneous Material Identifier

ND- Not Detected

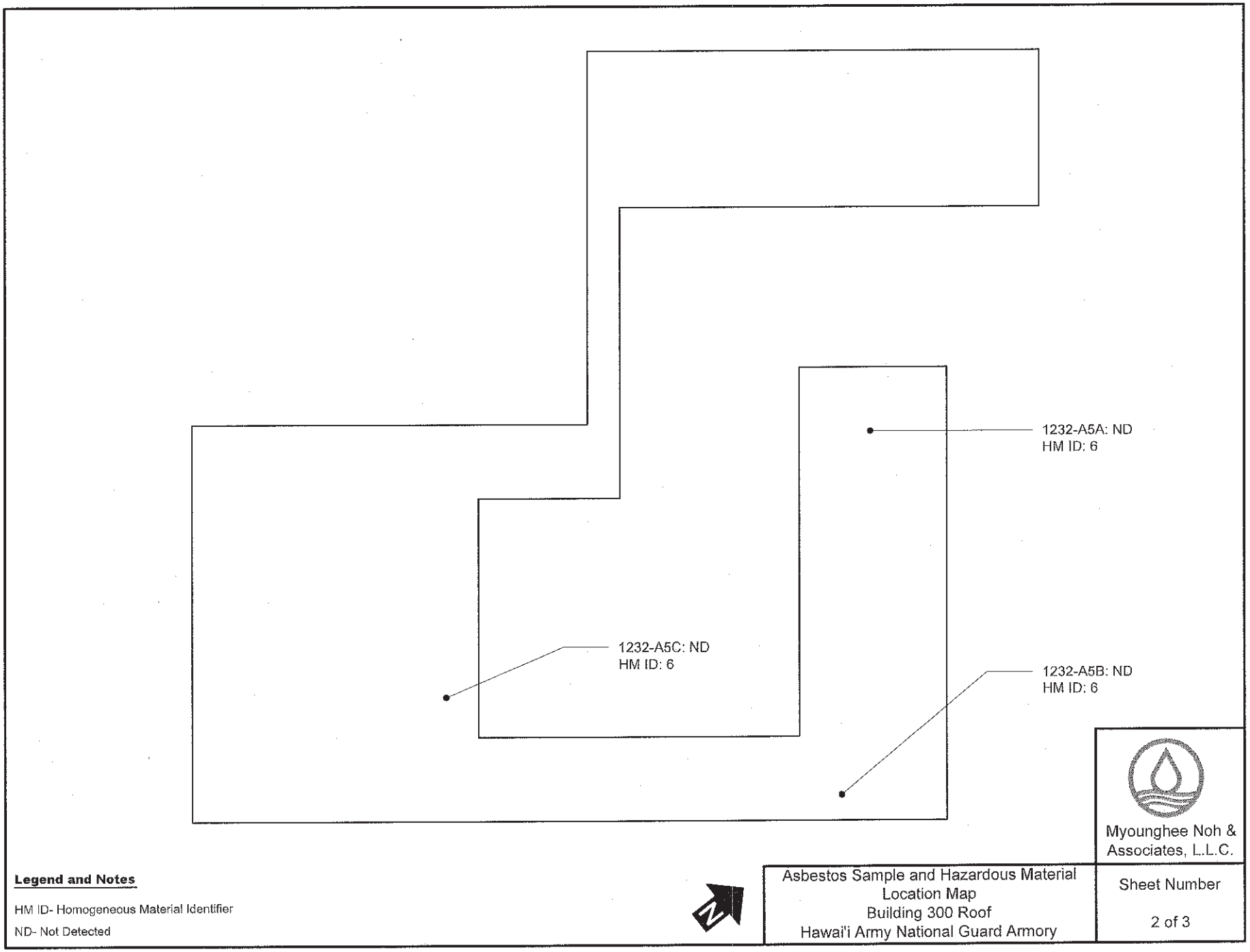
mg/kg- milligrams per kilogram (equivalent to ppm- parts per million)

Myounghee Noh & Associates, L.L.C.

Asbestos and Arsenic Sample and Hazardous Material Location Map
Building 300
Hawai'i Army National Guard Armory

Sheet Number

1 of 3



Legend and Notes

HM ID- Homogeneous Material Identifier

ND- Not Detected

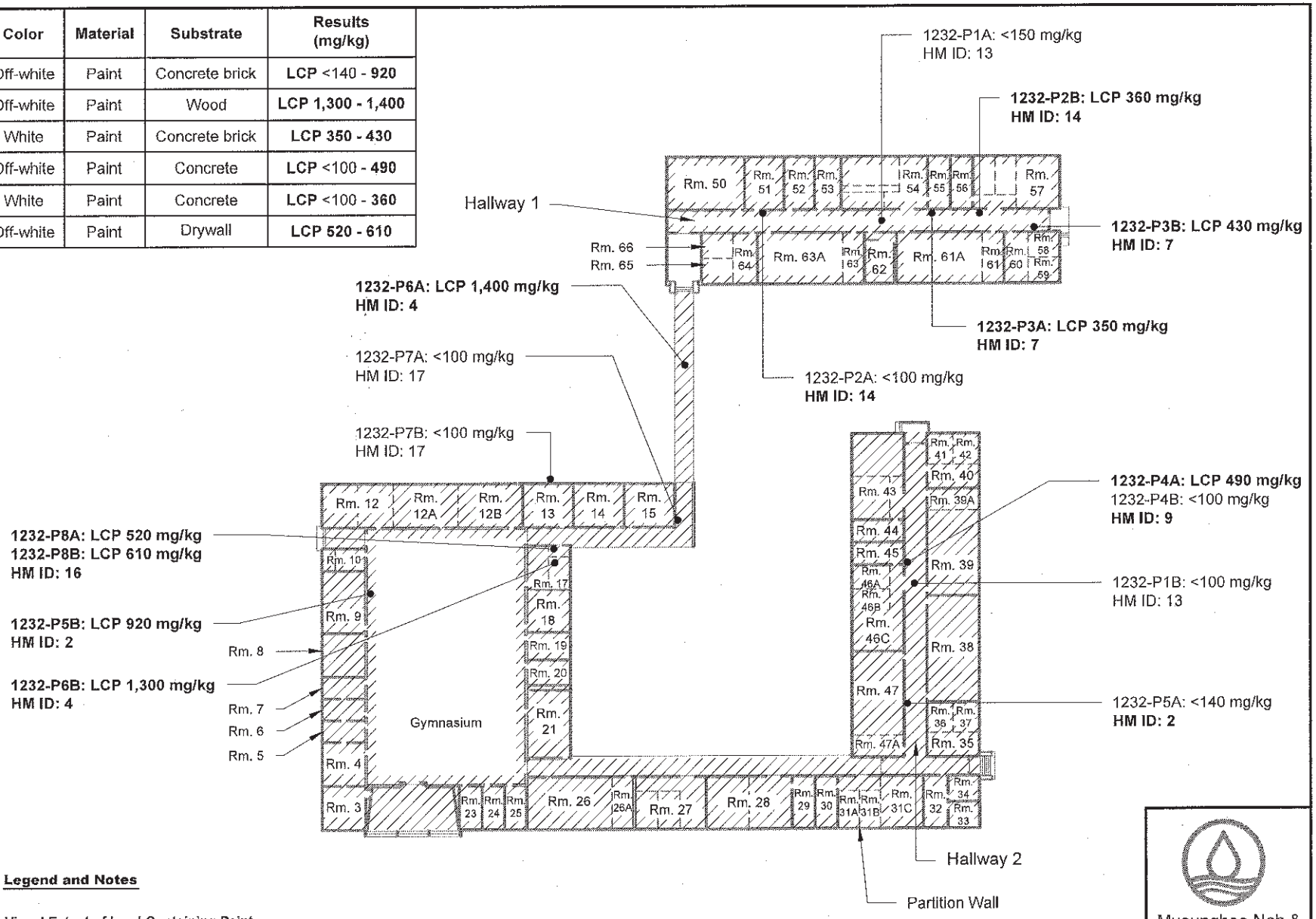
Asbestos Sample and Hazardous Material Location Map
Building 300 Roof
Hawai'i Army National Guard Armory

Myounghee Noh & Associates, L.L.C.

Sheet Number

2 of 3

HM ID	Color	Material	Substrate	Results (mg/kg)
2	Off-white	Paint	Concrete brick	**LCP <140 - 920**
4	Off-white	Paint	Wood	**LCP 1,300 - 1,400**
7	White	Paint	Concrete brick	**LCP 350 - 430**
9	Off-white	Paint	Concrete	**LCP <100 - 490**
14	White	Paint	Concrete	**LCP <100 - 360**
16	Off-white	Paint	Drywall	**LCP 520 - 610**



Legend and Notes

Visual Extent of Lead-Containing Paint

Bold values indicate results above the detection limit.

HM ID- Homogeneous Material Identifier

LCP- Lead-Containing Paint < 5,000 mg/kg

mg/kg- milligrams per kilogram (equivalent to ppm- parts per million)

Myounghee Noh & Associates, L.L.C.

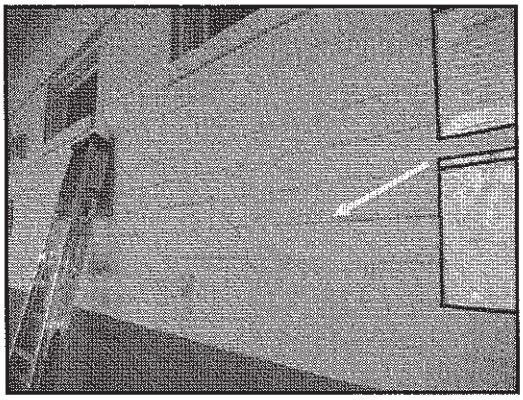
Lead Paint Sample and Hazardous Material Location Map
Building 300
Hawai'i Army National Guard Armory

Sheet Number

3 of 3

APPENDIX D

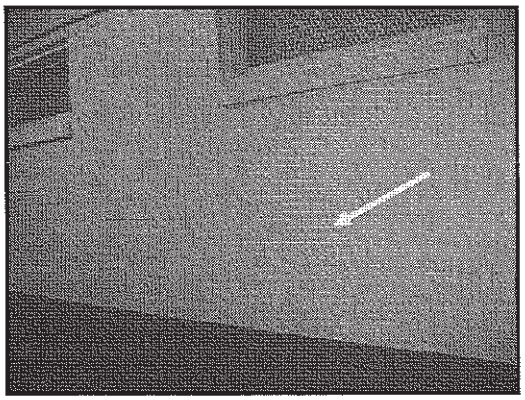
PHOTOGRAPHS



HM ID 1

Exterior
Off-white paint filler on concrete brick wall.

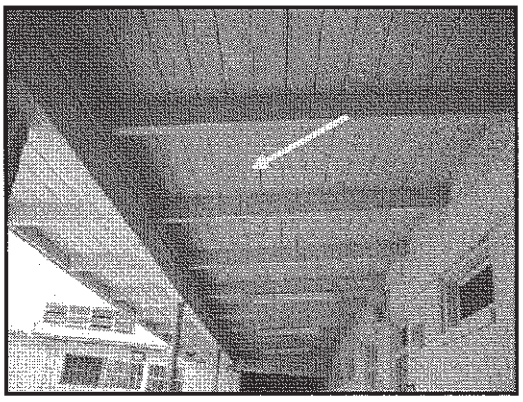
Non-ACM
1232-A6A: ND
1232-A6B: ND
1232-A6C: ND



HM ID 2

Hallway 2
Off-white paint on concrete brick wall.

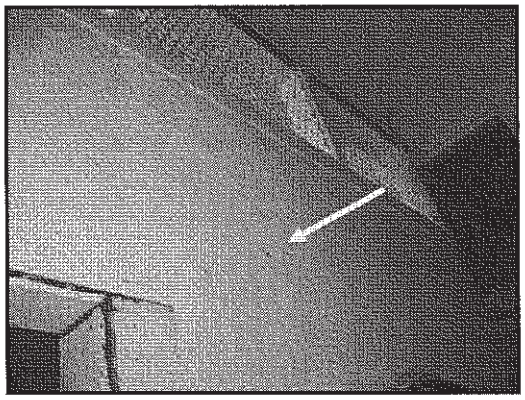
LCP
1232-P5A: <140 mg/kg
1232-P5B: 920 mg/kg



HM ID 4

Exterior
Off-white paint on wood roof underside.

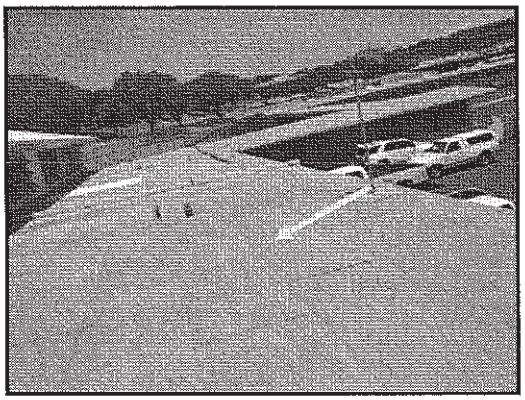
LCP
1232-P6A: 1,400 mg/kg
1232-P6B: 1,300 mg/kg



HM ID 5

Room 17
Off-white drywall wall.

Non-ACM
1232-A7A: ND
1232-A7B: ND
1232-A7C: ND



HM ID 6

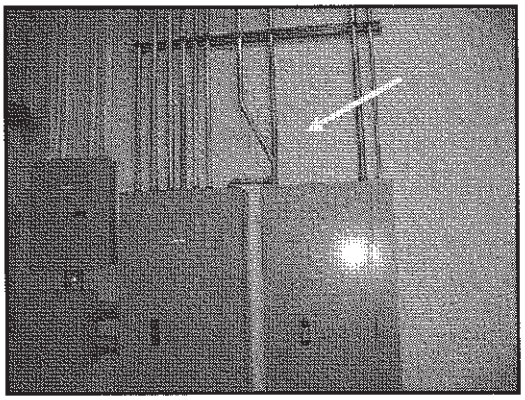
Roof
White built-up roofing on roof.

Non-ACM
1232-A5A: ND
1232-A5B: ND
1232-A5C: ND

HM ID 7

Hallway 1
White paint on concrete brick wall.

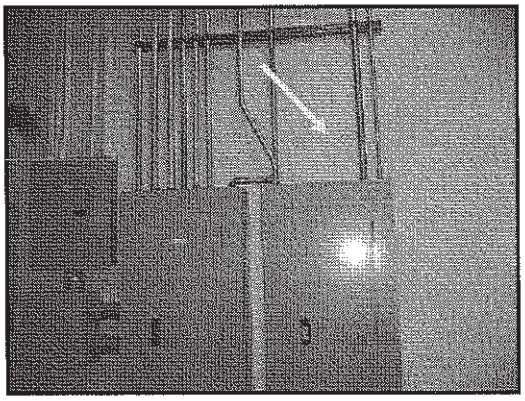
LCP
1232-P3A: 350 mg/kg
1232-P3B: 430 mg/kg



HM ID 8

Hallway 2
Off-white paint filler on concrete wall.

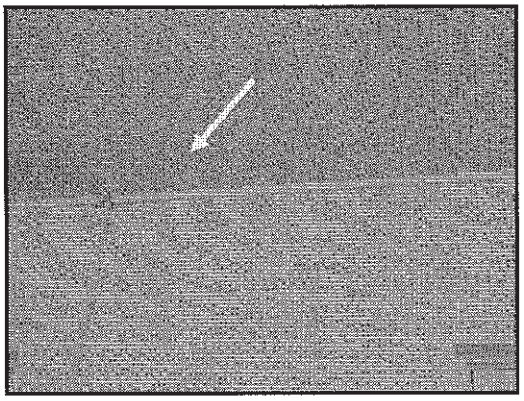
Non-ACM
1232-A3A: ND
1232-A3B: ND
1232-A3C: ND



HM ID 9

Hallway 2
Off-white paint on concrete wall.

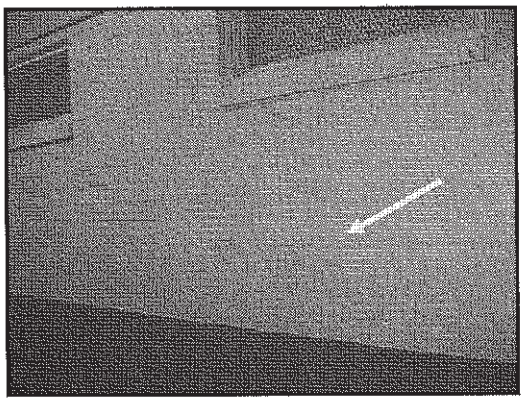
LCP
1232-P4A: 490 mg/kg
1232-P4B: <100 mg/kg



HM ID 10

Room 50
White 2' x 2' acoustic ceiling tile on wood.

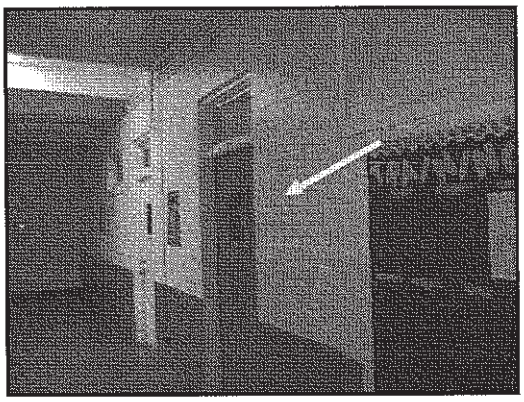
Arsenic-Containing
1232-ARS1A: 1,500 mg/kg
1232-ARS1B: 940 mg/kg



HM ID 11

Hallway 2
Off-white paint filler on concrete brick wall.

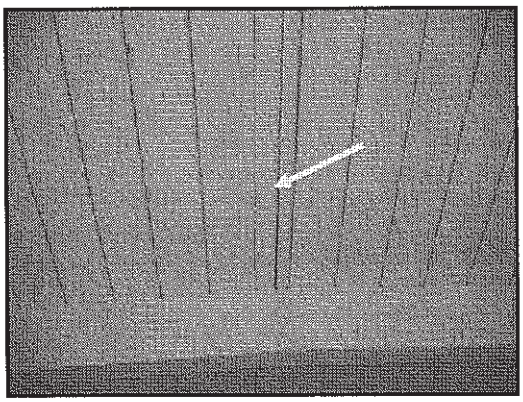
Non-ACM
1232-A4A: ND
1232-A4B: ND
1232-A4C: ND



HM ID 12

Hallway 1
White paint filler on concrete brick on wall.

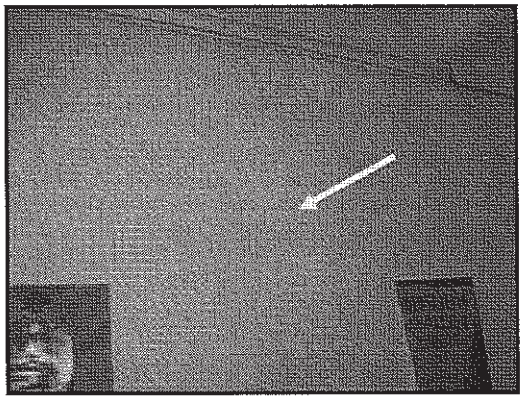
Non-ACM
1232-A2A: ND
1232-A2B: ND
1232-A2C: ND



HM ID 13

Hallway 2
White paint on wood ceiling.

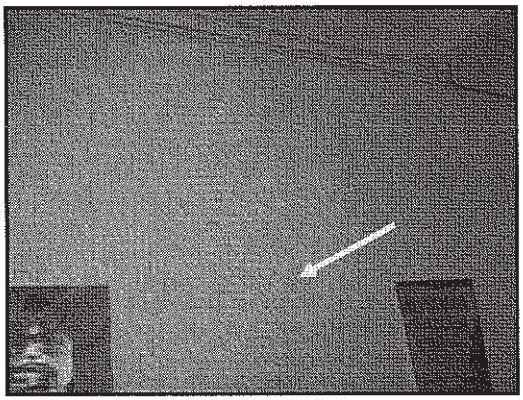
Non-LCP
1232-P1A: <150 mg/kg
1232-P1B: <100 mg/kg



HM ID 14

Hallway 1
White paint on concrete wall.

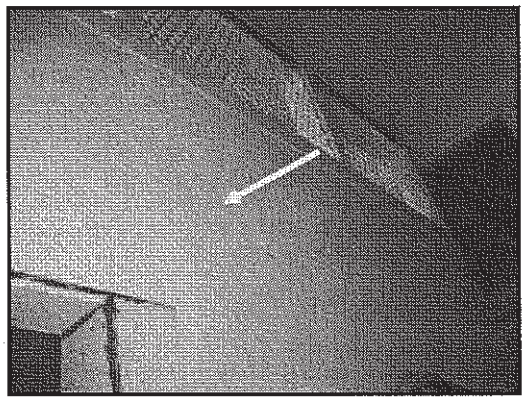
LCP
1232-P2A: <100 mg/kg
1232-P2B: 360 mg/kg



HM ID 15

Hallway 1
White paint filler on concrete wall.

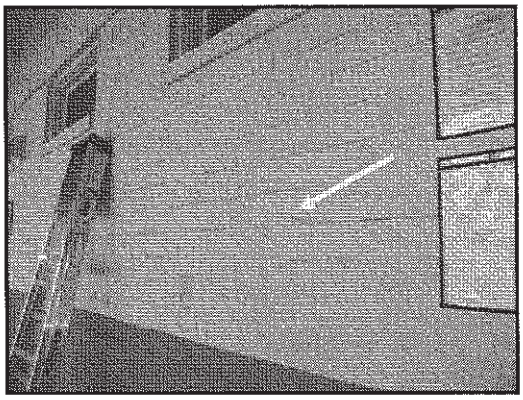
Non-ACM
1232-A1A: ND
1232-A1B: ND
1232-A1C: ND



HM ID 16

Room 17
Off-white paint on drywall wall.

LCP
1232-P8A: 520 mg/kg
1232-P8B: 610 mg/kg



HM ID 17

Exterior
Off-white paint on concrete brick wall.

Non-LCP
1232-P7A: <100 mg/kg
1232-P7B: <100 mg/kg

APPENDIX E

LABORATORY ANALYTICAL REPORTS

LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone: (323) 254-9960 Fax: (323) 254-9982 Email: pasadenalab@latesting.com

Attn: **Akari Ihara**
Myounghee Noh & Associates, LLC
99-1046 Iwaena Street
Suite 210A
Aiea, HI 96701

Fax: Phone: (808) 484-9214

Project: **21232 InSynergy Bldg 300 PV Upgrade Hazmat Survey**

Customer ID: 32MYOU50
Customer PO:
Received: 08/11/11 10:15 AM
LA Testing Order: 321113289

LA Testing Proj:

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B*/7000B)

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
1232-P 5 A	*0001*	8/9/2011	8/12/2011	<140 ppm
Site: 2				
1232-P 5 B	*0002*	8/9/2011	8/12/2011	920 ppm
Site: 2				
1232-P 6 A	*0003*	8/9/2011	8/12/2011	1400 ppm
Site: 4				
1232-P 6 B	*0004*	8/9/2011	8/12/2011	1300 ppm
Site: 4				
1232-P 4 A	*0005*	8/9/2011	8/12/2011	490 ppm
Site: 9				
1232-P 4 B	*0006*	8/9/2011	8/12/2011	<100 ppm
Site: 9				
1232-P 3 A	*0007*	8/9/2011	8/12/2011	350 ppm
Site: 7				
1232-P 3 B	*0008*	8/9/2011	8/12/2011	430 ppm
Site: 7				
1232-P 1 A	*0009*	8/9/2011	8/12/2011	<150 ppm
Site: 13				
1232-P 1 B	*0010*	8/9/2011	8/12/2011	<100 ppm
Site: 13				
1232-P 2 A	*0011*	8/9/2011	8/12/2011	<100 ppm
Site: 14				
1232-P 2 B	*0012*	8/9/2011	8/12/2011	360 ppm
Site: 14				
1232-P 8 A	*0013*	8/9/2011	8/12/2011	520 ppm
Site: 16				

Initial report from 08/12/2011 13:08:18

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

Reporting limit is 0.01 % wt. The QC data associated with these sample results included in this report meet the method quality control requirements, unless specifically indicated otherwise. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities.

* slight modifications to methods applied Samples received in good condition unless otherwise noted. Quality Control Data associated with this sample set is within acceptable limits, unless otherwise noted

Samples analyzed by LA Testing South Pasadena, CA CA ELAP 2283, AIHA-LAP, LLC ELLAP 102814

LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone: (323) 254-9960 Fax: (323) 254-9982 Email: pasadenalab@latesting.com

Attn: **Akari Ihara**
Myounghee Noh & Associates, LLC
99-1046 Iwaena Street
Suite 210A
Aiea, HI 96701

Fax: Phone: (808) 484-9214

Project: **21232 InSynergy Bldg 300 PV Upgrade Hazmat Survey**

Customer ID: 32MYOU50
Customer PO:
Received: 08/11/11 10:15 AM
LA Testing Order: 321113289

LA Testing Proj:

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B*/7000B)

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
1232-P 8 B	*0014*	8/9/2011	8/12/2011	610 ppm
Site: 16				
1232-P 7 A	*0015*	8/9/2011	8/12/2011	<100 ppm
Site: 17				
1232-P 7 B	*0016*	8/9/2011	8/12/2011	<100 ppm
Site: 17				

Initial report from 08/12/2011 13:08:18

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

Reporting limit is 0.01 % wt. The QC data associated with these sample results included in this report meet the method quality control requirements, unless specifically indicated otherwise. Unless noted, results in this report are not blank corrected . This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities.

* slight modifications to methods applied Samples received in good condition unless otherwise noted. Quality Control Data associated with this sample set is within acceptable limits, unless otherwise noted

Samples analyzed by LA Testing South Pasadena, CA CA ELAP 2283, AIHA-LAP, LLC ELLAP 102814

Asbestos Testing Chain of Custody

LA Testing Order Number *(Lab Use Only)*: 321113289

South Pasadena, CA - Los Angeles County
520 Mission Street
South Pasadena, CA 91030
PHONE: 1-800 303 0047
FAX: 323 254 9982

Company: Myounghee Noh & Associates L.L.C.	LA Testing-Bill to: ☑ Same ☐ Different If Bill to is Different note instructions in Comments** *Third Party Billing requires written authorization from third party*
Street: 99-1046 Iwaena St	
City/State/Zip: Aiea, HI 96701	
Report To (Name): Akari Ihara	Fax: 8084844660
Telephone: 8084849214	Email Address: akari@noh-associates.com
Project Name/Number: 21232 InSynergy Bldg - 300 PV upgrade Hazmat Survey	
Please Provide Results:	Purchase Order: / State Samples Taken: HI

Turnaround Time (TAT) Options* - Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☒ 3 Day ☐ 4 Day ☐ 1 Week ☐ 2 Week

**For RUSH TAT's Please Call Ahead to Confirm Lab Hours and Availability*

Materials Science and IAQ TATs are in Business Days rather than Hours (i.e. 24 Hour = End of Next Business Day)

Asbestos

PCM - Air
☐ NIOSH 7400
☐ w/ 8hr. TWA

TEM- Air ☐ 4-4.5hr TAT (AHERA ONLY)
☐ AHERA 40 CFR, Part 763
☐ NIOSH 7402
☐ EPA Level II
☐ ISO 10312

TEM - Water
Fibers ≥10µm ☐ Waste ☐ Drinking
All Fiber Sizes ☐ Waste ☐ Drinking

PLM - Bulk
☐ PLM EPA 600/R-93/116
☐ PLM EPA NOB (<1%)
☐ NYS 198.1 (friable-NY)
☐ NYS 198.6 (non-friable-NY)
Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
Point Count w/ Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

TEM - Dust
☐ Microvac – ASTM D 5755
☐ Wipe-ASTM D6480

TEM - Bulk
☐ TEM EPA NOB
☐ NYS NOB 198.4 (non-friable-NY)
☐ Chatfield SOP

Soil/Rock/Vermiculite
☐ PLM CARB 435 – A (0.25% sensitivity)
☐ PLM CARB 435 – B (0.1% sensitivity)
☐ TEM CARB 435 – B (0.1% sensitivity)
☐ EPA Reg. 1 Screening Protocol (Qualitative)

Other:

Lead (Pb)

Flame Atomic Absorption
☒ Chips SW846-7000B or AOAC 974.02
☐ Soil SW846-7000B/7420
☐ Air NIOSH 7082
☐ Wastewater SM3111B or SW846-7000B/7420
☐ ASTM Wipe SW846-7000B/7420
☐ non ASTM Wipe SW846-7000B/7420
☐ TCLP SW846-1311/7420/SM 3111B

ICP
☐ Air NIOSH 7300 Modified
☐ non ASTM Wipe SW846-6010B or C
☐ ASTM Wipe SW846-6010B or C
☐ Soil SW846-6010 B or C
☐ Waste Water SW846-6010B or C
☐ TCLP SW846-6010B or C

Graphite Furnace Atomic Absorption
☐ Soil SW846-7421 ☐ Wastewater EPA 200.9
☐ Air NIOSH 7105 ☐ Drinking Water EPA 200.9

Other: ☐

Microbiology

Wipe and Bulk Samples
☐ Mold & Fungi – Direct Examination
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi Culture (Genus & Species)
☐ Bacterial Count & ID (Up to Three Types)
☐ Bacterial Count & ID (Up to Five Types)
☐ MRSA
☐ *Pseudomonas aeruginosa*

Water Samples
☐ Total Coliform & E.coli (P/A)
☐ Fecal Coliform (SM 9222D)
☐ Sewage Screen
☐ Heterotrophic Plate Count (SM 9215)

Air Samples
☐ Mold & Fungi (Spore Trap)
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi (Genus & Species)
☐ Bacterial Culture & ID (Up to Three Types)
☐ Bacterial Culture & ID (Up to Five Types)
☐ Endotoxin Testing

Real Time Q-PCR (See Analytical Guide for Code)
Code:

Legionella
☐ Level 1 ☐ Level 2 ☐ Level 3 ☐ Level 4

Other: ☐

Materials Science

☐ Common Particle ID (large particles)
☐ Fine Particle ID (environmental dust)
☐ Basic Material ID (solids)
☐ Advanced Material ID
☐ Physical Testing (Tensile, Compression)
☐ Combustion by-products (soot, char, etc.)
☐ X-Ray Fluorescence (elem. analysis)
☐ X-Ray Diffraction (Crystalline Part.)
☐ MMVF's (Fibrous glass, RCF's)
☐ Particle Size (sieve/microscopy/laser)
☐ Combustible Dust
☐ Petrographic Examination
Other: ☐

IAQ

Nuisance Dust NIOSH ☐ 0500 ☐ 0600
Airborne Dust ☐ PM10 ☐ TSP
Silica Analysis: ☐ All Species
Silica Analysis – Single Species
☐ Alpha Quartz ☐ Cristobalite ☐ Tridymite
☐ HVAC Efficiency
☐ Carbon Black
☐ Airborne Oil Mist
Other: ☐

Client Sample #'s	1232 - PIA ~ 1232-P8B	Total # of Samples:	16
Relinquished (Client):	Date: 8/9/11	Time:	1500
Received (Lab):	Date: 8/10/11	Time:	1:45

Comments/Special Instructions:

Asbestos Testing Chain of Custody

LA Testing Order Number *(Lab Use Only)*:

South Pasadena, CA - Los Angeles County
520 Mission Street
South Pasadena, CA 91030
PHONE: 1-800-303-0047
FAX: 323-254-9982

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
1232-P1A			
↓ P1B			
1232-P8A			
↓ P8B			

Comments/Special Instructions:

Hazardous Homogeneous Materials and Sampling Survey Field Form: Lead Paint

Project # & Name: 21232 InSynergy PV Bldg. 300 Army National Guard Targeted HazMat Survey

Location: Diamond Head Army National Guard

Inspector Initials: AM / PE

Date & Time: 8/9/11

HM ID	Building	Flr	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
2	300	1	~~Ext~~, Rm 16, 17, Hallway 1, Hallway 1, Rm. 3-W7a, 51-66	Wall	OW	P	CC block	G F P		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-P 5 A	Hallway 2	wall	4985	Sameas HM11
1232-P 5 B	Gym	↓		

HM ID	Building	Flr	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
4	300	1	exterior, Rm. 17, exterior Hallway 1, Area 27	rock underside.	OW	P	wood	G F P		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-P 6 A	Hallway ext	rock underside	4992	
1232-P 6 B	& Rm. 17	↓		

HM ID	Building	Flr	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
7	300	1	~~Rm 16~~, Hallway 2	wall	OW	P	CC	G F P		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-P 4 A	Hallway 2	Wall	4984	Same as HM8
1232-P 4 B	↓	↓		

321132891

321132891

Hazardous Homogeneous Materials and Sampling Survey Field Form: Lead Paint

Project # & Name: 21232 InSynergy PV Bldg. 300 Army National Guard Targeted HazMat Survey

Location: Diamond Head Army National Guard

Inspector Initials: AM / RC

Date & Time: 8/9/11

HM ID	Building	Flr	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or	Hatch Color
7	300	1	Rm 35-47, Hallway 1	Wall	W	P	CC brick	G F P		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-P 3 A	Hallway 1	wall	4983	Green on tan-beige same as HM12
1232-P 3 B	↓	↓		

HM ID	Building	Flr	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
13	300	1	hallway #1, 58-66, Hallway 2	Ceiling, beams, purlin	W	P	W	G F P		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-P 1 A	Hallway 1	Ceiling	4981	
1232-P 1 B	Hallway 2	↓		

HM ID	Building	Flr	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
X					W	P	CC brick	G F P		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-P A				
1232-P B				

Hazardous Homogeneous Materials and Sampling Survey Field Form: Lead Paint

Project # & Name: 21232 InSynergy PV Bldg. 300 Army National Guard Targeted HazMat Survey

Location: Diamond Head Army National Guard

Inspector Initials: AL/PC

Date & Time: 8/12/11

HM ID	Building	Flr	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or	Hatch Color
14	300	1	Hallway 1, Hallway 2, Rm. 16	wall	W	P	CC	G F P		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-D 2 A	Hallway 1	wall	4982	Same as HM 15
1232-D 2 B	↓	↓		

HM ID	Building	Flr	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
16	300	1	Rm 17, 35, 8, 9	wall, Ceiling	OW	P	DW	G F P		XX

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-D 8 A	~~17~~ Rm. 17	wall	4993	Same as HM 5
1232-D 8 B	Rm. 16	Ceiling		

HM ID	Building	Flr	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
17	300	1	ext	wall	OW	P	CC brick	G F P		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-D 7 A	ext	wall	4994	Same as HM 1
1232-D 7 B	↓	↓		

LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone: (323) 254-9960 Fax: (323) 254-9982 Email: pasadenalab@latesting.com

Attn: **Akari Ihara**
Myounghee Noh & Associates, LLC
99-1046 Iwaena Street
Suite 210A
Aiea, HI 96701

Fax: Phone: (808) 484-9214
Project: **21232 InSynergy Bldg. 300 PV Upgrade Hazmat Survey**

Customer ID: 32MYOU50
Customer PO:
Received: 08/11/11 10:15 AM
LA Testing Order: 321113278

LA Testing Proj:
Analysis Date: 8/14/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1232-A3A *321113278-0001*	8	Gray/Tan Non-Fibrous Heterogeneous	2% Cellulose	98% Non-fibrous (other)	**None Detected**
1232-A3B *321113278-0002*	8	Tan/Green Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (other)	**None Detected**
1232-A3C *321113278-0003*	8	Gray/Tan Non-Fibrous Heterogeneous	5% Cellulose	95% Non-fibrous (other)	**None Detected**
1232-A4A *321113278-0004*	11	Tan/White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1232-A4B *321113278-0005*	11	Brown/Tan Non-Fibrous Homogeneous	4% Cellulose	96% Non-fibrous (other)	**None Detected**
1232-A4C *321113278-0006*	11	Brown/Tan/Green Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**

Initial report from 08/14/2011 15:27:29

Analyst(s)

John Lopez (21)

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. Samples reported as <1% or none detected may require additional testing by TEM to confirm asbestos quantities. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of LA Testing. LA Testing's liability is limited to the cost of analysis. LA Testingbears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. The test results contained within this report meet the requirements of NELAC unless otherwise noted. Samples received in good condition unless otherwise noted. Estimated accuracy, precision and uncertainty data available upon request.
Samples analyzed by LA Testing South Pasadena, CA NVLAP Lab Code 200232-0, CA ELAP 2283

LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone: (323) 254-9960 Fax: (323) 254-9982 Email: pasadenalab@latesting.com

Attn: **Akari Ihara**
Myounghee Noh & Associates, LLC
99-1046 Iwaena Street
Suite 210A
Aiea, HI 96701

Fax: Phone: (808) 484-9214

Project: **21232 InSynergy Bldg. 300 PV Upgrade Hazmat Survey**

Customer ID: 32MYOU50
Customer PO:
Received: 08/11/11 10:15 AM
LA Testing Order: 321113278

LA Testing Proj:
Analysis Date: 8/14/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1232-A2A *321113278-0007*	12	White/Green Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1232-A2B *321113278-0008*	12	White/Green Non-Fibrous Homogeneous	4% Cellulose	96% Non-fibrous (other)	**None Detected**
1232-A2C *321113278-0009*	12	Brown/White/Gree n Non-Fibrous Heterogeneous	3% Cellulose	97% Non-fibrous (other)	**None Detected**
1232-A6A *321113278-0010*	1	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (other)	**None Detected**
1232-A6B *321113278-0011*	1	Tan/Green Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1232-A6C *321113278-0012*	1	Brown/Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**

Initial report from 08/14/2011 15:27:29

Analyst(s)

John Lopez (21)

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone: (323) 254-9960 Fax: (323) 254-9982 Email: pasadenalab@latesting.com

Attn: **Akari Ihara**
Myounghee Noh & Associates, LLC
99-1046 Iwaena Street
Suite 210A
Aiea, HI 96701

Fax: Phone: (808) 484-9214

Project: **21232 InSynergy Bldg. 300 PV Upgrade Hazmat Survey**

Customer ID: 32MYOU50
Customer PO:
Received: 08/11/11 10:15 AM
LA Testing Order: 321113278

LA Testing Proj:
Analysis Date: 8/14/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos			Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**% Non-Fibrous**	**% Type**
1232-A5A *321113278-0013*	6	Black Fibrous Heterogeneous	8%	Glass	92% Non-fibrous (other)	**None Detected**
1232-A5B *321113278-0014*	6	White/Black Fibrous Heterogeneous	5%	Glass	95% Non-fibrous (other)	**None Detected**
1232-A5C *321113278-0015*	6	Gray/Black Fibrous Heterogeneous	10%	Glass	90% Non-fibrous (other)	**None Detected**
1232-A1A *321113278-0016*	15	White/Green Non-Fibrous Homogeneous	4%	Cellulose	96% Non-fibrous (other)	**None Detected**
1232-A1B *321113278-0017*	15	Brown/White/Green Non-Fibrous Heterogeneous	5%	Cellulose	95% Non-fibrous (other)	**None Detected**
1232-A1C *321113278-0018*	15	Brown/White/Green Non-Fibrous Heterogeneous	3%	Cellulose	97% Non-fibrous (other)	**None Detected**

Initial report from 08/14/2011 15:27:29

Analyst(s)

John Lopez (21)

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone: (323) 254-9960 Fax: (323) 254-9982 Email: pasadenalab@latesting.com

Attn: **Akari Ihara**
Myounghee Noh & Associates, LLC
99-1046 Iwaena Street
Suite 210A
Aiea, HI 96701

Fax: Phone: (808) 484-9214

Project: **21232 InSynergy Bldg. 300 PV Upgrade Hazmat Survey**

Customer ID: 32MYOU50
Customer PO:
Received: 08/11/11 10:15 AM
LA Testing Order: 321113278

LA Testing Proj:
Analysis Date: 8/14/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos			Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**% Non-Fibrous**	**% Type**
1232-A7A *321113278-0019*	5	White Fibrous Heterogeneous	5% 3%	Glass Cellulose	92% Non-fibrous (other)	**None Detected**
1232-A7B *321113278-0020*	5	White Fibrous Heterogeneous	7% 3%	Glass Cellulose	90% Non-fibrous (other)	**None Detected**
1232-A7C *321113278-0021*	5	Brown/White Fibrous Heterogeneous	4%	Cellulose	96% Non-fibrous (other)	**None Detected**

Initial report from 08/14/2011 15:27:29

Analyst(s)

John Lopez (21)

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. Samples reported as <1% or none detected may require additional testing by TEM to confirm asbestos quantities. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of LA Testing. LA Testing's liability is limited to the cost of analysis. LA Testingbears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. The test results contained within this report meet the requirements of NELAC unless otherwise noted. Samples received in good condition unless otherwise noted. Estimated accuracy, precision and uncertainty data available upon request.

Samples analyzed by LA Testing South Pasadena, CA NVLAP Lab Code 200232-0, CA ELAP 2283

THIS IS THE LAST PAGE OF THE REPORT.

Asbestos Testing Chain of Custody

LA Testing Order Number *(Lab Use Only)*:

321113278

South Pasadena, CA - Los Angeles County
520 Mission Street
South Pasadena, CA 91030
PHONE: 1-800-303-0047
FAX: 323-254-9982

Company: Myounghee Noh & Associates L.L.C.	LA Testing-Bill to: ☑ Same ☐ Different If Bill to is Different note instructions in Comments** *Third Party Billing requires written authorization from third party*
Street: 99-1046 Iwaena St.	
City/State/Zip: Aiea, HI 96701	
Report To (Name): Akari Ihara	Fax: 8084844660
Telephone: 8084849214	Email Address: akari@noh-associates.com
Project Name/Number: 21232 InSynergy Bldg. 300 PV upgrade HazMat Survey	
Please Provide Results:	Purchase Order: / State Samples Taken: HI

Turnaround Time (TAT) Options* - Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☒ 3 Day ☐ 4 Day ☐ 1 Week ☐ 2 Week

**For RUSH TAT's Please Call Ahead to Confirm Lab Hours and Availability*

Materials Science and IAQ TATs are in Business Days rather than Hours (i.e. 24 Hour = End of Next Business Day)

Asbestos

PCM - Air
☐ NIOSH 7400
☐ w/ 8hr. TWA

TEM- Air ☐ 4-4.5hr TAT (AHERA ONLY)
☐ AHERA 40 CFR, Part 763
☐ NIOSH 7402
☐ EPA Level II
☐ ISO 10312

TEM - Water
Fibers ≥10µm ☐ Waste ☐ Drinking
All Fiber Sizes ☐ Waste ☐ Drinking

PLM - Bulk
☒ PLM EPA 600/R-93/116
☐ PLM EPA NOB (<1%)
☐ NYS 198.1 (friable-NY)
☐ NYS 198.6 (non-friable-NY)
Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
Point Count w/ Gravimetric
☐ 400 (<0.25%) ☐ 1000 (<0.1%)

TEM - Dust
☐ Microvac – ASTM D 5755
☐ Wipe-ASTM D6480

TEM - Bulk
☐ TEM EPA NOB
☐ NYS NOB 198.4 (non-friable-NY)
☐ Chatfield SOP

Soil/Rock/Vermiculite
☐ PLM CARB 435 – A (0.25% sensitivity)
☐ PLM CARB 435 – B (0.1% sensitivity)
☐ TEM CARB 435 – B (0.1% sensitivity)
☐ EPA Reg. 1 Screening Protocol (Qualitative)

Other:

Lead (Pb)

Flame Atomic Absorption
☐ Chips SW846-7000B or AOAC 974.02
☐ Soil SW846-7000B/7420
☐ Air NIOSH 7082
☐ Wastewater SM3111B or SW846-7000B/7420
☐ ASTM Wipe SW846-7000B/7420
☐ non ASTM Wipe SW846-7000B/7420
☐ TCLP SW846-1311/7420/SM 3111B

ICP
☐ Air NIOSH 7300 Modified
☐ non ASTM Wipe SW846-6010B or C
☐ ASTM Wipe SW846-6010B or C
☐ Soil SW846-6010 B or C
☐ Waste Water SW846-6010B or C
☐ TCLP SW846-6010B or C

Graphite Furnace Atomic Absorption
☐ Soil SW846-7421 ☐ Wastewater EPA 200.9
☐ Air NIOSH 7105 ☐ Drinking Water EPA 200.9

Other: ☐

Microbiology

Wipe and Bulk Samples
☐ Mold & Fungi – Direct Examination
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi Culture (Genus & Species)
☐ Bacterial Count & ID (Up to Three Types)
☐ Bacterial Count & ID (Up to Five Types)
☐ MRSA
☐ *Pseudomonas aeruginosa*

Water Samples
☐ Total Coliform & E.coli (P/A)
☐ Fecal Coliform (SM 9222D)
☐ Sewage Screen
☐ Heterotrophic Plate Count (SM 9215)

Air Samples
☐ Mold & Fungi (Spore Trap)
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi (Genus & Species)
☐ Bacterial Culture & ID (Up to Three Types)
☐ Bacterial Culture & ID (Up to Five Types)
☐ Endotoxin Testing

Real Time Q-PCR (See Analytical Guide for Code)
Code:

Legionella
☐ Level 1 ☐ Level 2 ☐ Level 3 ☐ Level 4

Other: ☐

Materials Science

☐ Common Particle ID (large particles)
☐ Full Particle ID (environmental dust)
☐ Basic Material ID (solids)
☐ Advanced Material ID
☐ Physical Testing (Tensile, Compression)
☐ Combustion-by-products (soot, char, etc.)
☐ X-Ray Fluorescence (elem. analysis)
☐ X-Ray Diffraction (Crystalline Part.)
☐ MMVF's (Fibrous glass, RCF's)
☐ Particle Size (sieve/microscopy/laser)
☐ Combustible Dust
☐ Petrographic Examination

Other: ☐

IAQ

Nuisance Dust NIOSH ☐ 0500 ☐ 0600
Airborne Dust ☐ PM10 ☐ TSP
Silica Analysis: ☐ All Species
Silica Analysis – Single Species
☐ Alpha Quartz ☐ Cristobalite ☐ Tridymite
☐ HVAC Efficiency
☐ Carbon Black
☐ Airborne Oil Mist

Other: ☐

Client Sample #'s	1232 - A1A ~ A3E-A7C		Total # of Samples: 21
Relinquished (Client):		Date: 8/9/11	Time: 1500
Received (Lab):		Date: 8/11/11	Time: 10:15

Comments/Special Instructions: 5pt Stop
* Positive

Asbestos Testing Chain of Custody

LA Testing Order Number *(Lab Use Only)*:

321113278

South Pasadena, CA - Los Angeles County
520 Mission Street
South Pasadena, CA 91030
PHONE: 1-800-303-0047
FAX: 323-254-9982

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
1232-A1A			
1B			
1C			
1232-A7A			
7B			
7C			

Comments/Special Instructions:

Controlled Document – Asbestos Testing COC – A1.0 – 11/29/2009

Page ___ of ___ Pages

Job No. CA-1105-C

Attachment

Page 46

Hazardous Homogeneous Materials and Sampling Survey Field Form: Asbestos 321113278

Project # & Name: 21232 InSynergy PV Bldg. 300 Army National Guard Targeted HazMat Survey

Location: Diamond Head Army National Guard

Inspector Initials: AA/RC

Date & Time: 8/9/11 0700

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
8	300	1	~~Rm. 46~~, Hallway 2	wall	ow	~~F~~ F	cc	G F P	Y (N) / TSI (S) M		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-A 3 A	Hallway 2	wall	4984	
1232-A 3 B	↓	↓		
1232-A 3 C	↓	↓		

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
11	300	1	Rm. 35, 37, Hallway 1, Hallway 2, Rm. 35-47A, 3~~4~~ 34, ~~50~~ - 51~~4~~-66	walls	ow	F	cc brick	G F P	Y (N) / TSI (S) M		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-A 4 A	Hallway 2	wall	4985	
1232-A 4 B	(Gym)	↓		
1232-A 4 C	↓			

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
12	300	1	Rm. 35-47, Hallway 1	wall	ow	F	cc brick	G F P	Y (N) / TSI (S) M		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-A 2 A	Hallway 1	wall	4983	
1232-A 2 B	↓	↓		
1232-A 2 C	↓	↓		

Job No. CA-1105-C

Attachment

Page 47

Hazardous Homogeneous Materials and Sampling Survey Field Form: Asbestos

Project # & Name: 21232 InSynergy PV Bldg. 300 Army National Guard Targeted HazMat Survey

Location: Diamond Head Army National Guard

Inspector Initials: AI, PC

Date & Time: 8/9/11 ~ 0900

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
1	300	1	ext	wall	DW	Filler	CC brick	G F P	Y N / TSI S M		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-A C A	ext	wall	4994	
1232-A C B	↓	↓		
1232-A C C	↓	↓		

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
3	300	1	~~cafeteria~~ Gym	roof underside	Silver ~~DW~~ ~~Silver~~ ~~Grey~~	insulation	none	G F P	Y N / TSI S M		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-A A				No work on the gym roof.
1232-A B				
1232-A C				

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
6	300	1	Roof	~~Roof~~ Roofing	CW	built up roofing	none	G F P	Y N / TSI S M		

Sample ID	Room Sampled	Sample Location	PIC ID	Notes
1232-A 5 A	Roof	built up roofing	4989	all roofs are the same except for gym roof. standing seam w/ no paint.
1232-A 5 B	↓	↓		
1232-A 5 C	↓	↓		

Hazardous Homogeneous Materials and Sampling Survey Field Form: Asbestos

321113278

Project # & Name: 21232 InSynergy PV Bldg. 300 Army National Guard Targeted HazMat Survey

Location: Diamond Head Army National Guard

Inspector Initials: AL / PC

Date & Time: 8/9/17 0900

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
15	300	1	Hallway 1, Hallway 2	wall	W	P	CC	G F P	Y N / TSI S M		TT

	Sample ID	Room Sampled	Sample Location	PIC ID	Notes
*	1232-A 1 A	Hallway 1	wall	4982	
	1232-A 1 B	↓	↓		
	1232-A 1 C	↓	↓		

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
5	300	1	Rm. 17, 35, 8, 9 & 14 12, 12A, B, 13, 14, 15, 5B 34, 34A, 4a	wall, ceiling	DW	DW	none	G F P	Y N / TSI S M		XX

	Sample ID	Room Sampled	Sample Location	PIC ID	Notes
*	1232-A 7 A	Rm. 17	wall	4983	
	1232-A 7 B	↓	↓		
	1232-A 7 C	Rm. 14	ceiling		

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
								G F P	Y N / TSI S M		

	Sample ID	Room Sampled	Sample Location	PIC ID	Notes
*	1232-A A				
	1232-A B				
	1232-A C				

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1-GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including the following:
   1. Project Record Documents.
   2. Operation and Maintenance Manuals.
   3. Warranties.
   4. Instruction for the State's personnel.

B. Related documents include the following:
   1. SECTION 01700- EXECUTION REQUIREMENTS.

1.02 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting a Final Inspection to determine Substantial Completion, complete the following items in addition to requirements of ARTICLE 7.31 of the GENERAL CONDITIONS.
   1. Advise the Contracting Officer of pending insurance changeover requirements.
   2. Submit specific warranties, final certifications, and similar documents.
   3. 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.
   4. Make final changeover of permanent locks and deliver keys to the Contracting Officer. Advise the State's personnel of changeover in security provisions.
   5. Complete startup testing of systems.
   6. Submit test, adjust, and balance records.
   7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   8. Advise the Contracting Officer of changeover in other utilities.
   9. Submit changeover information related to the State's occupancy, use, operation, and maintenance.
   10. Complete final cleaning requirements, including touch up painting.

11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

12. Submit the O&M Manual(s) for review.

1.03 FINAL COMPLETION

A. Preliminary Procedures: Within 10 days from the Project Acceptance Date, complete the following items in addition to requirements of 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 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. 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. 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 on mylar or vellum sheets in the same material and size as the drawings transmitted to the Contractor. The new drawing sheets shall be titled and numbered to conform to the construction drawings and clearly indicate what information they supercede in the actual construction drawings. For example a new drawing that replaces drawing M-3, could be numbered M3a.

5. The Contractor shall bring to the attention of the 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) within 10 days after the Final Inspection Date but no later than the Contract Completion Date, unless the GENERAL CONDITIONS require an earlier submittal date.

7. The Contractor shall guarantee the accuracy of its final Record Documents. The State will hold the Contractor liable for costs the State incurs as a result of inaccuracies in the Contractor's Record Documents.

8. Prepare and submit construction photographs and electronic files, damage or settlement surveys, property surveys, and similar final record information as required by the 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 of 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.
      a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.

      b. Accurately record information in an understandable drawing technique.

      c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

d. Mark the contract drawings or the shop drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on contract drawings.

e. Mark important additional information that was either shown schematically or omitted from original Drawings.

f. Locate concealed building utilities by dimension from bench marks or permanent structures. Locate site utilities by dimensions, azimuth and lengths from bench marks or permanent structures.

g. Note field order numbers, Change Order numbers, Contract Modification numbers, Alternate numbers, post-construction drawing numbers (PCD) and similar identification (RFI numbers) where applicable.

h. The Contractor shall initial each deviation and each revision marking.

3. Use the final updated Contract Drawing set plus applicable shop drawings for making the final Field Posted Record Drawings submittal.

4. Certify drawing accuracy and completeness. Label and sign the record drawings.

5. Label the title sheet and on all sheets in the margin space to the right of the sheet number, written from the bottom upward, with the title FIELD POSTED RECORD DRAWINGS" and certification information as shown below. Provide a signature line and company name line for each subcontractor that will also certify the respective drawing. Adjust size to fit margin space.

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

6. Revise the Drawing Index and label the set "FIELD POSTED RECORD DRAWINGS". Include the label "A COMPLETE SET CONTAINS **F** 1 SHEETS" in the margin at the bottom right corner of each sheet. Quantify the total number of sheets comprising the set.

7. If the Contracting Officer determines a drawing does not accurately record a deviation or omits relevant information, the State will correct any FIELD POSTED RECORD DRAWINGS sheet. Contractor will be charged for the State's cost to correct the error or omission.

8. Use the final Field Posted Record Drawings sheets to create one electronic version of the set. The set shall be recorded in Adobe Acrobat PDF (Portable Document Format). Create a single indexed, bookmarked PDF file of the entire set of drawings and record on the CD. Submit one set of the final Field Posted Record Drawings sheets and the complete electronic CD set(s).

1.06 WARRANTIES

A. Submittal Time: Submit written manufacturer's warranties at request of the 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 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, DAGS Job Number, and name of Contractor.

   4. Use the final submittal of the warranties to create an electronic Adobe Acrobat PDF (Portable Document Format) version of the bound warranty documents files. Each sheet shall be separately scanned, at 600 DPI or better into a PDF file, indexed and recorded on a recordable compact disc (CD).

D. Provide 2 sets of manufacturer's warranties that exceed one year and one CD as part of the closing document submittals. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Assemble complete sets of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
   1. Operation Data:
      a. Emergency instructions and procedures.

      b. System, subsystem, and equipment descriptions, including operating standards.

      c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.

      d. Description of controls and sequence of operations.

      e. Piping diagrams.

   2. Maintenance Data:
      a. Manufacturer's information, Material Safety Data Sheets, and a list of spare parts.

      b. Name, address, and telephone number of installer or supplier.

c. Maintenance procedures.

d. Maintenance and service schedules for preventive and routine maintenance.

e. Maintenance record forms.

f. Sources of spare parts and maintenance materials.

g. Copies of maintenance service agreements.

h. Copies of warranties and bonds.

B. Use the following 3 paragraph headings, “Notes, Cautions and Warnings”, to emphasize important and critical instructions and procedures. Place the words “Notes”, “Cautions”, or “Warnings” immediately before the applicable instructions or procedures. Notes, Cautions and Warnings are defined as follows:
   1. Note: highlights an essential operating or maintenance procedure, condition or statement.

   2. Caution: highlights an operating or maintenance procedure, practice, condition or statement which if not strictly observed, could result in damage to or destruction of equipment, loss of designed effectiveness, or health hazards to personnel.

   3. Warning: highlights an operating or maintenance procedure, practice, condition, or statement that if not strictly observed, could result in injury to or death of personnel.

C. Organize the Operation and Maintenance Manuals into suitable sets of manageable size. Bind and index data in heavy-duty, “D” type 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Binder color shall be maroon, or if not available red. Identify each binder on front and spine with the printed title “OPERATION AND MAINTENANCE MANUAL”, Project Name and Title include building number when appropriate, Job Number, Prepared For: Hawaii Army National Guard, State of Hawaii, Prepared By: [Contractor] and Volume Number. Each binder is a single volume.

D. Electronic Format
   1. Provide all information (narratives, drawings and manual) on a Compact Disc (CD). Provide drawings and plans prepared for the O&M Manuals drawn electronically and saved as a PDF file. Name and index the files for ease of identification and updates.

   2. Provide the complete O&M Manual using Adobe Acrobat PDF (Portable Document Format) files. Each sheet shall be separately scanned into a PDF file, indexed, bookmarked, hyperlinked to the table of contents and recorded on a compact disc (CD). Scanned documents shall be scanned at 600 DPI or better. Indexes and bookmarks may be highlighted or colored text. The final submittal shall include written instructions for installing, accessing and retrieving information from the compact disc.

E. Pre-Final Submittal: Submit 2 printed sets of Pre-Final Operation and Maintenance Manuals, for review by the Contracting Officer, at least 5 days prior to scheduled final

inspection. Manuals shall be marked as Pre-Final. Make any correction noted before submitting the final Operation and Maintenance Manuals.

1. The user and the Department will each keep one copy of the Pre-Final submittal to operate and maintain the facility from the Project Acceptance Date through submission of the final submittal. Therefore, the submittal shall contain all the required information that is available at the time of submission.

2. One set will be returned with comments. Additional review comments may include problems discovered during the O&M Manual's review, site validation, and facility start up and will be provided to the Contractor after facility Project Acceptance Date.

F. Final Submittal: Use the final submittal of the manuals to create the electronic PDF file version of the bound Operation and Maintenance Manuals documents. Include the Submittal (100 percent) review comments along with a response to each item. Provide 1 Final set of the printed manuals and 6 Final compact discs, (CD5) as part of the closing document submittal. Final printed manual and disks shall be marked as Final.

PART 2- PRODUCTS

2.01 MATERIALS

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

PART 3 - EXECUTION

3.01 DEMONSTRATION AND TRAINING

A. Instruction: Instruct the State's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually accepted times.

3. Schedule training with the State's users, through the Contracting Officer with at least 7 days advanced notice.

4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.

2. Review of documentation.

3. Operations.

4. Adjustments.

5. Troubleshooting.

6. Maintenance.

7. Repair.

3.02 FINAL [PROGRESSIVE] CLEANING

A. General: Provide progressive cleaning for each portion of completed work. 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. Remove tools, construction equipment, machinery, and surplus material from Project site.

4. 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.

5. Remove debris and surface dust from limited access spaces, including: roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

6. Sweep concrete floors broom clean in unoccupied spaces.

7. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

8. 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.

9. VCT Floors: Sweep and mop floors clean

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

12. Wipe surfaces of mechanical 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.

END OF SECTION

DIVISION 3 - CONCRETE

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

All Sections in DIVISION 5 shall comply with all provisions of SECTION 0700 GENERAL CONDITIONS, SECTION 0800 SPECIAL CONDITIONS and SECTION 01100 - PROJECT REQUIREMENTS.

1.02 GENERAL REQUIREMENTS

The work to be done under this section shall include performing all operations and furnishing all plant, labor, equipment, and materials for all concrete work indicated on the drawings and specified herein.

1.03 STORAGE OF MATERIALS

Cement and aggregates shall be stored in such a manner as to prevent their deterioration or the intrusion of foreign matter. Any material which has deteriorated or which has been damaged shall not be used for concrete and shall be promptly removed from the site.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Portland cement shall conform to the requirements of ASTM 150,Type I, for all concrete work.

B. Concrete Aggregates:

1. Fine aggregates: Calcareous or basalt sands or a combination thereof. They shall meet the grading requirements of ASTM C33. If manufactured sands are used, use a water-reducing and/or air-entraining admixture as specified hereinafter to provide satisfactory workability. The cement content of a mix shall in no way be reduced if an admixture is used.

2. Coarse aggregates: Crushed close-grained, blue lava rock of grading sizes 57 or 67 (ASTM D448) or both with a maximum size not larger than 1/5 of the narrowest dimensions between sides of the nor larger than 3/4 of the minimum clear spacing between individual reinforcing bars or bundle of bars.

C. Water: Fresh, clean and drinkable.

D. Reinforcing Steel: Deformed bars conforming to ASTM A 615, as shown on the drawings.

E. Expansion Joint Filler: A pre-molded material of 1/2" thickness, unless otherwise noted, composed of fiberboard impregnated with asphalt conforming to ASTM D 1751.

F. Admixture: If used, shall conform to ASTM C494 or ASTM C260 and shall be mixed in proper amount in accordance with directions of manufacturer.

G. Curing Compound: Compatible with the floor finish to be applied. Unless otherwise required by the floor finish, the compound shall conform to the requirements of ASTM C309.

H. Moisture Barrier: Polyethylene film, minimum 0.006" thick.

I. "Key Kold Joint" shall be galvanized metal or PVC.

J. Formwork: Formwork shall be plywood commercial-standard Douglas Fir, moisture resistant, not less than 5-ply and at least 5/8" thick.

K. Epoxy Grout: Epoxy for grouting dowels into existing concrete shall be Sikadur "Hi Mod Gel" as manufactured by Sika Corporation or approved equal.

PART 3 - EXECUTION

3.01 DESIGN OF CONCRETE MIXES

A. Ingredients for concrete shall be Portland cement, fine and coarse aggregates, and water.

B. Design mix so that the concrete materials will not segregate nor cause excessive bleeding. Slump shall be 4 inches or less if consolidation is to be by vibration, and 5 inches or less if consolidation is to be by other methods. A tolerance of 1" above the indicated maximum will be allowed for individual batches.

C. Concrete cement content and the test results for 28-day compressive strength shall meet the following requirements:

28-Day Compressive Strength Test Results

Class	Min. Cement Contents Per Cubic Yard Sacks	Min. Average for 3 Cylinders, psi	Min. Average for 2 Cylinders, psi
3,000	5.50	3,000	2,750
2,500	5.00	2,500	2,250

D. The Contractor shall submit for approval by the Architect/Engineer the mixes he intends to use at least 14 days before the actual concrete placing operation.

E. The Contractor shall use only approved mixes.

3.02 TESTS

A. As directed by the Architect/Engineer. If required, slump tests shall conform to ASTM C 143, and compressive strength tests shall conform to ASTM C 39. Cost of testing, if required will be born by the Contractor.

B. If the strength of any test specimens ordered by the Architect/ Engineer fall below the requirements stipulated above, the Architect/Engineer shall have the right to require any and all defective concrete to be replaced, and all costs resulting therefrom shall be borne by the Contractor.

3.03 FORMWORK

A. Construct formwork so that the concrete surfaces do not deviate from established lines, grades and dimensions in excess of the following tolerances:

1. Variations in the plumb:

In any 20 feet length	1/4 inch
Maximum for entire length	1/2 inch

2. Variation from level or from the grades indicated:

In any 20 feet length	1/4 inch
Maximum for entire length	1/2 inch

3. Variation in the sizes and location of sleeves, floor openings, and wall openings: plus or minus 1/4 inch

4. Where soil conditions will permit excavation to accurate sizes without bracing, side forms for footings may be omitted if only approved by the by Architect.

5. Rough concrete finish may be used for all unexposed concrete surfaces, as obtained by using clean, straight lumber of metal forms.

3.04 REINFORCEMENT

A. Provide reinforcing steel bars, as indicated on the drawings, thoroughly cleaned of loose mill scale, loose flaky rust, oil, and all coatings that will destroy or reduce the bond before placing and again before pouring of concrete. Accurately position and secure in place as indicated. Cleaning, bending and placing of rein-

forcement shall be done in accordance with standard practice of the Concrete Reinforcing Steel Institute.

1. Unless permitted by the Engineer, do not bend reinforcementpartially embedded in hardened concrete. Improperly and/or excessively bent bars shall be replaced.

2. Unless otherwise noted on drawings, provide minimum concrete protection for reinforcement as follows:

   a. For footings and where concrete is deposited against the ground: 3 inches

   b. For formed surfaces in contact with ground: 2 inches

   c. For formed surfaces exposed to weather 1-1/2 inches

   d. Minimum concrete protection for any reinforcing shall in all cases be at least equal to the diameter of bar.

3.05 INSERTS AND FASTENING DEVICES EMBEDDED IN CONCRETE

Install inserts, anchors, grounds and other fastening devices as required for attachments of the work. Properly locate all embedded items in cooperation with other trades and secure in position before concrete is placed.

3.06 JOINTS

A. Construction joints shall be provided as detailed at locations indicated on the plans. Construction joints not shown on the plans shall be so made as to least impair the strength of the structure and shall be approved by the Architect/Engineer. In general, they shall be located near the middle of the spans of slabs, beams and girders unless a beam intersects a girder at this point, in which case the construction joints in the girders shall be offset a distance equal to twice the width of the beam. Joints in columns and walls shall be at the underside of floors, slabs, beams and girders and at the top of footings or floor slabs. Beams, girders, brackets, column capitals, haunches and drop panels shall be placed at the same time as slabs. Joints shall be perpendicular to the main reinforcement.

B. All reinforcing steel shall be continuous across construction joints. Keys and/or inclined dowels shall be provided as required. Longitudinal keys at least 1-1/2" deep shall be provided in all joints in walls and between walls and slabs or footings. Unless otherwise noted, joints shall be sealed with joint sealing compound.

C. Expansion joints shall be provided as detailed at locations indicated on the plans. Reinforcement or other embedded metal items bonded to the concrete (except dowels in floors or walls bonded on only one side of joint) shall not be permitted to extend continuously through any expansion joint. Joints shall be sealed with expansion joint filler and sealing compound at least 3/8 inch deep.

D. Contraction/control joints shall be provided where shown on the plans and shall be 1/4 the depth of the slab or a minimum of 1" deep. Unless otherwise indicated on the plans, joint may either be tooled, formed-in-place or sawcut. When saw-cut joints are provided, cutting shall be timed properly with the set of the concrete so that it is firm enough not to be torn or damaged by the cutting blade and before random shrinkage cracking can form in the slab. In any case, cutting shall be completed not later than 12 hours after the concrete is placed and finished. Unless otherwise indicated on the plans, joints shall be sealed with joint sealing compound.

3.07 MIXING CONCRETE

A. All concrete throughout shall be either job or plant mixture in an approved type of power operated mixer that will insure uniformity and homogeneity of the concrete produced. Contractor shall provide a sufficient number of mixers to continuously carry on the work.

B. Mixing at jobsite shall be done in accordance with ACI 304 and as follows:

1. Concrete shall be thoroughly mixed in a batch mixer of an approved type and size, which will insure a uniform distribution of materials throughout the mass. The machine shall have a control device to prevent materials from being discharged until they have been mixed for the specified minimum time.

2. The entire contents of the drum shall be discharged before materials of the succeeding batch are placed therein. No mixer shall be used which has a rated capacity of less than a 1-sack batch and no mixer shall be charged in excess of its rated capacity.

3. The first batch of materials placed in the mixer after the machine has been cleaned shall contain a sufficient excess of cement, sand and water to coat the inside of the drum without reducing the required mortar content of the mix. Upon cessation of mixing, the mixer shall be thoroughly cleaned.

C. Ready-Mixed and Mixed-In-Transit Concrete shall be mixed to conform to the provisions of ASTM C94 and as follows:

1. The plant shall have sufficient capacity and transportation equipment to deliver concrete at the rate desired. The interval between batches for a pour shall not exceed 30 minutes.

2. The time elapsed between the introduction of the mixing water to the cement and aggregates or the cement to the aggregates, and the placing of concrete in its final position shall not exceed 90 minutes.

3. In hot weather (more than 90 degrees F. ambient temperature) or under conditions contributing to quick stiffening of the concrete, the elapsed time

in paragraph 2. shall not exceed 60 minutes, if no retarding admixture is used. If an ASTM C494 Type B or D admixture is added to the concrete, the elapsed time 2. shall remain at 90 minutes.

D. Concrete shall be mixed only in such quantity as is required for immediate use. No retempering will be permitted and concrete that has started to harden shall be discarded and promptly removed from the job.

E. Admixture conforming to Paragraph 2.01 F. may be used in the concrete as recommended by the supplier and approved by the Achitect/Engineer.

F. Hand mixing of concrete will not be permitted except to make up shortages for fence post footings and sidewalks, thresholds, flagpole foundations, curbs and gutters, and thrust blocks.

3.08 PLACING CONCRETE

A. No concrete shall be placed in the absence of the Architect/Engineer or thier representative who shall be given one day advance notice of starting time of concrete pour. Place no concrete until foundation, forms, steel, pipes, conduits, sleeves, hangers, anchors, inserts, termite treatment and other work required to be built into or placed ahead of concrete placing have been inspected and approved by the Architect/Engineer. Concrete placed without such notice and approval shall be rejected.

B. Preparation

1. All sawdust, chips and other construction debris and extraneous matter shall be removed from interior of forms. Struts, stays, bracing, or blocks serving temporarily to hold forms in correct shape or alignment shall be removed when the concrete placing has reached an elevation rendering their service unnecessary.

2. Concrete shall be placed upon clean, damp surfaces with no free water, or upon properly compacted fills but never upon soft mud or dry, porous earth. Before pouring footing or foundations, bottoms of excavations shall be properly leveled off and tamped.

3. Before depositing new concrete on or against concrete which has set, all accumulations of mortar splashed upon reinforcing steel and the surfaces of forms shall be removed and the forms shall be retightened. The surfaces of previously set concrete shall be thoroughly roughened and cleaned of all foreign matter and laitance, saturated with water and slushed with a coat of cement grout. New concrete shall be placed before the grout has attained its initial set.

C. Conveying

1. Concrete shall be conveyed from mixer to forms as rapidly as practicable by methods that will prevent segregation.

2. Concrete shall be deposited as nearly as practicable in its final position. Extensive spading as a means of transportation shall be avoided and in no case shall vibrators be used to transport concrete inside the forms.

3. Open troughs and chutes shall have a slope not to exceed 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.

4. The concrete shall not be allowed to drop freely more than 6 feet except where specifically authorized by the Engineer. When placing operations would involve the dropping of concrete from a height of more than 6 feet, it shall be conveyed through pipes or flexible drop chutes.

5. If any appreciable segregation occurs through the conveying methods employed, their use shall be ordered discontinued by the Architect/Engineer and some other satisfactory method of placing concrete shall be used.

6. All chutes, troughs, pipes and other means of conveyances shall be kept clean and free from coatings of hardened cement or concrete by thoroughly cleaning with water and chipping after each pour. Water used for flushing shall be discharged away from the vicinity of the concrete or forms already in place.

D. Depositing

1. Unless adequate protection is provided, concrete shall not be placed during rain. Rainwater shall not be allowed to increase the mixing water nor to damage the surface finish. Fresh concrete that has been deposited but has not attained its initial set shall be protected in the event of rain.

2. Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement. As nearly as practicable, the concrete shall be dropped vertically without hitting reinforcement, sleeves or forms into its final position in order to avoid separation of coarse aggregates from concrete. After the initial set of concrete, the forms shall not be jarred and no strain shall be placed on the projecting reinforcing.

3. Formed concrete shall be deposited in horizontal layers not deeper than 2 feet avoiding inclined layers and inclined construction joints. The depth of layers shall be shallow enough so that the succeeding layer will be placed before the previous layer has attained its initial set. Concrete shall not be allowed nor shall it be allowed to flow horizontally or on slopes in the form. Concrete placing on a slope shall begin at the lower end of the slope and progress upward.

4. Construction joints shall be made only where located on the drawings or unless approved otherwise by the Engineer. Pours shall be planned to provide for the continuous placing of concrete from one construction joint to another. The face edges of all joints that are exposed to view shall be carefully finished true to line and elevation.

5. In slab construction, placing of the concrete shall be started at the far end of the work so that each batch will be dumped against previously placed concrete, not away from it. The concrete shall not be dumped in separate piles and the piles then leveled and worked together. For floor slabs on earth, additional requirements in Paragraph 3.05 shall apply.

6. Columns shall be placed in approximately 4-foot sections, with each section being vibrated and compacted as placed.

7. If depositing of concrete must be stopped short of a full placement, it shall be leveled to a horizontal plane or stopped against a vertical bulkhead. Such bulkhead or horizontal plane shall be located only as approved by the Architect/Engineer.

E. Compaction

1. All concrete shall be consolidated by vibration so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. All compaction shall be done by use of high frequency internal vibrators. Where the vibrator cannot be inserted into the concrete, compaction shall be done by spading, rodding or forking.

2. Frequency of vibrator shall be not less than 7,000 impulses per minute. The Contractor shall provide a sufficient number of vibrators to properly consolidate all concrete immediately after placing. At least one standby vibrator shall be on hand at all times during placement of the concrete.

3. Vibration shall not be applied through contact with reinforcement of forms. Vibration shall penetrate previously deposited concrete sufficiently to prevent pockets or voids or construction joints from occurring between pours, but must not be applied to concrete which has set up sufficiently to cease to be plastic under vibration.

3.09 FLOOR SLABS ON EARTH

A. All earth-supported slabs shall be reinforced with welded wire fabric as called for in the plans. Plain bar dowels shall be provided as detailed for construction and

expansion joints. Such dowels shall be wrapped or greased on one side of the joints to prevent bonding.

B. Care shall be taken in handling and placing the reinforcement. Reinforcement shall be positively set to the level required within the slab(s) as indicated on the plans.

C. A bond-break filler shall be provided where edge of slab abuts any vertical surface and where indicated on plans. Width of filler strips shall equal depth of floor slab.

D. Expansion joints with expansion joint filler shall be provided at locations indicated on plans.

E. Expansion joints shall be sealed with joint sealing compound at least 3/8" deep.

3.10 CONCRETE WALKS ON GROUND

A. Concrete walks shall be of one lift construction, 4 inches in thickness with the thickened edge, and of Class 2,500 concrete.

B. All reinforcing steel shall be continuous across construction joints. Keys and/or inclined dowels shall be provided as required. Unless otherwise indicated, joints shall be sealed with joint sealing compound.

C. Expansion joints shall be provided not more than 32 feet apart; at junctions with curbs; where walks abut building, platform, and other fixed structures; and elsewhere as shown in the plans. Reinforcement or other embedded metal items bonded to the concrete (except dowels in floors or walls bonded only one side of joint) shall not be permitted to extend continuously through any expansion joint. Joints shall be sealed with expansion joint filler and sealing compound at least 3/8" deep.

D. Contraction/control joints shall be provided where shown on the plans and shall be 1/4 the depth of the slab or a minimum of 1" deep. Unless otherwise indicated on the plans, joints may either be tooled, formed-in-place or saw cut. When saw-cut joint are provided, cutting shall be timed properly with there set of the concrete so that it is firm enough not to be torn or damaged by the cutting blade and before random shrinkage cracking can form in the slab. In any case, cutting shall be completed not later than 12 hours after the concrete is placed and finished. Unless otherwise noted on the plans, joints shall be sealed with joint sealing compound.

E. Concrete shall be tamped and screed to grade and section, sufficient mortar brought to the surface for finishing and the required finish given as specified hereafter before the concrete sets. Steps in connection with walks shall have same finish as walks. All edges except for those at saw-cut control joints shall be rounded to 1/8" radius. Cross slope for sloped or crowned walks shall be

5/32" per foot. No pedestrian traffic shall be permitted on concrete walks for a period of three days after placing.

F. Walks shall be finished as indicated hereinafter and scored where shown or called for on the plans.

3.11 FINISHING OF SLABS

A. Finish A - Scratched Finish: After concrete has been placed, struck off, consolidated and leveled, the surfaces shall be roughened with stiff brushes or rakes (cross scratched) before final set.

B. Finish B - Light Trowelled Finish: After the concrete has been placed, struck off, consolidated and leveled, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared and/or when the mix has stiffened sufficiently to permit the proper operation of a power-driven float. The surface shall then be consolidated with power-driven floats of the impact type except in thin sections. Hand floating with wood or cork-faced floats shall be used in locations inaccessible to the power-driven machine. The slab shall then be steel troweled to a uniform, smooth, texture.

C. Finish C – Trowel Finish: The surface shall be finished first with impact power floats, as specified above for Finish B, then with power trowels and finally with steel hand trowels. The first trowelling after power floating shall be done by a power trowel and shall produce a smooth surface which is relatively free of defects but which may still contain some trowel marks.

Additional trowelling shall be done by hand after the surface has hardened sufficiently. The final trowelling shall be done to a point when a ringing sound is produced as the trowel is moved over the surface. The finished surface shall be free of any trowel marks ands shall be uniform in texture and appearance. On surfaces intended to support floor coverings, any defects of sufficient magnitude to show through the floor covering shall be removed by grinding.

D. Finish D - Broom Finish: The concrete slab shall be given a coarse transverse scored texture by drawing a broom across the surface. The operation shall follow immediately after steel- trowelling performed under Finish B above.

E. Finish E - Non-Slip Finish: the surface shall be given a dust-on-application of abrasive aggregates. Finish with steel trowel but avoid over-trowelling. The rate of application of abrasive aggregates shall be not less than 25 pounds per 100 square feet or application shall be in strict accordance with the manufacturer's recommendations.

F. Finish F - Swirled Finish: After the concrete surface has been struck off, darbied, power floated and steel trowelled, the surface shall be given a swirl float finish. The float should be worked flat on the surface in semi-circular or fan-like motion.

G. Finish G – Exposed Aggregate Finish: Use white Portland cement and Molokai cinder aggregate in design mix. Match Fort Street Mall example shown to Contractor and Owner as agreed upon April 12, 1999. Provide 24 inches square sample for approval by the Owner and the Architect.

H. Finish H – Rock Salt Finish:

1. Salt: Coarse Rock Salt (equal to Morton's Kiln Dried Coarse softener salt).

2. Samples: Provide 3 samples, each 24 inches square showing a 1) light, 2) travertine, 3) mixed light and heavy, for approval prior to placing concrete.

3. Installation: Screed and hand trowel to initial set. Distribute approximately 5 lbs. of salt per 100 square feet. Incorporate into concrete with steel trowel leaving tops of crystals exposed. Cure per this specification wash and dissolve salt after 5 days of curing.

I. Finishing Tolerances for slabs as classified on the plans shall be accordance with the following:

1. Finishes shall be true planes within + or - 1/4" in 10 ft., as determined by a 1-ft. straightedge placed anywhere on the slab in any direction.

Unless otherwise shown on the plans, all slabs shall meet this tolerance. The tolerances will be checked prior to moving of forms or shores.

3.12 SELECTION OF FLOOR FINISHES

Unless otherwise indicated on plans, the following floor finishes shall be used.

1. Finish A - Scratched Finish: For surfaces intended to receive bonded applied cementitious applications, (such as setting beds for ceramic tile or quarry tile on 1st floor, where no membrane is called for).

2. Finish B - Light Trowelled Finish: For surfaces intended to receive roofing, waterproofing and membrane (such as setting beds on membranes, 2nd floor and above).

3. Finish C - Trowelled Finish: For interior floors (including refrigerator floor) and floors intended to receive floor coverings.

4. Finish D - Broom Finish: For equipment pads.

5. Finish E - Non-Slip Finish: For platforms, interior and exterior steps, landings and ramps.

6. Finish F - Swirled Finish: For upper floor lanais or balconies.

7. Finish G – Expose Aggregate Finish: For driveway.

8. Finish H - Rock Salt Finish: Where indicated on the drawings.

3.13 CURING AND PROTECTION

A. All concrete shall be cured for a period of not less than 7 days by one of the methods listed below. During this curing period, the concrete shall be maintained with minimum moisture loss at a relatively constant temperature. Fresh concrete shall be protected from heavy rains, flowing water, mechanical injury, and injurious action of the sun. Curing method selected must be compatible with the finish to be applied to the concrete.
Curing shall immediately follow the finishing operation.

B. Water Curing - If cured with water, concrete shall be kept wet by mechanical sprinklers, by ponding, or by any other method which will keep the surfaces continuously wet.

C. Saturated Sand Curing - Surfaces cured with sand shall be covered with a minimum of 1-inch thickness of sand which shall be kept uniformly distributed and continuously saturated during the entire curing period.

D. Curing Compounds - Curing compounds shall not be used on concrete surfaces that are to receive paint finish, acid stain or resilient flooring, except those that are recommended by the manufacturer to be compatible with the applied finish. The Contractor shall submit to the Architect/Engineer a letter certifying that the curing compound is compatible with the applied finish. Application shall be in accordance with the manufacturer's recommendations. If curing, sealing or other compounds are used which are incompatible with applied finish, such compound shall be thoroughly removed by grinding with a terrazzo grinder.

E. Waterproof Paper - Waterproof paper or opaque polyethylene film conforming to ASTM C171 may be used. The paper or film shall be anchored securely and all edges sealed or applied in such a manner as to prevent moisture escaping from the concrete. Waterproof paper shall not be used on floors that will be exposed when finished.

3.14 CLEANUP

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

END OF SECTION

DIVISION 5 - STEEL

SECTION 05400 – COLD FORMED STEEL

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

All Sections in DIVISION 5 shall comply with all provisions of SECTION 0700 GENERAL CONDITIONS, SECTION 0800 SPECIAL CONDITIONS and SECTION 01100 - PROJECT REQUIREMENTS.

1.02 SCOPE

The work covered by this section of the Specifications shall include light gauge metal framing.

1.03 GENERAL REQUIREMENTS

A. Submittals: All submittals shall be provided in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.

B. Provide metal joists and accessories as indicated on the Drawings, as specified herein, and as needed for a complete and proper installation. Provide product data as follows:

1. Material list of items proposed under this section
2. Manufacturer's product information and other data needed to prove compliance with the specified requirements.
3. Manufacturer's recommended installation procedures which, when approved by the Contracting Officer will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.04 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this Section.

B. In addition to complying with the pertinent codes and regulations of governmental agencies having jurisdiction, comply with pertinent recommendations contained in Specifications for Metal Lathing and Furring published by the Metal Lath/Steel Framing Association.

PART 2 - PRODUCTS

2.01 <u>METAL JOIST, AND ACCESSORIES</u>

A. Galvanized steel must meet the minimum requirements of ASTM A653/A653M Grade D (Fy=50 ksi) for 12 gauge (97 mil); ASTM A653/A653M Grade D (Fy=50 ksi) or ASTM A446 Grade A (Fy=33 ksi) for 14 and 16

gauge (68 and 54 mil); ASTM A653/A653M Grade A (Fy=33 ksi) for 18 gauge (43 mil) and lighter for the item and use intended. Galvanized coatings must meet the ASTM A653/A653M Specification.

B. Carbon sheet steel must meet the minimum requirements of ASTM A570 Grade 50 ksi for 12 gauge, ASTM 570 Grade 50 ksi for Grade 33 ksi for 14 and 16 gauge and Grade 33ksi for 18 gauge and lighter members. Carbon sheet steel products must be thoroughly coated with a rust inhibitive paint.
C. All structural members shall be designed in accordance with American Iron and Steel Institute (AISI) 'Specification for the Design of Cold-Formed Steel Structural Members', 2001 Edition.
D. Metal joists: fastening of components attached to wood shall be with wood screws as noted on the drawings. Holes in the metal joists shall be predrilled as necessary.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 ERECTION (JOISTS)

Joists shall be placed flush to the underside of the existing roof decking making maximum contact with the existing roof decking. Connect joist to the existing rafters with screws as noted in the drawings.

END OF SECTION

DIVISION 7- THERMAL AND MOISTURE PROTECTION

SECTION 07545 - FLUID APPLIED ELASTOMERIC ROOF COATING

PART I - GENERAL

1.01 SUMMARY OF WORK

A. Coat roof with fluid applied elastomeric acrylic coating, as indicated on drawings.

1.02 QUALITY ASSURANCE

A. Qualifications of Applicator: Fluid applied elastomeric acrylic coating shall be applied by a manufacturer approved applicator or a licensed waterproofing contractor with the basic knowledge of the material and application procedures.

B. Qualifications of Manufacturer: Manufacturer of fluid applied elastomeric acrylic coatings shall have at least 5 years of successful installations of product over existing EPDM I roofing. Other manufacturers' products shall be accepted for use on this project only after submittal of product data files to Contracting Officer's Representative supporting quality and full compliance with specifications herein. The Contracting Officer's Representative (COR) reserves the right to reject the substitution proposals should it be determined the submittals do not provide all functions required for application.

C. All work including disposal of materials shall be in applicable local building codes.

1.03 SUBMITTALS

A. Manufacturer's Literature: Submit six (6) copies of manufacturer's literature, certificates and samples to the Contracting Officer's Representative for review before work is started. Literature shall show material specifications, physical properties, manufacturer's estimated application rate for the required dry mil thickness per warranty, current application instructions of the manufacturer, certifications showing FM compliance and Material Safety Data Sheets.

B. Warranty: Submit sample copy of manufacturer's 5-year Warranty.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original sealed containers, clearly marked with the manufacturer's name, brand name, type of material, batch number and date of manufacture.

B. Store materials in an area where temperatures will not be less than 50 degrees F or more than 75 degrees F. Do not store for long periods in direct sunlight. In the storage and preparation of coating materials, the contractor shall be responsible to employ all appropriate safety and housekeeping measures for the prevention of fire and other hazards.

1.05 JOB CONDITIONS

A. Install all materials in strict accordance with all published safety, weather, environmental, and temperature precautions given by the manufacturer.

B. Do not apply elastomeric acrylic coating at temperatures below 50 degrees F. Do not apply if weather conditions will not permit complete cure before rain, dew, or fog.

PART 2- PRODUCTS

2.01 MATERIALS

A. Waterproofing Material: Flexible, acrylic, fabric reinforced coating, fluid applied in stages to form one continuous, seamless watertight membrane. 40 mil minimum cured total system thickness:

1 Base Coat: Highly flexible water based 100% pure acrylic polymer resin coatings.

2 Fabric: Polyester, non-woven, stitch-bonded and heat set fabric.

3 Finish Coat: UV light resistant, blend of highly flexible water based 100% pure acrylic polymer resin coating. Color as selected from manufacturer's standard colors.

B. Reinforcing Fabric: This material shall be non-woven 100% polyester, stitch bonded, heat set fabric with the following characteristics:

Weight:	3 oz / per square yard (106.31 grams / square meter)
Tensile Strength	Warp 741bs. (33.60 kg) per ASTM D 5034 Fill 451bs. (20.43 kg)
Elongation @ Break	Warp 21.3% per ASTM D 5034 Fill 51.3%
Ball Burst	111.1 lbs. (50.39 kg) per ASTM D 3787 Fill 24.2 lbs. (10.99 kg)
Trapezoid	Warp 13.5lbs. (6.13 kg) per ASTM D 117
Thickness	.018 inches (.457 mm) per ASTM D-1777

C. Cured Membrane Characteristics:

PROPERTY	TEST	RESULT
Elongation	ASTMD638	>300% elastomeric
Tensile Strength (cured)	ASTMD412	>2000 psi (13,789 kPA)
Density		12.11b/gal
Volume Solids		> or=53%
Weight Solids		> or=66%
Algae Resistance	ASTMG29	No Growth Supported
Moisture Vapor	ASTME96	3 Perms
Weathering	ASTMG26	No effect after 3,000 hours
Salt Spray Test	ASTME117	No effect
Fire Rating	ASTME108	Class A
VOC (calculated)		2 gIL
Susceptibility to Leakage	FM4470	No signs of water leakage
Windstorm Pressure	FM4470	Meets Class 1-90
Windstorm Pull	FM 4470	Class 1-735 on Structural Concrete
Severe Hail Test	FM 4470	No separation or rupture 1-SH
Resistance to Foot Traffic	FM 4470	No sign of tearing or cracking.
Liquid Applied Acrylic	ASTMD6083	Approved
Solar Reflectance	ASTMC1549	> or 0.90

Thermal Emittance	ASTMC1 371	> or = 0.79
OTC (Ozone Transport Commission)		Compliant
California Title 24		Compliant
CRRC (Cool Roof Rating Council)		Approved
Energy Star (Dept. of Energy)		Approved

D. Accessories: As required by the manufacturer for a complete and warranted waterproofing system

PART 3 - EXECUTION

3.01 PREPARATION OF SURFACES

A. General: The roof deck shall be dry and free of dirt, grease, latence, release agents, or other contaminants which will interfere with total adhesion of the elastomeric acrylic coating to the substrate.

3.02 MIXING

A. Elastomeric acrylic coating shall be mixed according to the manufacturer's specifications and recommendations for this type of application.

3.03 APPLICATION

A. roof preparation materials shall be allowed to fully dry prior to full roof surface application of elastomeric acrylic coating.

B. Apply surface primer if required by manufacturer.

C. Apply base coat, reinforcing fabric and finish coats per manufacturer's specifications and recommendations.

D. Elastomeric coating shall be applied by the roller method. Use of airless sprayer is not approved.

E. Warranty inspection shall consist of on site inspection by the Manufacturer's Representative and the Applicator to determine the suitability of application and proper mil thickness of coating installation. Deliver to Contracting Officer's Representative two copies of the fully executed 5 Year Product Warranty from the manufacturer, including the following provisions: The elastomeric acrylic coating will not leak water for a 5 year period due to deterioration as the result of ordinary weather conditions. The surety will not be held liable beyond two (2) years of the project acceptance date.

END OF SECTION

SECTION 07920 - SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Completely close with sealant all joints specified or required to be sealed to a watertight condition.

1.02 SUBMITTALS

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

B. Manufacturer's Data: Submit copies of manufacturer's product data and specifications for type of sealant required, to the Contracting Officer for approval.

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

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

E. Guaranty: Submit written guaranty as specified in paragraph entitled "GUARANTY" hereinbelow.

1.03 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, On surfaces to be painted, install sealants prior to painting.

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.

1.04 PRODUCT HANDLING

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

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

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

1.05 GUARANTY

A. Provide a 2-year guaranty against leaks, air infiltration, cracks and other failures of the installation and materials.
   1. Repair or replace sealants to seal leaks caused by faulty materials or workmanship.

2. Repair or replace damage to the building or its finishes, equipment or furniture when occasioned by such leaks.

PART 2- PRODUCTS

2.01 MATERIALS

A. Sealant Backer Rod: Compressible rod stock of polyethylene foam, polyethylene-jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable, nonabsorptive material as recommended for compatibility with sealant by the sealant manufacturer to control the joint depth for sealant placement, to break bond of sealant at bottom of joint, to form optimum shape of sealant bead on back side, and to provide a highly compressible backer which will minimize the possibility of sealant extrusion when joint is compressed. Do not use oakum or other types of absorptive materials as backstops.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer.

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

D. Primer for Sealants: Non-staining, as recommended by the sealant manufacturer.

E. Sealants at Exterior and Interior Vertical and Overhead Moving Joints: One-part polyurethane-based sealant, conforming to ASTM C 920, Type S, Grade NS, Class 25, Use NT. Provide one of the following, or approved equal:
   1. Dymonic; Tremco, Inc.
   2. Chem-Calk 900; Bostik Construction Products Div.
   3. Sikaflex la; Sika Corp.
   4. Dynatrol I; Pecora Corp.
   5. NP-1; Sonneborn.

F. Sealants at Interior Vertical and Overhead Non-Moving Joints: Non-Elastomeric Sealant; acrylic-emulsion type, conforming to ASTM C 834. Provide one of the following, or approved equal:
   1. AC-20 Acrylic Latex: Pecora Corp.
   2. Tremco Acrylic Latex 834; Tremco, Inc.
   3. Chem-Calk 600; Bostik Construction Products Div.
   4. Sonolac; Sonneborn.

G. Silicone Sealant: At Perimeter of All Plumbing Fixtures and Fittings: One-part mildew-resistant silicone sealant conforming to ASTM C 920, Type S, Grade NS, Class 25, Use NT, formulated with fungicide; intended for sealing interior joints with non-porous substrates. Provide one of the following, or approved equal:

1. Dow Corning 786; Dow Corning Corp.

2. SCS 1702 Sanitary; General Electric Co.

3. Tremsil 600 White; Tremco, Inc.

4. Omni Plus; Sonneborn.

5. 898 or 893, No. 345; Pecora Corp.

H. 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 approved equal:
   1. Extru-Seal; Pecora Corp.

   2. 440 Tape; Tremco, Inc.

   3. Chem-Tape 40; Bostik Construction Products Div.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 EXAMINATION

A. 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; waterproofing; 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 wirebrush to remove loose mill scale. Remove dirt, oil, or grease by solvent cleaning, and wipe surfaces with clean cloths.

5. Clean metal 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 manufacturers' 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 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 Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer. Provide concave joint configuration per Figure 5A in ASTM C 1193.

3.05 CLEAN UP

A. Immediately scrape off fresh sealant compound that has been smeared on masonry or porous surfaces and rub clean with a solvent as recommended by the compound manufacturer. Upon completion of sealant compound application, remove all remaining smears and stains resulting therefrom and leave the work in a clean, uniform, and neat condition.

3.06 PROTECTION

A. Protect areas adjacent to joints from compound smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.

B. 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 09900 — PAINTING AND REPAINTING

PART 1 GENERAL

1.01 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, Contracting Officer will select from standard colors and finishes available.
   1. PAINT NEW CONSTRUCTION
      a. Interior and Exterior surfaces scheduled to be finished.

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

      c. Pipes, conduit, ducts, support apparatus and other exposed mechanical and electrical items. Exterior mechanical and electrical equipment and items on the building exterior.

   2. REPAINT EXISTING CONSTRUCTION
      a. Repair work at exterior and interior of Building 300 Electrical Room, as noted in the drawings.

C. Surfaces not to be finished, unless otherwise indicated.
   1. Concrete floors, paving walks stairs and textured concrete. Other concrete surfaces scheduled not to be painted.

   2. Finish hardware, unless prime coated.

   3. Acoustical ceilings, unless scheduled to be painted.

   4. Plumbing and lighting fixtures, and electrical device plates.

   5. Movable furniture.

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

   2. Concealed surfaces include walls or ceilings in generally inaccessible spaces unless noted otherwise.

3. Finished metal surfaces.

4. Operating parts include moving parts of operating equipment and the following:
   a) Valve and damper operators.

   b) Linkages.

   c) Sensing devices.

   d) Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.02 RELATED SECTIONS

A. Divisions 16, identification marking of painting of electrical equipment and apparatus.

1.03 REFERENCES

A. ASTM D16 - Definition of terms relating to Paint, Varnish, Lacquer and Related Products.

B. ASTM D2016 - Test Method for Moisture Content of Wood.

C. MPI (Master Painter's Institute) - Approved Product List.

D. PCDA (Painting and Decorating Contractors of America - Painting - Architectural Specification Manual.

E. PCA (Portland Cement Association) - Painting Concrete.

F. SSPC (Steel Structures Painting Council - Steel Structures Painting Manual)

1.04 DEFINITIONS

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

1.05 SUBMITTALS

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

   2. Manufacturer's Information: Provide data on all listed materials, including:
      a. Thinning and mixing instructions

      b. Application instructions and required mil film thicknesses.

      c. Manufacturer's Material Safety Data Sheets.

B. Certifications: Provide a letter certifying paints and coatings are free of asbestos, lead, zinc-chromate, strontium chromate, cadmium, and mercury and mercury compounds, . Provide a letter certifying the amounts of mildewcide added by both the paint manufacturer and paint supplier. Provide a letter certifying that abrasive blast media are free of crystalline silica.

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

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

E. Samples:
   1. Submit paint finish samples, 8.5” x 11” in size illustrating selected colors and textures for each selection. Divide sample in horizontal strips showing prime and overlapping second and finish coats. Show coat tinting. Prepare transparent finish samples on same material as that on which coating will be applied. Identify each sample.

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

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

H. Qualification Data: For Applicator.

1.06 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

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

C. Provide a Comprehensive Spray Plan when airless spraying is proposed. to include:
   1. Documentation that the individual spray applicator(s) on the project have completed an approved “Spray Applicator Certification Program” conducted by the Painting Industry of Hawaii. The certification program shall include material and equipment selection, use and maintenance, hands-on application and safety training.

   2. Proposed overspray protection methods.

   3. Paint Manufacturer’s spray application instructions and recommendations for products to be used.

4. Proposed schedule to shut-down and covering existing air-conditioning and ventilation equipment and existing air intake, return and diffuser grilles.

D. In addition, the Contracting Officer shall have the right to require the immediate removal of any paint applicator who demonstrates negligence, lack of competence or repeated non-compliance with the contract requirements.

1.07 REGULATORY REQUIREMENTS

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

1.08 DELIVERY, STORAGE, AND HANDLING

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

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

1.09 PROJECT CONDITIONS

A. Do not apply materials when surfaces and ambient temperatures are outside the ranges required by the paint product manufacturer. Do not apply exterior coatings during rain or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

B. Protect public, pedestrians and tenants from injury. Provided, erect and maintain safety barricades around scaffolds, hoists and where constriction operations create hazardous conditions.

C. Completed Work: Provide necessary protection for wet paint surfaces.

D. Protective Covering and Enclosures: Provide and install clean sanitary drop cloth or plastic sheets to protect furniture, equipment, floor and other areas that are not scheduled for treatment. Remove any paint applied to surfaces not scheduled for treatment.

E. Fire Safety: Contractor and its employees shall not to smoke in the vicinity of the paint storage area. Exercise precautions against fire at all times and remove waste rags, plastic (polyester sheets), empty cans, etc. from the site at the end of each day.

F. Where airless spraying is used, ensure that protective enclosures are erected to prevent the escape of overspray from the work area.

G. Safeguarding Property: Safeguard the work and also the property of the State and other individuals in the vicinity of Contractor's work. Make good on any damages and for losses to work or property caused by Contractor or its employee's negligence. Where damaged property cannot be cleaned and restored to its original condition (i.e. prior to being damaged) replace it with a new product of equal quality. No prorating or use of "used" products will be permitted.
   1. For painting and spray painting operation, assume that cars will not be temporarily relocated from parking areas during the painting operations.

   2. Paint overspray shall not carry more than 5 lineal feet beyond the building eave line nor within 10 lineal feet of pedestrians or property and surfaces not scheduled to be painted. Immediately cease spray painting when overspray carries beyond these specified limits. Do not continue until protective barriers are erected to properly contain the overspray and damages caused by the overspray have been corrected.

   3. The Contractor shall be assessed $300.00 for each incidence of property or personal damage caused by overspray until such time that a satisfactory settlement has been agreed upon by the damaged party and corrective action has been completed. All corrective action shall be settled within 24 hours from the time the damage is discovered. Should the Contractor fail to take corrective action in a timely and expeditious manner, the Contracting Officer shall contact the Contractor's Insurance company to seek resolution on the matter.

H. For Repainting Work
   1. Incidental work to be performed:
      a. Contractor shall move furniture and equipment to provide sufficient work space. Protect furniture and equipment. Replace furniture and equipment to their original locations after completed painting work.

b. Carefully remove and neatly store away or properly protect in-place items not to be replaced. Reinstall removed items.

2. Minimum Painting Work: Unless noted otherwise, minimum interior painting work area shall be the complete inside surfaces of one room. Minimum exterior painting work area shall be one side of a single story building or one side of one story on multiple story buildings.

1.10 EXTRA MATERIALS

A. Provide extra paint in each of the different colors, types and surface textures of exterior and interior paint to the user I school upon completion of the project. Paint shall be in unopened one gallon containers and labeled with color, type, texture, room locations, and date in addition to manufacturer's label.
   1. Provide 5 gallons of each color for paint used over large areas, such as the exterior of the building.

   2. Provide 1 gallon of each color for all other areas.

1.11 WARRANTY

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

PART 2- PRODUCTS

2.01 PAINT MATERIALS, GENERAL

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

B. Mildewcide
   1. Except for metal primers, provide primer and finish coats with suitable chemical mildewcide to the maximum amount of mildewcide per gallon of paint permitted by the mildewcide manufacturer without adversely affecting the quality of the paint, but not less than one ounce per gallon.

C. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
   1. Proprietary Names: Use of manufacturer's proprietary product names in the Paint Systems Schedule in Part 3 below to designate colors or materials, is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed products to be used.

   2. Equivalency: Equivalent products to the specified products are listed in the Master Painter's Institute's "Architectural Painting Specification Manual ."

3. Substitution: Requests for substitution of a product or product if a manufacturer is not on the “Approved Product List” will be evaluated for equivalency based on product test results per the test criteria of the Master Painter’s Institute.

D. Colors: Match existing, as noted in the drawings or to be determined by contracting officers.

E. Hazard Materials: Do not use paint or paint products containing asbestos, lead, mercury and mercury compounds, zinc chromates, strontium-chromate, and cadmium. Do not use abrasive blast media that contain crystalline silica.

2.02 MISCELLANEOUS MATERIALS

A. Provide patching and repair materials. Compatible with paint finishes and substrates. Use weather resistant materials for exterior surfaces and surfaces exposed to moisture.

B. Accessories
   1. General: Provide other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

   2. Thinners: Thinning of paint shall be done using material recommended by the manufacturer. Mix proprietary products according to manufacturer’s requirements. Do not use compound thinner, mineral oil, kerosene, refined linseed oil, or gasoline for thinning.

PART 3- EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
   1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
      a) Ensure that concrete and masonry surfaces are cured and dried pt 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.

3.02 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be

painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations in each space orarea, 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 Of New Work: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.

2. Surface Preparation Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
   a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.

   b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. Submit test results to Contracting Officer.
      i. Prior to painting, concrete and masonry surfaces shall be allowed to cure and dry in accordance with the paint manufacturer's instructions and recommendations.

      ii. Efflorescence and laitance shall be removed from the surface.

      iii. Prior to paint application, interior and exterior concrete and masonry (including grout joints) scheduled to receive paint shall be tested to determine the alkalinity level of the surface. Testing shall be performed in strict accordance with the test kit manufacturer's instructions. Submit test results to the Contracting Officer.

      iv. 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.

c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. 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.
   a. 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.

   b. Prime wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood.

   c. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.

   d. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. 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.
   a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.

   b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

   c. 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.

5. 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.

D. Surface Preparation Of Existing Work**:** 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.

2. Wash all surfaces with a solution of tn-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. Surface preparation existing 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 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-alkalai balance is achieved. Allow to dry.

6. Surface preparation existing 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. Surface preparation existing Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

8. Surface preparation existing 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. Surface preparation existing 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 I 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. Surface preparation existing 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.

E. High Pressure Water Washing Preparation:
   1. High pressure water washing may be used in lieu of brush washing to remove loose paint material, chalking, dirt, and debris from exterior wood, concrete and masonry surfaces to be painted. Use skilled mechanics experienced in the use and operation of the sprayer equipment.

2. High pressure water washing does not replace proper preparatory work such as sanding of the substrate prior to painting. Remove surface contaminants and loose paint material remaining after pressure washing by other means.

3. Ensure the pressure rating of the sprayer equipment will not damage the substrate. Ensure the nozzle type and size is appropriate to clean the surface without damaging the substrate. Restore or repair any damage surfaces to its original condition.

4. Take precautions prevent over-spray and water infiltration into the building through doors, windows, vents, louvers, cracks and other building openings. Seal openings. Immediately clean water and debris that entered the building. Restore or repair any damage surfaces to its original condition.

5. For mildew removal, use high pressure washing only to wash the surface after is has first been sterilized with a mildew treatment solution.

F. Mildew Removal Preparation:
   1. Remove mildew and sterilize the surface to be painted using one of the following methods:
      a. Apply a commercial mildew remover applied per manufacturer's instructions.

   2. Following treatment, clean the surface with potable water and allow to thoroughly dry before priming, painting or applying sealing and caulking compounds.

G. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
   1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

   2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

   3. Use only thinners approved by paint manufacturer and only within recommended limits.

H. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.03 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
   1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.

2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

3. Provide finish coats that are compatible with primers used.

4. The term “exposed surfaces” includes areas visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only unless otherwise noted.

6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.

7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.

9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.

10. Sand lightly between each succeeding enamel or varnish coat.

11. Ensure primers are top coated within the times required by the paint manufacturers. Top coats not applied within the recoating window may be rejected.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
   1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer’s written instructions, sand between applications.

   2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

   3. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

4. Be aware of the requirements for, and restrictions on, spray painting contained in PROJECT CONDITIONS Paragraph.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
   1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.

   2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.

   3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Electrical items to be painted include, but are not limited to, the following:
   1. Electrical equipment that is indicated to have a factory-primed finish for field painting.

G. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

H. 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.

I. 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.

J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.04 FIELD QUALITY CONTROL TESTING

A. Inspection and Approvals: Obtain written approval upon completion of each phase of work (phases of work are: surface preparation and spot prime, prime, first finish coat, second finish coat) before proceeding into the next phase or work. For any particular area of work that deviates from the submitted work schedule, notify the 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 edoing the operation at no cost to the State.

2. Right of Rejection: Non conforming work will be rejected by the Contracting Officer. Remove rejected material from the job site immediately. Redo rejected work at no cost to the State.

B. Moisture Testing: Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Masonry, Concrete, Concrete Unit Masonry and Gypsum Wallboard: 12 percent.

   2. Wood: 15 percent, measured in accordance with ASTM D2016.

   3. Submit test results to Contracting Officer.

C. 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: Quantity as appropriate at the Tunnel Entry.

   2. Tests shall be paid by Contractor.

   3. Submit test results to Contracting Officer.

D. Adhesion Testing:
   1. Provide adhesion testing per ASTM D3759 Test B (x scratch peel test):
      a. Test after each scheduled paint coat.

      b. Should test fail, remove paint, prepare surface, then recoat and test again.

   2. Testing shall be performed by a NACE certified inspector. The cost of testing shall be borne by the Contractor.

   3. Test schedule: Quantity as appropriate at the Tunnel Entry.

   4. Submit test results to Contracting Officer.

3.05 CLEANING

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

3.06 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by 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.
   1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.07 EXTERIOR PAINT SCHEDULE

A. Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry): Provide the following finish systems over exterior concrete, stucco, and brick masonry substrates:
   1. Acrylic Finish: Two finish coats over a primer.
      a. Primer: Exterior concrete and masonry bondihg primer: MPI #17 3210 PREP & PRIME GRIPPER Multi-Purpose Water—Based Primer-Sealer; 1.7 mils DFT.

      b. Finish Coats: Exterior acrylic paint: MPI #154 WB. Light Industrial Coating, MPI Gloss Level 6, 4216 DEVFLEX high Performance Waterborne Acrylic Semi-Gloss Enamel; 1.6 mils DFT per coat.

      c. Finish Coat Gloss Level: Semi-Gloss.

B. Concrete Unit Masonry: Provide the following finish systems over exterior concrete unit masonry:
   1. Acrylic Finish: Two finish coats over a block filler.
      a. Block Filler: Concrete unit masonry block filler: MPI #4 4000 BLOXFIL Interior/Exterior heavy Duty Acrylic Block Filler; 7 mils DFT.

      b. Finish Coats: Exterior acrylic paint. MPI #11 2406 DULUX Professional Exterior 100% Acrylic Latex; 1.5 mils DFT per coat.

      c. Finish Coat Gloss Level: Semi-Gloss.

C. Smooth Wood: Provide the following finish systems over smooth wood siding, wood trim, and other smooth exterior wood surfaces:
   1. Acrylic Finish: Two finish coats over a primer.
      a. Primer: Exterior wood primer for acrylic enamels. MPI #17 3210 PREP & PRIME GRIPPER Multi-Purpose Water —Based Primer-Sealer; 1.7 mils DFT.

      b. Finish Coats: Exterior acrylic paint. MPI #154 W.B. Light Industrial Coating, MPI Gloss Level 6, 4216 DEVFLEX high Performance Waterborne Acrylic Semi-Gloss Enamel; 1.6 mils DFT per coat.

      c. Finish Coat Gloss Level: Semi-Gloss.

D. Plywood: Provide the following finish systems over exterior plywood:
   1. Acrylic Finish: Two finish coats over a primer.
      a. Primer: Exterior wood primer for acrylic enamels. MPI #17 3210 PREP & PRIME GRiPPER Multi-Purpose Water—Based Primer-Sealer; 1.7 mils DFT.

b. Finish Coats: Exterior acrylic paint. MPI #154 W.B. Light Industrial Coating, MPI Gloss Level 6, 4216 DEVFLEX high Performance Waterborne Acrylic Semi-Gloss Enamel; 1.6 mils DFT per coat.

c. Finish Coat Gloss Level: Semi-Gloss.

E. Ferrous Metal and Copper: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
   1. Acrylic Finish: Two finish coats over a rust-inhibitive primer.
      a. Pretreat: OSPHO Rust Solution or equal (for rusted surfaces only)

      b. Primer: Exterior galvanized metal primer. MPI #79 4160 DEVGUARD Multi-Purpose Tank & Structural Primer; 2.0 mils DFT.

      c. Finish Coat: Exterior acrylic paint. MPI #154 W.B. Light Industrial Coating, MPI Gloss Level 6, 4216 DEVFLEX high Performance Waterborne Acrylic Semi-Gloss Enamel; 1.6 mils DFT per coat.

      d. Finish Coat Gloss Level: Semi-Gloss.

F. 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. Pretreat: OSPHO Rust Solution or equal (for new galvanized surfaces only)

      b. Primer: Exterior galvanized metal primer. MPI #79; 2.0 mils DFT.

      c. Finish Coat: Exterior acrylic paint. MPI #154 W.B. Light Industrial Coating, MPI Gloss Level 6, 4216 DEVFLEX high Performance Waterborne Acrylic Semi-Gloss Enamel; 1.6 mils DFT per coat.

      d. Finish Coat Gloss Level: Semi-Gloss.

G. Aluminum: Provide the following finish systems over exterior aluminum surfaces:
   1. Acrylic-Enamel Finish: Two finish coats over a primer.
      a. Primer: Exterior aluminum primer under acrylic finishes. MPI #134 4020 DEVFLEX Waterborne DTM Primer & Flat Finish; 2.0 mils DFT.

      b. Finish Coats: Exterior semigloss acrylic enamel. MPI # 110-G5 4216 DEVFLEX High Performance Waterborne Acrylic Semi-Gloss Enamel; 1.5 mils DFT per coat.

      c. Finish Coat Gloss Level: Semi-Gloss.

H. Metal Doors & Frame and Expanded Metal Mesh at Generator Bldg:
   1. High performance coating system

      a. Pretreat: 167 PRE-PRIME Penetrating Epoxy Sealer (for rusted surfaces only).

b. Primer: High build epoxy coating, low gloss. MPI #108 DEVRAN two component epoxy, high solids, low gloss coating; 4.0 mils DFT.

c. Finish Coats: Polyurethane, 2 component, pigmented, gloss. MPI #72 DEVTHANE 379 Aliphatic Urethane Gloss Enamel; 2.0 mils DFT per coat.

d. Finish Coat Gloss Level: Gloss.

3.08 INTERIOR PAINT SCHEDULE

A. Concrete and Masonry (Other Than Concrete Unit Masonry): Provide the following paint systems over interior concrete and brick masonry substrates:
   1. Acrylic Finish: Two finish coats over a primer.
      a. Primer: Interior concrete and masonry primer. MPI #50 1000 PREP & PRIME Interior Water-Based Primer-Sealer; 2.0 mils DFT.

      b. Finish Coats: Interior acrylic paint. MPI #141 4216 DEVFLEX High Performance Waterborne Acrylic Semi-Gloss Enamel; 1.5 mils DFT.

      c. Finish Coat Gloss Level: Semi-Gloss.

B. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:
   1. Acrylic Finish: Two finish coats over a block filler.
      a. Block Filler: Concrete unit masonry block filler, MPI #4 4000 BLOXFIL Interior/Exterior heavy Duty Acrylic Block Filler; 7 mils DFT.

      b. Finish Coats: Interior acrylic paint. MPI #141 4216 DEVFLEX High Performance Waterborne Acrylic Semi-Gloss Enamel; 1.5 mils DFT.

      c. Finish Coat Gloss Level: Semi-Gloss.

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 1000 PREP & PRIME Interior Water-Based Primer-Sealer; 1.5 mils DFT.

      b. Finish Coats: Interior acrylic paint. MPI #139 7400 DULUX DIAMOND Premium 100% Acrylic Interior; 1.5 mils DFT per coat.

      c. Finish Coat Gloss Level: Semi-Gloss.

D. Wood and Hardboard: Provide the following paint finish systems over new interior wood surfaces:
   1. Acrylic-Enamel Finish: Two finish coats over a primer.
      a. Primer: Interior wood primer for acrylic-enamel and semigloss alkyd-enamel finishes. MPI #39 3210 PREP & PRIME GRIPPER MultiPurpose Water—Based Primer-Sealer; 1.5 mils DFT.

      b. Finish Coats: Interior acrylic enamel. MPI #141 4216 DEVFLEX High Performance Waterborne Acrylic Semi-Gloss Enamel; 1.5 mils DFT.

c. Finish Coat Gloss Level: Semi-Gloss.

E. Ferrous Metal: Provide the following finish systems over ferrous metal:
   1. Acrylic Finish: Two finish coats over a primer.
      a. Primer: Interior ferrous-metal primer. MPI #79 4160 DEVGUARD MultiPurpose Tank & Structural Primer; 2.0 mils DFT.

      b. Finish Coats: Interior acrylic paint. MPI #141 4216 DEVFLEX High Performance Waterborne Acrylic Semi-Gloss Enamel; 1 .5 mils DFT.

      c. Finish Coat Gloss Level: Semi-Gloss.

F. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
   1. Acrylic Finish: Two finish coats over a primer.
      a. Primer: Interior zinc-coated metal primer. MPI #95 4160 DEVGUARD Multi-Purpose Tank & Structural Primer; 2.0 mils DFT.

      b. Finish Coats: Interior acrylic paint. **MPI #141** 4216 DEVFLEX High Performance Waterborne Acrylic Semi-Gloss Enamel; 1.5 mils DFT.

      c. Finish Coat Gloss Level: Semi-Gloss.

END OF SECTION

DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13282 - LEAD HAZARD CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies the Contractor's requirements and responsibilities for controlling lead hazards associated with the project. Lead-containing paints (LCP) ranging from 450 to 1,500 [milligrams per kilogram (mg/Kg) or parts per million (ppm)] were identified during the targeted hazardous material survey for the subject building identified as Building 300 located at 3949 Diamond Head Road, Honolulu, Hawaii.

B. For the purpose of this Section, LCP is defined as any paint containing a measurable level of lead. None of the identified LCP at the project area exceeded the lead-based paint (LBP) threshold of 5,000 ppm. The Contractor shall refer to the hazardous material survey report included in Section 01715 for specific LCP findings.

C. The Contractor shall perform all work in accordance with applicable federal, state, and local regulations, and implement appropriate engineering controls and safety measures to prevent workers, the public, and the environment from exposures to hazardous materials. Perform work in accordance with 29 Code of Federal Regulations (CFR) 1910.1025, 29 CFR 1926.62, Hawaii Administrative Rules (HAR) 12-148.1, and the requirements specified herein. All costs incurred due to the Contractor's negligence in controlling hazards shall be borne by the Contractor, including, but are not limited to, medical, legal, cleanup, restoration, monitoring, and reporting.

D. All waste generated, including but are not limited to, paint chips and building materials shall be properly contained and managed in accordance with applicable federal, state, and local regulations.

E. The Contractor must read and understand the specifications and the survey report in Section 01715. The locations of paints sampled are provided in the survey report. The Contractor shall verify the locations and quantities of all affected hazardous materials.

F. The Contractor shall ensure that all employees and subcontractors involved in disturbing or removing hazardous materials have access to the hazardous material survey report and information in this Section. All project personnel shall understand the potential health risks.

G. The Contractor shall assure that only workers who have been trained in accordance with the U.S. Occupational Safety and Health Administration (OSHA) Lead in Construction Standard 29 CFR 1926.62, and State of Hawaii Occupational Safety and Health Division (HIOSH) HAR Chapter 12-148.1 are allowed to perform the work specified in this Section.

1.02 REFERENCES

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

1. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
   a. ANSI Z88.2 1980 Practice for Respiratory Protection

2. American Society for Testing and Materials (ASTM) INTERNATIONAL
   a. Standard Guide for Sample Selection of Debris Waste from a Building Renovation or Lead Abatement P roject for T oxicity C haracteristic Leaching Procedure (TCLP) Testing for Leachable Lead (Pb) E 1908-03

3. CODE OF FEDERAL REGULATIONS (CFR)
   a. 29 CFR 1910.134 Safety and Health Standards (Respiratory Protection)

   b. 29 CFR 1910.1025 Safety and Health Standards (Lead)

   c. 40 CFR 260 Hazardous Waste Management System: General

   d. 40 CFR 261 Identification and Listing of Hazardous Waste

   e. 40 CFR 262 Standards for Generators of Hazardous Waste

   f. 40 CFR 263 Standards for Transport of Hazardous Waste

   g. 40 CFR 264 Standard for Architects and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

   h. 40 CFR 265 Interim S tatus S tandards f or Architects and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

   i. 40 CFR 745 Subpart E Lead P aint R enovation, R epair, and P ainting Program

4. U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
   a. Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing

5. UNDERWRITERS LABORATORIES, INC. (UL)
   a. UL-586 1985 High-Efficiency, Particulate, Air Filter Units

6. State Requirements: State requirements which govern hazard abatement work or transportation and disposal of hazardous waste materials include, but are not limited to, the following:
   a. Toxic Materials and Harmful Physical Agents: Title 12 Hawaii Administrative Rules (HAR) Subtitle 8, Chapter 202

   b. Respirator Protection, Title 12 HAR Subtitle 8, Chapter 12-64.1
   c. Access to Medical Records, Title 12 HAR Subtitle 8, Chapter 202-3.1

   d. Hazard Communication, Title 12 HAR Subtitle 8, Chapter 149

1.03 DEFINITIONS

A. Competent Person: Contractor personnel who is capable of identifying existing and predictable lead paint hazards in the work area and project site, selecting the appropriate control strategy for lead exposure, and who has the authority to take prompt corrective measures to manage exposure.

B. High Efficiency Particulate Air (HEPA) Filter Equipment: HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead dust.

C. Industrial Hygienist (IH): A certified third party professional who will ensure that the abatement work is performed in accordance with the project specifications and applicable regulations. The IH shall be certified by the State of Hawaii Department of Health and shall have a minimum of five years of abatement or hazardous material project experience.

D. IH Technician (IHT): A certified third party professional who will serve as the IH's representative and ensure that the abatement work is performed in accordance with the project specifications and applicable regulations. The IHT shall perform the field work under the supervision of the IH. The IHT shall have the Project Monitor and Contractor/Supervisor certification from the State of Hawaii.

E. Lead: Metallic lead including all inorganic lead compounds and inorganic lead soaps. Excluded are all organic lead compounds.

F. Lead Action Level (AL): The AL for an 8-hour Time-Weighted Average (TWA) exposure to airborne lead is 30 micrograms per cubic meter. Employee exposure to airborne lead above the AL triggers additional worker protection requirements, including medical surveillance.

G. Lead Control Area: An area isolated by physical boundaries to prevent unauthorized entry of personnel where lead disturbance operations are performed. One purpose of a Lead Control Area is and to prevent the spread of lead dust, paint chips, or debris.

H. Lead Permissible Exposure Limit (PEL): The limit is 50 micrograms per cubic meter of air as an 8-hour TWA as determined by Appendix A of 29 CFR 1910.25. Employee exposure to airborne lead above the PEL triggers additional worker protection requirements.

I. Personal Monitoring: Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour TWA in accordance with 29 CFR 1910.1025. The samples shall be representative of the employee's work tasks. The breathing zone shall be considered an area within 12 inches of the nose or mouth of an employee.

J. Time-Weighted Average (TWA): The TWA is an 8-hour time-weighted average of airborne lead per cubic meter of air, which represents the employee's 8-hour workday as determined by 29 CFR 1910.1025.

1.04 GENERAL REQUIREMENTS

A. Notice to IH: The Contractor shall keep the IH apprised of the project schedule and shall provide a minimum of five working days notice prior to conducting activities under this Section.

B. Title to Materials: Waste materials resulting from this work shall become the property of the Contractor and shall be disposed of as specified herein.

C. Medical Examinations: Before exposure to lead dust, the Contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.1025. Examination is not required if records show the employee has been examined as required by 29 CFR 1910.1025 within the past 12 months. Maintain complete and accurate records of employees' medical records for a period of 40 years or 20 years after termination of employment, whichever is longer.

D. Training: Within 12 months prior to assignment to lead work, each employee shall receive training with regard to the hazards of lead; safety and health precautions; the use and requirements for protective clothing, equipment, and respirators; and the additional requirements of 29 CFR 1910.1025. Furnish each employee with a respirator fit test as required by 29 CFR 1910.1025. Discuss engineering and other hazard control techniques and procedures.

E. Respirator Program: Establish and implement a respirator program as required by ANSI Z88.2, 29 CFR 1910.134, and 29 CFR 1910.1025.

F. Health and Safety Compliance: In addition to detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding handling, storing, transporting, and disposing of lead-containing waste materials. Implementation of regulatory requirements should be addressed in the Contractor Work Plan prior to the start of field activities. Where specification requirements and referenced documents vary, the most stringent requirement shall apply.

1.05 SUBMITTALS

A. Within 10 days of receiving notice to proceed, submit the following to the State for review:

1. Lead Hazard Control Plan: Submit a detailed, job-specific plan of the work procedures to be used in the disturbance work with LCPs. The Plan shall include, but is not limited to, table of contents, a clear scope of work, sketch of control areas, methods to control lead hazards, Contractor’s worker and supervisor certifications, training records, medical evaluation, interface of trades, sequencing of lead- and non-lead related work, disposal plan, worker exposure air monitoring plan, material safety data sheets (MSDS) for any products to be used, respirators to be used, and other personal protective equipment (PPE). Training certificates for all workers shall include OSHA/HIOSH required “Lead in Construction” training. If a third party is retained by the Contractor to prepare the work plan, the Contractor shall approve and sign the Work Plan prior to submittal. The Lead Hazard Control Plan shall be approved by the State prior to the start of work.

2. Respiratory Protection Program: ANSI Z88.2, 29 CFR 1910.134, EM 385-1-1, and 29 CFR 1910.1025.

B. Following the approval of the Contractor's Work Plan and prior to the start of work the Contractor shall meet with the State Representative to review the specifications and Work Plan. The attendance and minutes of this meeting will be kept by the Contractor and submitted to the State prior to the start of work.

C. The following Contractor close-out submittals shall be prepared and submitted to the IH.
   1. Daily entry logs showing all persons entering the hazardous materials control areas on site.

   2. Air monitoring results within 24-hours of receipt from the laboratory.

   3. Waste disposal facility waste acceptance document.

   4. Waste characterization results.

   5. Completed Uniform Hazardous Waste Manifest Form, when applicable.

   6. Project monitoring and visual clearance results.

   7. Certification that the work was performed in accordance with the specifications or deviations.

   8. Certification that the respiratory protection used by the Contractor during the project was adequate.

1.06 COORDINATION WITH OTHER SECTIONS

A. The requirements included in this Section are intended to be in accordance with Section 01715.

1.07 PRODUCT HANDLING

A. Materials that become contaminated with lead shall be disposed of in accordance with applicable regulations.

1.08 PATENTED DEVICES, MATERIAL AND PROCESS

Not used.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 PROTECTIVE CLOTHING

A. Furnish personnel exposed to lead dust with disposable protective whole body clothing, head covering, gloves, and foot coverings. Furnish disposable plastic or rubber gloves to protect hands from lead.

3.02 WARNING SIGNS AND LABELS

A. Provide warning signs at approaches to the lead control area. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Provide and affix labels to impermeable bags, lead waste drums, and other containers containing lead materials, waste, or debris. Signs and labels shall comply with the requirements of 29 CFR 1910.1025.

3.03 PREPARATION PRIOR TO DISTURBANCE OF LEAD-CONTAINING PAINT

A. The Contractor shall establish lead control areas for all interior and exterior areas where LCP will be disturbed. Post warning notices at control area entrances as required by applicable Federal and State regulations. Disable and seal building ventilation systems when applicable. Utilize polyethylene sheeting to contain wastes and prevent contamination of areas outside of the control area.

B. The Contractor shall demarcate all lead control areas using lead warning tape. Lead warning tape should be at least 20 feet away from the closest painted surface being disturbed for exterior lead control areas or as appropriate for interior control areas.

C. The Contractor shall place 6-mil polyethylene drop sheets around the control areas' surrounding surfaces. The Contractor shall secure drop sheets so that wind or other forces will not dislodge the sheets. For exterior lead control areas, the Contractor shall utilize effective lead dust control measures to fully contain the lead dust or debris. Drop sheets shall be periodically cleaned and kept free of debris. Any water captured by the drop sheet shall be evaluated for lead-contamination, properly characterized, and disposed of in accordance with applicable regulations. There shall be no runoff containing lead or other hazardous materials.

3.04 ACTIVITIES DISTURBING LEAD-CONTAINING PAINTS

A. Within the project area, disturbance of LCP is anticipated as part of the photovoltaic system installation. Whenever LCP is disturbed, work shall be performed in a manner minimizing the airborne lead dust. As needed, work practices should utilize wet methods and tools equipped with high efficiency particulate air (HEPA)-filter collection devices.

B. The Contractor shall not perform dry removal or dry sweeping. Waste or paint debris generated during removal shall be promptly contained or packaged and shall not be allowed to accumulate uncontrolled. Lead-containing waste shall be properly marked and stored in secure containers appropriate for storing lead-containing waste. The Contractor shall not allow lead-containing waste to be (1) stored outside the lead control area, (2) in a high traffic unsecured area, or (3) where the waste could interact with rainfall or wind and create a secondary hazard or contamination.

3.05 LEAD CONCENTRATIONS IN THE WORK AREA

A. The maximum permissible exposure to airborne concentrations of lead shall be 50 micrograms per cubic meter within the lead control area, and 30 micrograms per cubic meter at the boundary of the lead control area. The maximum permissible exposure limits shall be in accordance with the most recent publications of 29 CFR 1926.62 and HAR 12-148.1. The work shall stop whenever these limits are exceeded, and the Contractor shall remedy the condition prior to commencing work.

B. The Contractor is responsible to train and fit each worker in proper respiratory use. The Contractor is required to ensure that employees utilize respirators appropriate for the level of lead present in the work area. The Contactor shall ensure that employees utilize the device whenever it is required.
   1. Air Purifying Respirators: Provide half-face or full-face type respirators. Equip full-face respirators with a nose cup or other anti-fogging device as appropriate.

   2. Filter Cartridges: Provide, at a minimum, HEPA type filters labeled with the National Institute for Occupational Safety and Health (NIOSH) Certification for "Radionuclides, Radon Daughters, Dust, Fumes, Mists including Asbestos-Containing Dusts and Mists" and color coded in accordance with ANSI Z228.2 (1980). In addition, a chemical cartridge section may be added.

   3. Non-permitted respirators: Do not use single use, disposable, or quarter-face respirators.

   4. Require that respiratory protection be used at all times that there is any possibility of LCPs being disturbed, intentional or accidental.

   5. Require that a respirator be worn by anyone in a lead control area at all times when LCPs are disturbed.

   6. Regardless of Lead Dust Levels: Require that the minimum level of respiratory protection used be half face air-purifying respirators with HEPA filters.

C. Fit Testing
   1. Initial Fitting: Provide initial fitting of respirators during a respiratory protection course of training. Fit the types of respirator to be worn by each individual. Allow an individual to use only those respirators for which training and fit testing have been provided.

   2. On Annual Basis: Check the fit of each worker's respirator by having irritant smoke blown onto the respirator from a smoke tube.

   3. Upon Each Wearing: Require that each time an air-purifying respirator is put on it be checked for fit with a positive and negative pressure fit check in accordance with the manufacturer’s instructions or ANSI Z88.2 (1980) and the company respiratory protection program. Each fit test shall be documented.

D. Type of Respiratory Protection Required
   1. Provide Respiratory Protection as indicated for the work task. Higher levels of protection may be provided as desired by the Contractor, or as directed by the Competent Person. Determine the proper level of protection by dividing the expected or actual airborne lead dust levels in the work area by the protection factors given below.
      a. Loose equipment cleaning prior to removal in uncontaminated area: Half-face dual cartridge-type respirator.
      b. Plastic installation which does not disturb LCPs: Half-face dual cartridge-type respirator.
      c. Removing or cleaning items or plastic installation when such operation may disturb LCPs or dust: Dual Cartridge, Half-face Air Purifying Respirators.
      d. Lead-containing material removal: Dual Cartridge, Half-face Air Purifying Respirators.
      e. Gross cleaning of removal area(s): Dual Cartridge, Half-face Air Purifying Respirators.
      f. Loading and unloading drums on truck (outside work area): Dual Cartridge, Half-face Air Purifying Respirators.
      g. Lead-Containing Paint removal: Dual Cartridge, Half-face Air Purifying Respirators.

PROTECTION FACTORS

RESPIRATOR TYPE	PROTECTION FACTOR
Air purifying: Negative pressure respirator High efficiency filter Half-facepiece	Up to 500 ug/m^3
Air purifying (PAPR): Negative pressure respirator High efficiency filter Full-facepiece	Up to 2500 ug/m^3
Powered-air purifying Positive pressure respirator High efficiency filter Half- or full-facepiece Or Type C supplied air: Positive pressure respirator, Continuous-flow half- or full-facepiece	Up to 5000 ug/m^3

3.06 TOOLS

A. Filters on vacuums and exhaust equipment shall be absolute HEPA filters and UL 586 labeled.

3.07 AIR MONITORING

A. Employee Monitoring: During LCP disturbance the Contractor shall monitor employees' exposure to lead in accordance with OSHA requirements. The Contractor shall collect air samples from employees' breathing zones during each shift, for the duration of LCP disturbance. The Contractor shall collect samples from at least 25% of workers performing lead-disturbing tasks, and not less than two workers. Alternatively, or in response to employee exposure

monitoring the Contractor may submit to the State a Negative Exposure Assessment.

B. Work area and Adjacent Areas: The Contractor shall perform appropriate level of area air monitoring to ascertain the effectiveness of the engineering control measures. The Competent Person shall conduct visual inspections during and after LCP disturbance. All work must be performed in a manner protective of workers, occupants, the public, and the environment.

3.08 STOP ACTION LEVELS

A. Inside Work Area: Maintain airborne levels in the work area of less than the Stop Action Level given below for the type of respiratory protection in use. If the lead dust levels rise above this figure for any personal air sample taken, revise work procedures to lower ambient dust levels. If lead dust levels for any work shift or 8-hour period exceeds the Stop Action Level, stop all work except corrective action and notify the IH. After correcting the cause of lead dust levels, do not recommence work unless otherwise authorized, in writing, by the IH. Costs associated with implementing corrective actions and lost time associated with samples exceeding Stop Action Levels shall be borne solely by the Contractor and shall not be passed on to the Owner.

LEAD

STOP ACTION LEVEL ($\mu g/m^3$)	RESPIRATOR REQUIRED	PROTECTION FACTOR
50	Half-face APR	10
5,000	PAPR or Type C, Continuous flow	100
50,000	Type C, Pressure demand	1000

3.09 ANALYTICAL METHODS

A. The following methods shall be used in analyzing filters used to collect air samples. The filters used shall be in accordance with the referenced methods. Samples collected for lead analysis shall be collected and analyzed utilizing the NIOSH 7082 method or equivalent.

3.10 AIR SAMPLE MEDIA

A. Lead Sample Cassettes: Samples will be collected on 37 millimeter (mm) cassettes with 50 mm extension cowl with 0.8 micrometer cellulose ester membrane.

3.11 LABORATORY TESTING

A. The services of a testing laboratory will be employed by the Contractor performing personal air monitoring. Personal air monitoring samples shall be analyzed on a 24-hour turnaround time. The Contractor shall submit all personal exposure monitoring results and field documentation to the State Representative within 24 hours of receiving the results from the laboratory. The State Representative will have access to all air monitoring tests and results.

3.12 CLEAN UP

A. The Contractor shall maintain surfaces of the lead control area free of accumulations of paint chips and dust, restrict the spread of dust and debris, and keep waste from being distributed over the general project area. Do not dry sweep the area. Following the completion of LCP disturbance, remove all lead-containing dust and debris by vacuuming with a HEPA filtered vacuum followed by wet mopping if vacuuming is not effective.

B. The Contractor is responsible for the restoration and cleaning of any areas outside the work area impacted by or contaminated by lead dust or debris generated by the Contractor's work, such as removal, handling, or storage of lead-containing waste. The Contractor shall perform remedial cleaning and restoration of these areas, if any, at no additional cost to the State.

3.13 CLEARANCE

A. At the completion of LCP disturbance work, the Competent Person shall visually inspect all indoor and exterior lead control areas, as well areas adjacent to the lead control area, for residual lead paint chips and accumulated dust and debris. The cleanup standard for clearance is the complete absence of lead paint chips, and the complete absence of any dust and debris generated from lead paint and lead paint removal activities. The Contractor shall re-clean areas showing lead dust or residual lead paint chips to the satisfaction of the State.

3.14 TEMPORARY STORAGE AREA

A. A temporary storage area may be established on the project site for the purpose of accumulating lead paint wastes. The temporary storage area shall comply with 40 CFR 761, 40 CFR 262, and the following requirements:
   1. Adequate roof and wall to prevent rainwater from reaching the stored wastes.

   2. Floors constructed of smooth and impervious material to prevent or minimize the release of a spilled waste.

   3. No drain valve, floor drains, expansion joints, sewer lines, or other openings that would permit liquids to discharge from the area.

   4. No waste may be stored in the temporary storage area beyond 10 days from the completion of removal work.

3.15 DISPOSAL

A. The Contractor is responsible to collect and prepare for analysis a representative sample(s) of the waste generated as a result of work described in this Section. The sample shall be analyzed by an accredited laboratory for lead and cadmium, or any other contaminant(s) required by the landfill, using the Toxicity Characteristic Leaching Procedure (TCLP). If analytical results indicate the TCLP level is below the U.S. Environmental Protection Agency (EPA) criteria and within landfill acceptance criteria, the waste can be disposed of as general construction debris. If the TCLP results exceed the landfill acceptance criteria, the waste shall be managed as a hazardous waste. The Contractor shall inform the State within 24 hours if the waste is determined to be hazardous.

B. The Contractor shall assume the paint chip, paint dust, and paint debris generated under this work is a hazardous waste due to the presence of lead unless sampling and analysis demonstrate that it is not a hazardous waste. This assumption should be reflected in the Contractors bid price.

C. The Contractor shall assume the waste generated from vacuuming the site following LCP removal activities is a non-hazardous waste unless sampling and analysis demonstrate that it is a hazardous waste. A representative sample of the waste shall be collected and analyzed as described in paragraph 3.15A. If the waste is found to be hazardous, it shall be disposed of in accordance with all applicable federal, state, and local regulations at no additional cost to the State.

D. The Contractor shall submit a copy of the TCLP analytical results, Waste Manifest, and Landfill Receipt, to the State within five days of disposal. The final contract payment will not be made until all disposal documents have been submitted.

E. All waste is to be transported by a waste hauler with the required federal, state, and local licenses.

F. Vehicle shall be placarded with the appropriate Department of Transportation (DOT) placard, if required.

G. The Contractor shall not transport lead waste materials in open trucks. If waste material is to be transported in drums, drums shall be appropriately labeled.

APPENDIX A

HAZARDOUS WASTE DISPOSAL LOG (Sample)

Name of project _____

Street address _____

City, State, Zip code _____

Year 20___	**Description of Hazardous Waste**	**Approximate Weight Kg Pound**	**Special Handling**
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			

_____

By Signature

_____

Print Name

APPENDIX B

PROJECT HAZARDOUS WASTE LOG (Sample)

Project: _____
Job number: _____

Start date: _____ Completion date: _____

General contractor: _____
Address: _____
_____
Telephone/fax no.: _____
Name of superintendent for this project: _____

Name of generator: _____
Address: _____
_____
Telephone/fax no.: _____

Description of hazardous waste: _____
_____
Approximate weight (kg or pounds):
Monthly disposal log:
Month: Weight:
_____
_____
Disposal site: _____

Contractor disposing of hazardous waste: _____
Address: _____
_____
Telephone/fax no.: _____

Disposal contractor is a (check one):

Conditionally Exempt Small Quantity Generator	
Small Generator	
Large Generator	

APPROVAL:

Competent Person: _____
Company: _____
Address: _____
_____
Telephone no. _____

_____
Signature Date

END OF SECTION

SECTION 13284 – ARSENIC HAZARD CONTROL

PART 1 – GENERAL

1.01 SUMMARY

A. This section defines the Contractor's responsibilities for controlling arsenic hazards associated with the project. An arsenic-containing material was identified during a targeted hazardous material survey for the subject building located at 3949 Diamond Head Road, Honolulu, Hawaii. The duplicate test result was 940 and 1,500 milligrams per kilogram [mg/Kg or parts per million (ppm)].

B. For the purpose of this Section, aresenic-containing material is defined as any material containing a measurable level of arsenic. The Contractor shall refer to the hazardous material survey report included in Section 01715 for specific arsenic-containing material findings.

C. The project area is the interior and exterior of the photovoltaic system installation that will be disturbed. Refer to the hazardous material survey report in Section 01715 for the location of arsenic-containing material.

D. All waste generated as the result of arsenic-containing material removal shall be properly contained and managed in accordance with applicable federal, state, and local regulations.

E. The Contractor shall perform all work in accordance with applicable federal, state, and local regulations, and implement appropriate engineering controls and safety measures to prevent workers, occupants, the public, and the environment from exposures to hazardous materials. Perform work in accordance with 29 Code of Federal Regulations (CFR) 1910.1018, and the requirements specified herein. All costs incurred due to the Contractor's negligence in controlling hazards shall be borne by the Contractor, including, but are not limited to, medical, legal, cleanup, restoration, monitoring, and reporting.

F. The Contractor must read and understand the project specifications and the survey report provided in Section 01715. The Contractor should verify the locations and quantities of all affected hazardous materials.

G. The Contractor shall ensure that all employees and subcontractors involved in disturbing or removing hazardous materials have access to the hazardous material survey report and information in this Section. All project personnel shall understand the potential health risks.

H. The Contractor shall assure that only workers who have been trained in accordance with the U.S. Occupational Safety and Health Administration (OSHA) Inorganic Arsenic in Construction Standard 29 Code of Federal Regulations CFR 1926.1018, and State of Hawaii Occupational Safety and Health Division (HIOSH) HAR Chapter 12-148.1 are allowed to perform the work specified in this Section.

1.02 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only:
   1. OSHA: U.S. Department of Labor, Occupational Safety and Health Administration, including but not limited to:
      a. Respiratory Protection; Title 29, Part 1910, Section 134 of the Code of Federal Regulations

      b. Access to Employee Exposure and Medical Records; Title 29, Part 1910, Section 1020 of the Code of Federal Regulations

      c. Hazard Communication; Title 29, Part 1910, Section 1200 of the Code of Federal Regulations

      d. Specifications for Accident Prevention Signs and Tags; Title 29, Part 1910, Section 145 of the Code of Federal Regulations

B. DOT: U.S. Department of Transportation, including but not limited to: Hazardous Substances; Title 29, Parts 171 & 172 of the Code of Federal Regulations.

C. EPA: U. S. Environmental Protection Agency (EPA), including but not limited to: National Emission Standard for Hazardous Air Pollutants (NESHAP) National Emission Standard for Arsenic Title 40, Part 61, Sub-part A, and Sub-part M of the Code of Federal Regulations

D. State Requirements: State requirements which govern hazard abatement work or hauling and disposal of hazardous waste materials include, but are not limited to, the following:
   1. HIOSH – Toxic Materials and Harmful Physical Agents - Title 12, Subtitle 8, Chapter 202

   2. HIOSH - Respirator Protection - Title 12, Subtitle 8, Chapter 145-5

   3. HIOSH - Hazard Communication - Title 12, Subtitle 8, Chapter 145-3

E. Local Requirements: Comply with all local requirements which govern arsenic abatement work or hauling and disposal of arsenic waste materials.

1.03 STANDARDS

A. Standards which apply to arsenic work or hauling and disposal of arsenic waste materials include, but are not limited to, the following:
   1. American National Standards Institute (ANSI), Broadway, New York, New York 10018

   2. Practices for Respiratory Protection Publication Z88.2-80

   3. American Society for Testing and Materials (ASTM), Race Street Philadelphia, PA 19103

4. Safety and Health Requirements Relating to Occupational Exposure to Inorganic Arsenic.

1.04 DEFINITIONS

A. Area Monitoring: Sampling of airborne arsenic concentrations within and outside of the arsenic control area, which is representative of the airborne concentrations of arsenic which may reach the breathing zone of personnel potentially exposed to arsenic.

B. Arsenic: An element that is widely distributed in the earth's crust. Inorganic arsenic occurs naturally in soil and in many kinds of rock, especially in minerals and ores that contain copper or lead.

C. Arsenic Permissible Exposure Limit: The limit for arsenic in air is 10 $\mu g/m^3$ for an 8-hour day, 40-hour workweek.

D. Competent Person: Contractor personnel who is capable of identifying existing and predictable lead paint hazards in the work area and project site, selecting the appropriate control strategy for lead exposure, and who has the authority to take prompt corrective measures to manage exposure.

E. HEPA Filter Equipment: High Efficiency Particulate Air (HEPA) filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining arsenic or lead. Filters shall be 99.97 percent efficiency for retaining arsenics of 0.3 micrometers or larger.

F. Personal Monitoring: Sampling of airborne arsenic concentrations within the breathing zone of an employee to determine the 8-hour time weighted average in accordance with Appendix A of 29 CFR 1926.1101. The samples shall be representative of the employee's work tasks. The breathing zone shall be considered an area within 12 inches of the nose or mouth of an employee.

G. Time Weighted Average (TWA): The TWA is an 8-hour time weighted average of airborne concentration of arsenic per cubic centimeter of air which represents the employee's 8-hour workday as determined by Appendix A of 29 CFR 1926.1101.

1.05 DESCRIPTION OF WORK

A. An arsenic containing material was identified, as indicated in the hazardous material survey report (Section 01715). Arsenic hazard control shall be implemented during any work which will disturb the arsenic containing material in accordance with 40 CFR 61, Subpart M, National Emissions Standards for Hazardous Air Pollutants (NESHAP).

1.06 SUBMITTALS

A. Within 10 days of receiving notice to proceed, submit the following to the State for review:
   1. Arsenic Hazard Control Plan: Submit a detailed, job-specific plan of the work procedures to be used in the work disturbing arsenic-containing materials. The Plan shall include, but are not limited to, table of contents, a clear scope

of work, sketch of control areas, methods to control arsenic hazards, worker and supervisor training records, medical evaluation, interface of trades, sequencing of arsenic- and non-arsenic related work, disposal plan, worker exposure air monitoring plan, MSDS for any products to be used, respirators, and other personal protective equipment. Training certificates for all workers shall include OSHA/HIOSH required hazardous material-specific training. If a third party is retained by the Contractor to prepare the work plan, the Contractor shall approve and sign the Work Plan prior to submittal. The Arsenic Hazard Control Plan shall be approved by the State prior to the start of work.

2. Respiratory Protection Program: ANSI Z88.2, 29 CFR 1910.134, EM 385-1-1.

B. Following the approval of the Contractor's Work Plan and prior to the start of work, the Contractor and the State Representative shall meet to review the specifications and work procedures. The attendance and minutes of this meeting will be kept by the Contractor and submitted to the State prior to the start of work.

C. The following Contractor close-out submittals shall be submitted to the State.
1. Daily entry logs showing all persons entering the hazardous materials control areas on site

2. Air monitoring results within 24-hours of receipt from the laboratory.

3. Waste disposal facility waste acceptance document.

4. All waste characterization results.

5. Completed Uniform Hazardous Waste Manifest Form, when applicable.

6. Project observation/documentations and visual clearance results.

7. Certification that the work was performed in accordance with the specifications, and justification of deviations, if any.

8. Certification that the respiratory protection used by the Contractor during the project was adequate.

PART 2 - PRODUCTS

None used.

PART 3 - EXECUTION

3.01 AIR PURIFYING RESPIRATORS

A. Respirator Bodies: Provide half face or full face type respirators. Equip full face respirators with a nose cup or other anti-fogging device as would be appropriate for use in air temperatures less than 32 degrees fahrenheit..

B. Filter Cartridges: Provide, at a minimum, HEPA type filters labeled with NIOSH and MSHA Certification for "Radionuclides, Radon Daughters, Dust, Fumes, Mists including Arsenic-Containing Dusts and Mists" and color coded in accordance with ANSI Z228.2 (1980). In addition, a chemical cartridge section may be added, if required, for solvents, etc., in use.

C. Non-permitted respirators: Do not use single use, disposable or quarter-face respirators.

D. Require that respiratory protection be used at all times that there is any possibility of disturbance of arsenic-containing materials whether intentional or accidental.

E. Require that a respirator be worn by anyone in a Work Area at all times, regardless of activity, during a period that starts with any operation which could cause airborne arsenic until the area has been cleared for re-occupancy.

F. Regardless of Airborne Arsenic: Require that the minimum level of respiratory protection used be half-face air-purifying respirators with high efficiency particulate air filters.

G. Do not allow the use of single-use, disposable, or quarter-face respirators for any purpose.

3.02 FIT TESTING

A. Initial Fitting: Provide initial fitting of respiratory protection during a respiratory protection course of training. Fit types of respirator to be actually worn by each individual. Allow an individual to use only those respirators for which training and fit testing have been provided.

B. On Annual Basis, check the fit of each worker's respirator by having irritant smoke blown onto the respirator from a smoke tube.

C. Upon Each Wearing: Require that each time an air-purifying respirator is put on it be checked for fit with a positive and negative pressure fit test in accordance with the manufacturer's instructions or ANSI Z88.2 (1980).

3.03 PROTECTIVE CLOTHING

A. Furnish personnel exposed to airborne concentrations of arsenic greater than or equal to the permissible exposure limit with disposable protective whole body clothing, head covering, gloves, and foot coverings. Furnish disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber gloves for comfort, but shall not be used alone. Use tape to secure sleeves at the wrists and to secure foot coverings at the ankles.

3.04 PERSONNEL DECONTAMINATION UNIT

A. Provide a decontamination area adjacent to the work area. The decontamination area will consist of a polyethylene sheet placed adjacent to the work area large enough for employees to remove disposable coveralls and shower prior to exiting

the work area. All waste generated during decontamination will be disposed of as arsenic containing debris. At the conclusion of work the plastic sheet will be disposed of as arsenic containing waste. Position a HEPA vaccum at the decontamination unit which will workers will use to clean off protective clothing prior to removal.

3.05 CLEANING OF DECONTAMINATION UNITS

A. Clean debris and residue from the decontamination area promptly. HEPA vacuum and/or damp wipe all surfaces after each shift change.

3.06 WORK PROCEDURE

A. Perform arsenic-related work in accordance with 29 CFR 1926.1101 and as specified herein. Use wet removal procedures. Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking shall not be permitted in the arsenic control area or change room. Personnel of other trades not engaged in the removal and demolition of arsenic containing material shall not be exposed at any time to airborne concentrations of arsenic greater than or equal to 10 microgram per cubic meter of air, unless the personnel protection provisions of this specification are complied with by the trade personnel. Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the arsenic control areas. Seal intake and exhaust vents in the arsenic control are with 6 mil plastic sheet and tape. Seal seams in HVAC components that pass through arsenic control area. Disconnect electrical service when wet removal is performed and provide temporary electrical service protected by a ground fault circuit interrupter (GFCI).

3.07 ARSENIC CONTROL AREA REQUIREMENTS

A. Provide a marked perimeter around the work area during arsenic containing material removal operations. No one will be permitted in the arsenic control area unless the person is provided with appropriate training and protective equipment (respirators and disposable coveralls). During the arsenic removal operation, should the arsenic abatement employees need to exit the controlled area, they will be required to remove their disposable coveralls, place them in an approved impermeable disposal bag, and then exit the area. Conduct personal air monitoring samples on 25% of the work crew or a minimum of two employees whichever is greater during each work shift.

B. The Competent Person shall conduct visual inspections of the upwind and downwind of the arsenic control area during each work shift and take prompt and appropriate measures to control arsenic-containing dust or debris. No arsenic-containing dust or debris shall be outside of the control area.

C. Area air monitoring may be conducted at the Competent Person or the State's discretion. If the concentration of airborne arsenic at the boundaries is greater than or equal to the PEL (10 microgram per cubic meter air), or background quantity whichever is greater, the Contractor shall stop work, and correct the condition(s) causing the increase, and notify the State immediately. If adjacent areas are contaminated, the contaminated areas shall be cleaned and visually inspected. The Competent Person shall certify in writing that the area has been cleaned of all arsenic contamination.

D. All costs related to the contamination and cleanup caused by the Contractor's negligence shall be borne by the Contractor, including legal, medical, air monitoring, testing, analysis, and reporting.

3.08 ARSENIC HANDLING PROCEDURES

A. General Procedure: Wet arsenic material with a fine spray of water. Remove material and immediately place in sealed impermeable bags. Collect arsenic waste, scrap, debris, bags, containers, equipment, and arsenic-contaminated clothing and place in sealed impermeable bags constructed of 6 mil plastic sheet. Provide arsenic caution labels on sealed impermeable bags and arsenic waste containers.

3.09 WORK AREA MONITORING

A. Work Area Airborne Arsenic Levels: Workers shall not be exposed to airborne arsenic above the OSHA Action Level, 5 micrograms per cubic meter air, within the work area without protection.

B. Outside the Work Area: The Competent Person shall control the arsenic-containing dust and debris outside the work area. No arsenic-containing dust or debris shall be migrated to non-work areas.

C. The Contractor shall be responsible for the worker monitoring and required OSHA documentations.

3.10 ANALYTICAL METHODS

A. The following methods will be used in analyzing filters used to collect air samples, when applicable. The filters used shall be in accordance with the referenced methods. Samples collected for arsenic analysis shall be collected and analyzed utilizing the EPA 7060A or 6010B method.

3.11 SAMPLE MEDIA

A. Same as Lead Sample Cassettes: Samples will be collected on 37 mm cassettes with 50 mm extension cowl with 0.8 micrometer cellulose ester membrane.

3.12 LABORATORY TESTING

A. The services of a testing laboratory shall be employed by the Contractor. Arsenic air sample results shall be made available to the workers within 24 hours upon receipt from the laboratory.

B. The Contractor is responsible for the laboratory testing services employed for his/her worker monitoring.

3.13 CLEAN UP

A. Contractor shall maintain surfaces of the arsenic control area free of accumulations of dust. Restrict the spread of dust and debris; keep waste from being distributed over the general area. Do not dry sweep the area. When the removal and demolition is complete, clean all visible debris and dust by

vacuuming with a High Efficiency Particulate Air (HEPA) filtered vacuum cleaner followed by wet mopping.

B. The Contractor shall certify that the inside and outside of the work areas are free of arsenic-containing dust or debris, and there will be no exposure hazards to the occupants, the public, and the environment.

C. The Contractor shall certify that the respirator protection for the employees was adequate and that there are no visible accumulations of dust on the work site. The Competent Person shall visually inspect the affected surfaces for accumulated dust at the end of work each day. The Contractor shall reclean areas showing dust or debris at no additional cost to the State.

D. The Contractor is responsible for the restoration and cleaning of any areas impacted by or contaminated by arsenic-containing dust or debris generated by the Contractor's handling or storage of arsenic-containing waste. Contractor shall perform remedial cleaning and restoration of these areas, if any, at no additional cost to the State.

3.14 CLEARANCE

A. The Competent Person shall visually inspect the affected surfaces for accumulated dust. In settline any disputes, wipe sampling shall be used. Wipe samples will be analyzed using NIOSH method 9102 or equivalent. The laboratory reporting limit shall be 1 microgram per cubic meter air, and sample analytical results shall indicate no reportable arsenic.

B. The Competent Person shall visually inspect exterior areas adjacent to the work area for arsenic-containing dust and debris. The Contractor shall restore any areas impacted by debris from the removal work to their original condition.

3.15 DISPOSAL

A. According to EPA guidelines, a representative sample of the waste generated during the removal work must be collected. However, it is not anticipated that the State-approved landfill or regulatory agencies will require the Toxicity Characteristic Leaching Procedure (TCLP) analysis for the materials containing 52-110 mg/Kg arsenic.

B. All arsenic-containing debris will be water-sprayed and contained in sealed construction waste bags for transfer and disposal.

APPENDIX A

HAZARDOUS WASTE DISPOSAL LOG

(NAME OF PROJECT)
Street Address
City, State, Zip Code

YEAR	DESCRIPTION OF HAZARDOUS WASTE	APPROXIMATE WEIGHT IN POUNDS	SPECIAL HANDLING
JANUARY			
FEBRUARY			
MARCH			
APRIL			
MAY			
JUNE			
JULY			
AUGUST			
SEPTEMBER			
OCTOBER			
NOVEMBER			
DECEMBER			

_____
By Signature

_____
Print Name

APPENDIX B

PROJECT HAZARDOUS WASTE LOG
(Contractor to complete one per school site)

PROJECT: _____
DOE JOB NO. _____
START DATE: _____ COMPLETION DATE: _____
GENERAL CONTRACTOR: _____
ADDRESS: _____
_____
TELEPHONE: _____ FAX NUMBER: _____
NAME OF SUPERINTENDENT FOR THIS PROJECT: _____

NAME OF GENERATOR (SCHOOL): _____
ADDRESS: _____
_____
TELEPHONE: _____ FAX NUMBER: _____
DESCRIPTION OF HAZARDOUS WASTE: _____
APPROXIMATE WEIGHT (IN POUNDS): _____
MONTHLY DISPOSAL LOG:
MONTH: _____ WEIGHT IN POUNDS: _____
MONTH: _____ WEIGHT IN POUNDS: _____
MONTH: _____ WEIGHT IN POUNDS: _____
DISPOSAL SITE: _____

CONTRACTOR DISPOSING OF HAZARDOUS WASTE: _____
ADDRESS: _____
_____
TELEPHONE: _____ FAX NUMBER: _____

DISPOSAL CONTRACTOR IS A (CHECK ONE OF THE FOLLOWING):

CONDITIONALLY EXEMPT SMALL QUANTITY GENERATOR 9

SMALL GENERATOR 9

LARGE GENERATOR 9

APPROVAL:

STATE DESIGNATED COMPETENT PERSON: _____
COMPANY: _____
ADDRESS: _____
_____
TELEPHONE NUMBER: _____

_____ _____
SIGNATURE DATE

END OF SECTION

DIVISION 16 - ELECTRICAL

SECTION 16052 - ELECTRICAL PHOTOVOLTAIC SYSTEM

PART 1 - GENERAL

1.02 SUMMARY OF PROJECT

A. The work covered by this section of the Specifications shall include furnishing all labor, materials, equipment and services to construct and install the complete electrical system shown on the accompanying Drawings and specified herein. All new equipment shall meet the terms of Buy American Act Compliance .This work shall include but is not necessarily limited to:

1. Photovoltaic system, inclusive of PV modules, PV inverters, mounting clips, combiner boxes, drawings, calculations.

2. Photovoltaic system raceways, outlets, and boxes.

3. Complete photovoltaic system branch circuit wiring.

4. Power wiring for equipment.

5. Wiring, up to and including safety switches.

6. Wiring and connecting of all electrical equipment supplied for installation and use in this contract and not specifically listed as work by others, including the furnishing of disconnects for all motors.

7. Test the completed installation.

1.03 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330 - SUBMITTAL PROCEDURES:
   1. Shop Drawings: Power systems, including branch circuits, outlets, panelboards, and wiring.

1.04 GENERAL REQUIREMENTS

A. It is the intent of the plans and specifications to provide a complete installation. Should there be omissions or discrepancies in the plans and specifications, the Contractor shall call the attention of the Contracting Officer to such omissions and discrepancies in advance of the date of bid opening so that the necessary corrections can be made. Otherwise the Contractor shall furnish and install the omissions or discrepancies as if the same were specified and provided for.
   1. Before bidding on this work, carefully examine each of the drawings and the site. By submitting a proposal of the work included in this contract, the Contractor shall be deemed to have made such examination and to be familiar with and accept all conditions of the job site.

2. Standards:
   a. The entire installation shall be made in strict accordance with the latest rules and regulations of the National Electrical Code, NFPA, ANSI, NEMA, and IPCEA, Underwriters Laboratories Inc., ISO 9001 Quality Standard, Institute of Electrical and Electronic Engineers (IEEE) and the local ordinances, rules and regulations of the local County.

   b. The Electrical Contractor shall obtain and pay for the electrical permit as required by local laws and rules. All work shall be inspected by the proper local authorities as it progresses. The Electrical Contractor shall pay all inspection fees and shall deliver certificates of completion and inspection to the Owner before final payment will be made. Cost of permit and inspection fees shall be included in the Electrical Contractor's quoted price for the installation.

   c. Arrange with Hawaiian Electric Company (HECO) and pay for service charges and any work by them pertaining to the photovoltaic system project.

   d. Based on HECO's review of preliminary NEM Agreement, project will not require a HECO Interconnection Study. See attachment for the sample of the preliminary NEM Agreement. Following items (but not limited to) shall be required to be submitted to HECO for review/approval:
      1) The Electrical Contractor shall submit the signed NEM contract agreement.
      2) Minimum Site Load without generation shall be noted to be 44.5 kW.
      3) The Electrical Contractor shall submit spec sheets for the Inverter and PV Panels.
      4) The Electrical Contractor shall provide Fault Current of Generator (Inverter) in Amps.
      5) The Electrical Contractor shall provide information of circuit breaker for inverter (installed in existing distribution panel "MDP"; Provide sample spec sheet of the breaker showing make and model.
      6) The Electrical Contractor shall provide information of new PV utility disconnect switch; Provide sample spec sheet of the utility disconnect showing make and model.
      7) The Electrical Contractor shall provide all necessary labels/placards, per HECO requirements.
      8) The Electrical Contractor shall include in the package and submit final design drawings, with Electrical Engineer of record stamp and signature.
   e. The Electrical Contractor shall keep the PV system off until the NEM agreement is executed.

3. Drawings:
   a. Contract Drawings: These specifications are accompanied by floor plans of the building, and diagrammatic electrical layouts showing the approximate location of the outlets, switches, devices and other equipment. The wiring layouts and schedules show the approximate locations of all outlets, switch controls, service runs and other electrical apparatus. These locations are approximate and before installing, the Contractor shall study adjacent architectural details and make installation in most logical manner. Any device may be relocated within 10'-0" before installation at the direction of the Contracting Officer, whose decision shall be final.

   b. Shop Drawings: Submit six (6) copies of shop drawings, manufacturer's technical brochures and catalog cuts accompanied by a letter of transmittal from the Electrical Contractor. Submittals, which fail to provide sufficient information for evaluation, will be returned to the Contractor for resubmittal without extensions of time or waiver. Shop drawings, or catalog cuts, of the following equipment shall be submitted:
      1) Circuit breakers, safety switches

      2) Photovoltaic System equipment

      3) Any built-to-order equipment.

      Shop drawings and catalog cut submittals processed by Contracting Officer are not Change Orders. The purpose of the submittals by the Contractor is to demonstrate to Contracting Officer that he understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use.

   c. As-Built Drawings: The Contractor shall keep at the job site a complete, neat and accurate record of all approved deviations from the contract drawings, shop drawings and specifications, indicating the work as actually installed. These changes shall be recorded on prints of the drawings affected and the shop drawings. Above reference to deviation shall not be construed to allow deviations without prior approval. Reproducible as-builts shall be submitted prior to final acceptance to Contracting Officer.

4. Symbols: The standard electrical symbols together with special symbols, notes, and instructions shown on the drawings indicate the work and equipment required and are all to be included as a part of these specifications.

1.05 QUALITY ASSURANCE

A. For actual fabrication, installation and testing of the work of this section, use only thoroughly trained and experienced workmen completely familiar with items required and with manufacturers' recommended methods of installation. In acceptance or rejection of installed work, no allowance will be made for lack of skill on part of workmen.

B. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the installed work and materials of all other trades.

1.06 WARRANTY

A. All work and materials executed under this Section shall be under warranty to be free from defects of materials and workmanship for one (1) year from date of final acceptance of project as a whole, except lamps, which shall be warranted for 50% of the rated life as published by the manufacturer. All repair and replacement work required, including other work damaged by this work's defects shall be performed without cost to the Owner. Should any equipment or material fail within this period, the Contractor shall replace or repair that item at no cost to the Owner for material and/or services, if such is due to faulty workmanship or quality of material furnished. The Contractor shall be responsible for all damages to any part of the premises caused by failure in the equipment furnished under this section for a period of one year after the final acceptance of the work as a whole.

B. Maintenance for the photovoltaic system shall be for one (1) year from date of final acceptance of the project as a whole. Contractor shall periodically check system operation once every two (2) months for one (1) year. Record all information in sequence listed below with results and findings. Items requiring attention shall be noted and corrections shall be by Contractor. Notify Contracting Officer's Project Coordinator for scheduling of maintenance test so that a Contracting Officer's Inspector can be present during test.

1. At the Inverter: Use a voltmeter and a DC ammeter to check and record the inverter's operating DC input voltage and current level and on the AC side, and the inverter's output voltage and current levels. Check that the appropriate LEDs are lit up to indicate proper operation of the inverter. If the inverter can display the total kWh produced since it first started up, record the amount. Use this number to compare the PV system's production since the last inspection.

2. On the Roof: Note and record the condition of the modules. Look for signs of degradation (for example, color changes, fogged glazing, de-lamination, warping, or water leaks), cracked glazing, and bent frames on the modules. Tighten all loose nuts and bolts, holding the modules to the mounting rack and to the mounting clips. Secure any loose wiring under the modules. Check the wiring for cuts, gashes, or worn spots in the wiring's insulation. Replace any damaged wire runs. Check the frame ground connections between modules and from the modules to the junction box(es). Check to see that the sealants around all building penetrations are in good condition and repair if necessary. Open the junction box(es) and look for and correct any dirty, loose, or broken connections. Test the tightness of each connection and tighten all loose ones. Note any problems that can be corrected at a later time or at the next scheduled inspection time. Close the junctions box(es) and check that all conduit connections are tight.

Remove all sources of shade on the array and rinse the array to remove the accumulated dust, dirt, and other debris. Some debris, such as bird droppings, may need to soak a bit to fully remove it.

3. At the Combiner Box(es): Open the combiner box(es) and look for any dirty, loose, or broken connections, and correct as necessary. Use a voltmeter and DC ammeter to measure and record the array's operating voltage and current level on the output side of the combiner box(es). Note the relative sun conditions at the time (i.e., full sun, partly cloudy, heavy overcast). Remove the fuses and then check and record each string's open circuit voltage and current levels. Note any deviation between strings for future correction. You can also use the open circuit measurements to determine if the array's output is degrading over time. Return the fuses and close the combiner box(es).

4. Inside: Open all disconnect switches. Use the ohmmeter section of the voltmeter to check the grounding system connections. Greater than 25 ohms indicates that corrosion or a poor connection is present, which must be located and corrected. If opening the disconnect switch breaks the ground, you need to rewire the switch to correct the problem. Check each of the disconnected sections for a ground-fault condition any that are found.

5. Back at the Inverter: Turn the inverter off and check for dirty, loose, or broken wires and connections. Check for and repair any ground faults. Power the system up. Check for normal start up operation and that the inverter produces AC electricity.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall be new and of the best quality available in their respective kinds, free from all defects, NEC Articles 90-6 and 110-3 and those items listed by the Underwriters' Laboratories shall bear "UL" label of approval and shall be of the make and types specified for approval.

B. Brand names and catalog numbers indicate standards of design and quality required. In case of obsolescence, supersedure, or error in catalog number, the associated description and intent implied by the application shall govern. Requests for substitutions shall comply with applicable sections.

Example:

Item	Manufacturer and Catalog No. Specified	Substitute Manufacturer & Catalog Number
Cable	Joe Doe - No. 3200	King - No. 3200

C. Failure to obtain approval of substitute materials prior to bidding shall mean that materials as specified shall be provided. Qualifying data shall include cuts, shop drawings, and specifications to show equality with material specified herein and in drawings. The decision of Contracting Officer shall govern as to what

materials or equipment may be substituted for that specified. The burden of proof as to the equality of any proposed substitution shall be upon the Contractor.

2.02 MATERIALS

A. Raceways:

1. Rigid metal conduit - Rigid steel, hot-dipped galvanized inside and outside, zinc-coated, round bore for use with threaded fittings, 1/2-inch minimum diameter, except as noted. Other sizes to conform to NEC requirements, based on THW wires. Manufacture and install according to NEC Article 346. Aluminum conduits not allowed.

2. Rigid non-metallic conduit - Non-metallic conduit shall be polyvinyl chloride (PVC) schedule 40 round bore for underground use. Non-metallic conduits shall be permitted only where indicated on Drawings. Manufacture and install according to NEC Article 347.

3. Flexible metallic tubing - Flexible, galvanized steel used in conjunction with factory approved fittings. Manufacture and install according to NEC Article 349.

4. Electrical Metallic Tubing (EMT) - Zinc coated or galvanized, round bore, thin walled metal tubing, 3/4 inch minimum diameter. Manufacture and install according to NEC Article 348.

5. Liquidtight flexible metal conduit - Flexible steel, zinc-coated, jacketed with high density polyethylene or polyvinyl-chloride jacket. Use with factory approved fittings. Manufacture and install according to NEC Article 351.

6. Intermediate metal conduit - Steel conduit, zinc-coated inside and outside with additional silicone epoxy-ester lubricating coating inside; 3/4 inches minimum diameter. Manufacture and install according to NEC Article 345.

B. Wires:

1. Conductors shall be copper, 600 volts, No. 12 AWG minimum. Conductors No. 10 and smaller, solid and round. Conductor No. 8 and larger, 7 or 19 strands, concentric. All conductors No. 6 and smaller shall be NEC Type TW, XHHW and THW. All conductors No. 4 and larger shall be NEC Type XHHW or THW. Fixture wiring shall be NEC Type RHH or THHN. Exterior conductors shall be Type RHW-USE or cross-linked polyethylene, Style USE. Fire alarm conductors shall be Type THWN.

2. Color Code: Brown- Phase “A”, Orange-Phase “B”, Yellow-Phase “C”, White-Neutral, Green-Ground (480Y/277V System). Black-Phase "A", Red-Phase "B", Blue-Phase "C", White-Neutral, Green-Ground. (208/120V System) Color coding shall be maintained throughout entire system. Use other colors when more wires than above listed are contained on one raceway and for 480 volt system. CONTRACTING OFFICER shall determine whether deviation from color coding will be permitted.

3. Communications Wiring: Wiring for data and telephone (voice), shall be unshielded twisted pair (UTP), Category 6, where specified.

C. Disconnect Switch: Heavy duty fusible or non-fusible safety switch shall be horsepower rated when used as motor disconnect. Contacts shall be lever operated and spring loaded. When for use with fuses, conventional or of current limiting type, blades shall be rejection type. Enclosures to have provision for padlocking. Provide NEMA 1 enclosure for interior locations and NEMA 4X for exterior locations.

D. Circuit Breakers: Individual breakers shall be molded plastic case, with toggle operated mechanism thermal-magnetic overload trips. Inter-changeable trip shall be provided when available. Toggle positions "ON", "TRIPPED" and "OFF", engraved on body of toggle. Provide circuit breaker(s) compatible with existing panelboard enclosures, as indicated on drawings.

E. Pullboxes: Pullboxes shall be provided where required by the NEC or Utility Company requirements. Boxes shall be code gauge steel with screw cover and raintight construction when installed in locations exposed to rain.

F. Enclosures and Cabinets: Enclosures and cabinets for panelboards, breakers, and switches shall be NEMA type, fabricated from galvanized steel, prime painted and enamel finished according to NEMA specifications.

G. Outlet Boxes: Outlet boxes shall be of size and type best suited to particular use or location but in any case shall be of sufficient size to contain without crowding all conductor and connections which may be required in any outlet box. Manufacture and install according to NEC Article 351.
   1. Concealed boxes shall be pressed from NEC gauge steel; galvanized 4" square x 1-1/2" deep minimum. Boxes in interior locations shall be code gauge galvanized steel, not less than 14 gauge, not less than minimum size required by Code. Pressed galvanized steel boxes: In ceilings and dry walls, 4" square by 1-1/2" deep minimum. For mounting of single device such as a switch or receptacle, 2" by 3" by 1-1/2" deep minimum.

   2. Exposed boxes and weather exposed boxes, recessed boxes, including lighting outlets on exterior shall be galvanized cast iron or alloyed aluminum, with threaded hubs for conduit connections, with gasketed covers. Aluminum boxes shall be prime painted and enamel finished.

H. Devices: Approved equal products manufactured by Arrow-Hart, Bryant, General Electric, Hubbell, Leviton, Pass & Seymour, or Slater Electric.
   1. Duplex Convenience Receptacles: Duplex, 20-amperes, 125 volts, back and side wired, 3 wire, self-grounding type, specification grade, ivory plastic body, with parallel and ground U-shaped slots, NEMA 5-20R; Leviton #5362, or approved equal.

   2. GFI Receptacles: Duplex, 20-amperes, 125 volts, back and side wired, 3 wire, specification grade, ivory plastic body, with parallel and ground U-shaped slots, NEMA 5-20R; Hubbell #GF5362I, or approved equal.

3. Telephone (Voice) Outlet: RJ-11 RJ-45 Jack on high-impact, plastic ivory housing. UL Listed. 50 micro-inches, hard gold-plated phospher bronze spring wire contacts. Leviton or approved equal.

4. Data Outlet: RJ-45 jack on high impact, ivory plastic housing. UL Listed. Leviton or approved equal.

5. Device Plates:
   a. Plates for interior flush construction shall be molded plastic of high dielectric strength and arc resistance, meeting or surpassing UL 514, ivory color or matching surrounding area. Stainless steel, satin finish, 18% chrome, 8% nickel, with suitable hole to fit device. Plates for communication outlets shall be provided with connections for appropriate jacks or devices.

   b. Plates for exposed and weather exposed boxes shall be cast metal with neoprene gasket for sealing against entry of water and moisture into box. Switch plates shall be provided with neoprene cover over handle or raintight lever mechanism.

   c. Receptacle safety outlet enclosure shall consist of an outlet plate with a hinged safety cover that shall remain weatherproof while in use or idle. The enclosure shall have a latching mechanism to allow the enclosure to maintain weatherproof integrity. The enclosure shall have a cord port(s) capable of allowing an appropriate size electrical cord(s) to pass through when the safety cover is closed. The enclosure shall be UL Listed and conform to NEC Article 410.57. Body materials shall be of flame resistant, ultra violet inhibiting, impact resistant, polycarbonate resin. Gasket materials shall be of sufficient thickness to form a weatherproof seal. Attachment screw shall be stainless steel. TAYMAC Corporation or approved equal.

I. Photovoltaic System:
   1. Photovoltaic Inverter (10-Year Minimum Warranty): The PvPowered 50kW commercial inverter provides high reliability with ease of installation. Twenty (20)-plus year design-life features busbar power connections, card cage circuit board design. Inverter features Smart Air Management, where low parts count reduce potential failure points. Inverter shall have side cable entry and oversized busbar landings. Other acceptable manufacturers are Solectria Inc., SMA America and Fronius Inc.

      Features
      a. Superior Reliability
         Engineered power connections eliminate failure points
         Advanced, card cage circuit board system

      b. Full power output at 295VDC
         Complete range of fused DC sub-combiner options
         Exterior mounting flange for fast and easy anchoring

c. Electrical Specifications

Model	**PVP 50kW**
Continuous Output Power (kW)	50
Weighted CEC Efficiency	96.0% (208V)
DC Imp Nominal Current (A)	178
AC Operating Range (V)	
208-	183 - 228
AC Maximum Continuous Current	141 (208V)
Harmonic Distortion (%THD)	<3
Standby Losses (W)	33

d. Mechanical Specifications

Model	**PVP 50kW**
Enclosure	NEMA 4
	Powder Coated Steel
	Pad-mount

2. Photovoltaic Modules:
   a. Model Suntech STP250S-20/Wd+, High Efficiency, High Quality PV Module for on-grid commercial systems installation. The module provides the total module efficiency of 15.2% or better. Excellent performance under low light environments (mornings, evenings, cloudy days). Other acceptable manufacturers are Suntech, SunPower, etc (provide total module efficiency) or approved equal or better.

      Features
      Nominal 18 V DC for standard output
      Outstanding low-light performance
      25-year transferrable power output warranty
      (5 yrs/95%, 12 yrs/90%, 18 yrs/85%, 25 yrs/80%)

      1) Electrical Characteristics

Model	**STP250S-20/Wd+**
Open-circuit voltage (Voc)	37.4V
Short-circuit current (Isc)	8.63A
Maximum power at STC (Pmax)	250Wp

      2) Module Diagram: Dimensions are 65.6.inches x 39.0 inches.

3. Combiner Box (2-Year Minimum Warranty):
   a. Combiners: Current monitoring combiners are ETL listed to UL 1741 for 600 Volt DC photovoltaic systems and are designed for 4 to 16 input channels using the 8-channel Obvius SCM monitoring units. The output data can be received using any modbus capable datalogger, inverter or power meter. Model SolarBOS Smarts™ Combiner, CSM 1-14-15-4XF

      Features
      1) Combiner Specifications: CSM-14-15-4XF (14-circuit, single output monitoring combiner box with 15-amp fuses and NEMA-4X fiberglass enclosure). SolarBOS offers single and dual output terminals (CS and CD), anywhere from 4 to 16 input circuits, 1 to 30-amp fuses, 4X

enclosures. Other acceptable manufacturer is Midnite Solar Inc, or approved equal.

Refer to the following table for dimensions and shipping weights.

No. of Input Circuits	14
Max Fuse Size (Amps)	30
Enclosure NEMA Ratings	4X
Steel Enclosure Dimensions	16x12x6 inch
Fiberglass Enclosure Dimensions	16x14x7 inch

Example part number is explained below:

CSM1-08-15-4X Currrent Monitoring Combiner, 8 circuit, single output terminals, with ONE 8-channel monitoring unit. 15-amp fuses and NEMA 4X enclosure.

4. Photovoltaic Modules Mounting Clips: The S-5!™ mini clamps are a handy way to install PV modules. Compatible service life, penetration free attachment, lower installation costs, cooler roofs, rising energy costs and increased environmental concerns.

   The S-5-PV Kits are furnished with stainless steel Universal PV stud; aluminum PV grab; stainless steel flange nuts; and aluminum or stainless steel mounting disc, which is supplied separately. S-5-PV Kits are compatible with most common metal roofing materials.

   The S-5-PV Kit-30 accommodates frame thicknesses of 1.2” to 1.9”. Mounting disc is offered in aluminum for aluminum clamps or stainless steel for brass clamps on copper roofing.

   Each system should be reviewed by a qualified licensed professional who understands wind effects on metal roof design and construction prior to purchase and installation.

5. Data Acquisition Server shall provide high performance and low cost for:
   a. Demand response programs
   b. Benchmarking building operations performance
   c. Verification of energy savings and utility costs
   d. Cost allocation to department or tenants
   e. Internet based supervisory control outputs

   Applications include:
   a. Demand response program control and reporting
   b. Cost allocation to tenants and third parties
   c. Measurement and verification of energy savings
   d. Data center branch circuit monitoring
   e. Monitoring performance of building systems

   Installation is as follows:
   a. “Flex” I/O inputs provide easy connections for analog, pulse and resistance sensors

b. Integrated web server provides setup and configuration using any industry standard web browser.
c. Data Monitoring is to tie into existing HI-ARNG BACnet Energy Management Controls System Server.
d. Mapping must be done by authorized Automated Logic vendor.

Wireless connectivity option is as follows:
a. All data is stored at the site in nonvolatile memory, insuring protection of valuable information in the event of power loss
b. On-board ModHopper (R9120-x) for wireless RS 485 communications

6. A89DC-08 Solar Current Monitor with Modbus Output: Features of this monitor include:
   a. 8 non-contact Hall Effect current sensors provide ease of installation
   b. Modbus RTU RS 485 output for readings
   c. Real time readings of DC current levels for all DC generating devices.

   The A89DC-08 can be combined with additional Obvius products to provide a complete monitoring package for solar installations. Options include:
   a. Inverters with Modbus output
   b. ModHopper transceivers for wireless Modbus communications.

   Other features include:
   a. User-selectable options for detecting failed devices or panels.

J. Hardware, Supports, Backing, Etc.: All hardware, supports, backing, and other accessories necessary to install electrical equipment shall be provided. Wood materials shall be "wolmanized" treated against termites; iron or steel materials shall be galvanized for corrosion protection, and non-ferrous materials shall be brass or bronze. All wood screws shall be brass or galvanized steel.

K. Other Materials: All other materials not specifically described but required for a complete and operable electrical installation, shall be new, first quality of their respective kinds, and as selected by Contractor subject to approval by Contracting Officer.

PART 3 - EXECUTION

3.01 INSTALLATION AND WORKMANSHIP

A. Perform all work in accordance with equipment manufacturer's requirements and applicable NFPA standards. Install equipment and materials in a workmanlike manner conforming to recognized commercial standards.

B. Construction Methods:
   1. Comply with local ordinances and regulations of the County. Workmanship shall be subject to approval of Contracting Officer, who shall be afforded every opportunity to determine skill and competency. Concealed work re-opened at random during formal inspection by Contracting Officer without additional charge to the Owner.

2. Construction shall conform to construction practices as recommended by American Electricians Handbook by Croft (latest edition) Edison Electric Institute, National Electrical Code, National Electrical Safety Code and applicable instructions of manufacturers of equipment and materials supplied for project.

3.02 SURFACE CONDITIONS

A. Inspection: Prior to work of this section, carefully inspect installed work of other trades and verify that all such work is complete to point where this installation may properly commence.

B. Discrepancies: In event of discrepancy, immediately notify Contracting Officer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.03 PREPARATION

A. Coordination: Coordinate installation of electrical items with schedules for work of other trades to prevent unnecessary delays in total work. Where electrical items are shown in conflict with locations of structural members and mechanical or other equipment, furnish and install required supports and wiring to clear encroachments.

B. Accuracy of Data: The data indicated on drawings and in specifications are as exact as could be secured but their absolute accuracy is not guaranteed. Exact locations, distances, levels and other conditions will be governed by job decisions of Contracting Officer.

3.04 INSTALLATION OF RACEWAYS AND FITTINGS

A. All wiring for branch circuits shall be installed in conduit except as noted.

B. All conduits within building interior shall be rigid steel conduits or electrical metallic tubing. Electrical metallic tubing may be above floor. Paint steel conduits in or under ground floor slabs with asphaltic corrosion resistance base paint or compound.

C. Conduits shall be of ample size to allow drawing in or removing of wires and cables without undue strain and suitable bushings shall be installed on each end of every run of conduit where wires are installed.

D. Conduit system shall be continuous from outlet to outlet or fitting to fitting so that electrical continuity is obtained between all conduits of the system.

E. Cut raceways square, and ream inner edges. Adjoining lengths shall butt together evenly in couplings to provide passage for installing conductors. Factory threads shall be cleaned with die before installation of conduit. Use of running threads not permitted. Where conduits cannot be joined by standard threaded couplings, approved watertight conduit unions shall be used.

F Bends, offsets, and crossing of conduits shall be avoided wherever possible. When necessary make bends and offsets with hickey or conduit bending machine. Do not use vise or pipe tee. Flattened or crushed conduit shall not be

acceptable. Bends made so that interior cross-sectional area will not be reduced. Radius of curve of inner edge of field bend shall be not less than ten times internal diameter of raceway.

G. Cap raceways during construction with plastic or metal-capped bushings to prevent entrance of dirt or moisture. Swab all raceways out and dry before wires or cables are pulled in.

H. Mount raceway free from other pipes, valves, or mechanical equipment. Keep all conduits at least six inches away from the covering on hot water pipes, and 18" away from kitchen exhaust ducts.

I. Fish wires, cords, strings, chains or the like shall not be placed or inserted in the conduit system during installation of the conduits.

J. After conduit system has been installed, empty conduits shall be left with a nylon drag wire.

K. Install insulating bushings and two locknuts on each end of every run of conduit at enclosures and boxes. Provide grounding bushings as required to grounding receptacles and connect conduits to service ground, per NEC Article 250.

L. Run exposed raceways parallel with, or at right angles to structural or architectural elements.

M. Securely fasten raceways with galvanized pipe strap, with screws or bolts and spaced not more than 7 feet apart, or with approved beam clamps, or approved single or gang pipe hangers spaced not more than 7 feet apart, as conditions require. Vertical runs shall be supported at intervals not exceeding 5 feet by approved clamp hangers. Conduit runs with one 90-degree bend or equivalent, 150 feet maximum length without pullbox shall be permitted. Support raceways from structure. Do not support raceways from or on mechanical pipes, ducts or ceiling suspension wires.

3.05 INSTALLATION OF CONDUCTORS

A. Except for cables and wires otherwise called for, install all conductors in conduit, wireway or cable tray.

B. Color Coding: Wires shall be color-coded in accordance with requirements of the NEC.

C. Tag all feeders for identification.

D. Splicing:
   1. Wires shall be formed neatly in enclosures and boxes. Conductors, #10 and smaller shall be twisted and made secure with wirenut suitable for the purpose. Splice conductors #8 through #4/0 with high pressure compression (indent) copper sleeve connectors. Do not use bolt-on connectors.

   2. Insulate all splices with a minimum of two half-lapped layers of vinyl-plastic electrical tape where insulation is required.

3. Splice insulation shall be 200% in thickness of original wire insulation and of same electrical and mechanical characteristics.

E. Lubricants: Chemically neutral to insulation and sheath. Sherwin-Williams "flaxsoap." Apply liberally during pulling. Other means of lubricating allowed with written approval of Contracting Officer.

F. Pulling Conductors: Mechanical means for pulling to be torque limiting type and not to be used for No. 2 AWG and smaller wires. Pulling tensions shall not exceed manufacturer's recommendations. Form neatly in enclosure for minimum of cross-overs.

G. Communication System Wiring:
1. Above grade communication wiring may be run exposed and shall be adequately secured by straps or other approved methods. Wiring above the suspended (drop ceiling) shall be supported by J-hooks or other approved methods. Wiring shall NOT be laid on the suspended ceiling framing system. Installation of wiring shall conform to applicable EIA/ TIA standards.

2. Underground wiring shall be installed in new communications (telephone) raceways.

3.06 INSTALLATION OF OUTLET BOXES

A. Provide outlet boxes to suit conditions encountered. Provide outlet boxes in spaces with extension or raised rings of such depth that metal will be flush with surrounding surfaces of opening. When two or more switches are installed at single location, mount in gang box under single device plate. Close all unused knockouts and hubs.

3.07 GROUNDING

A. All metallic enclosures, raceways, and electrical equipment shall be grounded according to requirements of National Electrical Code, Article 250.

B. Service entrance, motors, metallic enclosures, raceways and electrical equipment grounded according to requirements of National Electrical Code, Article 250. At service entrance, install copper clad steel ground rods (number as required) to obtain ground to 25 ohms or less as measured by three-point potential method with electrical ground megger. Connect service entrance ground to building service entrance equipment via ground wire (size as per NEC Article 250-94) and nearest cold water pipe with No. 1/0 bare copper wire. Ground connection to equipment, raceways, motors, grounding type receptacles and other metallic parts directly exposed to ungrounded electric conductors by No. 12 AWG minimum, AWG copper, NEC type TW, green insulated. At water meter and "dielectric" union joints, install pipe clamps, Thomas & Betts Co. No. 3900 series, on both sides of meter on metallic pipes and connect together with No. 1/0 copper. Connection shall not interfere with installation or removal of water meter.
1. All grounding wire runs within buildings shall be in rigid steel conduits. Where practicable, all ground wires shall be run together with circuit conductors.

2. A No. 6 bare copper wire shall be used to connect ground to intercommunication cabinet. A four-foot slack of grounding wire shall be left in cabinet.

3.08 EQUIPMENT CONNECTIONS

A. Connect all photovoltaic equipment. Make power connections to equipment with short section of flexible conduit. Provide disconnect switches for all equipment as indicated on plans.

3.09 MISCELLANEOUS DETAILS

A. Cut, core and patch as required to install electrical system. Repair any surface damaged or marred by notching, coring or any other process necessary for installation of electrical work. Cutting, repairs and refinishing shall be subject to the approval of Contracting Officer. Need for remedial work determined by Contracting Officer as attributable to poor coordination and workmanship shall be cause for reconstruction to the satisfaction of the Contracting Officer, and at no cost to the Owner.

3.10 FINISHING

A. Patch, repair and restore all structural and architectural elements cut or drilled for installation of electrical system. Drilling, cutting, patching, repairing and restoring shall be finished by suitable trades subject to approval of Contracting Officer.

B. Attach electrical equipment to wood by wood screws, and attach to concrete by embedded or expansion inserts and bolts. Use power-driven charge with approval only. Close unused knock-outs on boxes or enclosures with metal cap. Powder actuated fasteners shall not be used on precast concrete. Do not use powder activated fasteners to attach enclosures and boxes to the building.

C. Wipe clean all exposed raceways and enclosures with rag and solvent. Prime painting and finishing of unfinished raceways and enclosures shall conform to PAINTING Section. Factory finished enclosures shall not be painted. Panelboard, switches, circuit breakers, junction boxes, and equipment shall be identified by stenciling with engraved plastic nameplates on cover or door. Voltage and phase shall be indicated on nameplates for panelboards, switches and circuit breakers.

D. Mark all control, communication wires and fire alarm wires with wire markers attached to conductors in all enclosures.

3.11 TESTING AND INSPECTIONS

A. After the installation has been completed, and at such time as Contracting Officer may direct, the Contractor shall conduct all tests required to secure approval of the installation from all agencies having jurisdiction. The equipment shall be demonstrated to operate in accordance with the requirements of this section of the specifications. The test shall be performed in the presence of the Contracting Officer representative. The Contractor shall furnish the necessary instruments and personnel required for the test, and the Owner will furnish the necessary electrical power.
   1. All wiring shall be tested to insure proper operation according to functions specified. All systems shall test free from short circuits and grounds, shall be

free from mechanical and electrical defects. All systems shall show proper neutral connections.

2. Interior installation, 600 volts and less shall be tested for insulation resistance after all wiring is completed and ready for connection to equipment. With a 500V megger, measure and record the insulation resistance from phase to phase, and phase to neutral. The above tests shall be witnessed by the Contracting Officer representative and resistances of feeder cables shall be recorded and four (4) copies submitted to Contracting Officer.

3. Proper operation of all electrical devices shall be demonstrated at request of University during final inspection.

4. Balance loading on each feeder.

5. Measure ground resistance at service equipment in the presence of the Contracting Officer representative. Submit four (4) copies of test results to Contracting Officer.

B. The Contractor shall retape splices which have been bared for inspection. The Electrical Contractor shall test all portions of the electrical system furnished by him for proper operation and freedom from accidental grounds. All tests shall be subject to the approval of the Owner.

C. Wherever test or inspection reveals faulty equipment or installation, the Contractor shall take corrective action, at his own expense repairing or replacing equipment or installation as directed.

D. If the Owner (or his representative) shall discover any of the following errors, the Contractor, at his own expense shall go over all similar portions of the entire job, taking the necessary or directed remedial action.
   1. Loose connections.

   2. Impaired clearance.

   3. Improper finish.

   4. Improper adjustment.

3.13 CLEAN UP

Upon completion of all installation, lamping and testing, thoroughly inspect all exposed portions of the electrical installation and completely remove all exposed labels, soil, markings and foreign material.

(See Attachment for
"Sample Net Energy Metering and Interconnection Agreement")

END OF SECTION

SAMPLE

APPENDIX II

NET ENERGY METERING AND INTERCONNECTION AGREEMENT (Greater Than 10 kW But Not More Than 100 kW)

This Net Energy Metering and Interconnection Agreement ("Agreement") is made on (DATE), and entered into by and between SOH Department of Defense, Hawaii Army National Guard ("Customer-Generator") and _____ ("Owner/Operator") and Hawaiian Electric Company, Inc. ("Company"), sometimes also referred to herein jointly as "Parties" or individually as "Party." This Agreement provides for Customer-Generator to interconnect and operate a Generating Facility in parallel with Company's distribution system. This Agreement is applicable only to Company's customers who satisfy all requirements of the definition of an "Eligible Customer-Generator" set forth in the Company's Rule 18 relating to net energy metering, and only to the Generating Facility described and installed at the location listed below. The Generating Facility may not be relocated or connected to Company's system at any other location without Company's express written consent. A description of the Generating Facility including a summary of its significant components shown in Exhibit A, (DESCRIPTION OF CUSTOMER-GENERATOR'S GENERATING FACILITY), Exhibit B, (GENERATING FACILITY OWNED BY THE CUSTOMER-GENERATOR OR THIRD PARTY OWNER) including a single line diagram and three-line diagram (if Generating Facility's Total Rated Capacity is greater than or equal to 30kW but not more than 100 kW) showing the general arrangement of how the Generating Facility and loads are interconnected with Company, and Exhibit C, (INTERCONNECTION FACILITIES OWNED BY THE COMPANY), are attached to and made a part of this Agreement.

Section 1. Permits and Licenses: Customer-Generator shall be responsible for the design, installation, operation, and maintenance of the Generating Facility and shall obtain at its expense, and maintain any required governmental authorizations and/or permits for the construction and operation of the Generating Facility. Customer-Generator shall not commence parallel operation of the Generating Facility until Company has provided written approval. Company shall provide such written approval within thirty (30) business days from Company's receipt of a copy of the final inspection or approval of the Generating Facility, which has been issued by the governmental authority having jurisdiction to inspect and approve the installation. Company's written approval shall not be unreasonably withheld. Company shall have the right to have its representatives present at the final inspection made by the governmental authority having jurisdiction to inspect and approve the installation of the Generating Facility. Customer-Generator shall be required to notify Company in accordance with the terms of Section 14, herein, at least five (5) business days prior to such inspection. Customer-Generator shall not add generation capacity in excess of the Total Rated Capacity set forth in Section 2 of this Agreement, or otherwise modify the Generating Facility without the prior written permission of Company. In no event may the Total Rated Capacity of the Generating Facility exceed 100 kW.

Section 2. Interconnection of Facilities: Pursuant to Rule 18, Paragraph B.2. of the Company's tariff, as authorized by the Public Utilities Commission of the State of Hawaii ("Commission"), Company will study and assess the projected interaction of Customer-Generator's Generating Facility with the

Company's system including a review of the equipment and devices required to permit Customer-Generator's Generating Facility to operate in parallel with and deliver electric energy to Company's system, such as, but not limited to, transmission lines, distribution lines, transformers, switches, relays, and circuit breakers.

A. Facilities: (1) For the purposes of this Agreement, the "Generating Facility" is defined as the equipment and devices, and associated appurtenances, owned by the Customer-Generator or leased by the Customer-Generator, which produce electric energy for use by the Customer-Generator and are to be interconnected and operated in parallel with the Company's system.

(2) The Customer-Generator shall furnish, install, operate and maintain, at its cost, the interconnection facilities (such as circuit breakers, relays, switches, synchronizing equipment, monitoring equipment, and control and protective devices and schemes) identified in Exhibit B hereto ("Customer-Generator Interconnection Facilities").

(3) The point of interconnection is shown on the single-line diagram and three-line diagram (provided by the Customer-Generator and reviewed by the Company) which are attached to Exhibit B (provided that the three-line diagram is not required if the Generating Facility's Total Rated capacity is less than 30 kW).

(4) The Customer-Generator agrees to test the Generating Facility, to maintain operating records, and to follow such operating procedures, as may be specified by the Company to protect the Company's system from damages resulting from the parallel operation of the Generating Facility, including such testing, records and operating procedures as more fully described in Exhibit B attached hereto and made a part hereof.

(5) The Company may inspect the Generating Facility, as more fully described in Exhibit B.

B. Interconnection Facilities Owned by the Company: The Company agrees to furnish, install, operate and maintain such interconnection facilities on its side of the point of interconnection with the Generating Facility as required for parallel operation with the Generating Facility and as more fully described in Exhibit C attached hereto and made a part hereof ("Company Interconnection Facilities"). All such interconnection facilities shall be the property of the Company. Where portions of the Company Interconnection Facilities are located on the Customer-Generator's premises, the Customer-Generator shall provide, at no expense to the Company, a suitable location for and access to all such equipment. If a 120/240 Volt power source or sources are required, the Customer-Generator shall provide these at no expense to the Company.

C. Customer-Generator Payments: The Customer-Generator agrees to pay to the Company a non-refundable contribution for the Company's investment in the interconnection facilities described in Exhibit C, subject to the terms and conditions included in Exhibit C, and to pay for other interconnection costs. The interconnection costs will not include the cost of an initial technical screening of the impact of the Generating Facility on the Company's system, but will include the actual cost (or such lesser amount as the Company may specify to facilitate the processing of interconnection requests for similarly situated facilities) of additional technical study for the Generating Facility.

Section 3. Installation: Design, installation, operation and maintenance of the Generating Facility shall include appropriate control and protection equipment, including an automatic load-break device such as a circuit breaker or inverter and a manual disconnect device that has a visible break to isolate the Generating Facility from the Company's system. The manual disconnect device must be accessible by the Company and be capable of being locked by the Company in the open position, to establish working clearance for maintenance and repair work in accordance with the Company's safety rules and practices. The disconnect devices shall be furnished and installed by the Customer-Generator and are to be connected between the Generating Facility and the Company's electric system. The disconnect devices shall preferably be located in the immediate vicinity of the electric meter serving the Customer-Generator. With permission of the Company, the disconnect devices may be located at an alternate location which is accessible to the Company on a 24-hour basis. The manual disconnect device shall be clearly labeled "Customer-Generator System Disconnect".

The Customer-Generator grants access to the Company to utilize the disconnect device, if needed. The Customer-Generator shall obtain the authorization from the owner and/or occupants of the premises where the Generating Facility is located that allows the Company to access the Generating Facility for the purpose specified in this Agreement. Company may enter premises where the Generating Facility is located at all reasonable hours without notice to Customer-Generator for the following purposes: (a) To inspect Generating Facility's protective devices and read or test meter(s); and (b) to disconnect the Generating Facility and/or service to Customer-Generator, whenever in Company's sole opinion, a hazardous condition exists and such immediate action is necessary to protect persons, Company's facilities, or property of others from damage or interference caused by the Generating Facility, or the absence or failure of properly operating protective device.

Section 4. Metering: The Company will supply, own, and maintain all necessary meters and associated equipment utilized for billing. The meters will be tested and read in accordance with the rules of the Commission and the Company. The Customer-Generator shall, at its expense, provide, install and maintain all conductors, service switches, fuses, meter sockets, meter instrument transformer housing and mountings, switchboard meter test buses, meter panels and similar devices required for service connection and meter installations on the Customer-Generator's premises in accordance with the Company's Rule 14, Section A.2. Company may, at its expense, install meter(s) to record the flow of electric power in each direction.

Section 5. Indemnification:

(a) The Customer-Generator shall indemnify, defend and hold harmless the Company and its officers, directors, agents and employees, from and against all liabilities, damages, losses, fines, penalties, claims, demands, suits, costs and expenses (including reasonable attorney's fees and expenses) to or by third persons, including the Company's employees or subcontractors, for injury or death, or for injury to property, arising out of the actions or inactions of the Customer-Generator (or those of anyone under its control or on its behalf) with respect to its obligations under this Agreement, and/or arising out of the installation, operation and maintenance of the Generating Facility and/or the Customer-Generator Interconnection Facilities, except to the extent that such injury, death or damage is attributable to the

gross negligence or intentional act or omission of the Company or its officers, directors, agents or employees.

(b) The Company shall indemnify, defend and hold harmless the Customer-Generator, and its officers, directors, agents and employees, from and against all liabilities, damages, losses, fines, penalties, claims, demands, suits, costs and expenses (including reasonable attorney's fees and expenses) to or by third persons, including the Customer-Generator's employees or subcontractors, for injury or death, or for injury to property, arising out of the actions or inactions of the Company (or those of anyone under its control or on its behalf) with respect to its obligations under this Agreement, and/or arising out of the installation, operation and maintenance of the Company Interconnection Facilities, except to the extent that such injury, death or damage is attributable to the gross negligence or intentional act or omission of the Customer-Generator or its officers, directors, agents or employees.

(c) Nothing in this Agreement shall create any duty to, any standard of care with reference to, or any liability to any person not a party to it.

Provided, however, where the Customer-Generator is an agency of the United States, the United States understands that it may be held liable for loss, damages expense and liability to third persons and injury to or death of persons or injury to property caused by the United States in its engineering design, construction ownership or operations of, or the making of replacements, additions betterment to, or by failure of, any of such party's works or facilities used in connection with this Agreement to the extent allowed by the Federal Tort Claims Act 28 U.S.C. § 2671 et seq. and the Contract Disputes Act of 1978, 41 U.S.C. §§ 601-613.

Company shall be responsible for damages or injury caused by Company, Company's agents, officers, and employees in the course of their employment to the extent permitted by law.

Provided, however, where the Customer-Generator is an agency of the State of Hawaii (the "State"), the State shall be responsible for damages or injury caused by the State's agents, officers, and employees in the course of their employment to the extent that the State's liability for such damage or injury has been determined by a court or otherwise agreed to by the State. The State shall pay for such damage and injury to the extent permitted by law. The State shall use reasonable good faith efforts to pursue any approvals from the Legislature and the Governor that may be required to obtain the funding necessary to enable the State to perform its obligations or cover its liabilities hereunder. The State shall not request Company to indemnify the State for, or hold the State harmless from, any claims for such damages or injury.

Company shall be responsible for damages or injury caused by Company, Company's agents, officers, and employees in the course of their employment to the extent that Company's liability for such damage or injury has been determined by a court or otherwise agreed to by Company, and Company shall pay for such damage and injury to the extent permitted by law. Company shall not request the State to indemnify Company for, or hold Company harmless from, any claims for such damages or injury.

[FOR OWNER / OPERATOR OTHER THAN STATE AGENCY]

The Owner/Operator shall indemnify, defend and hold harmless the Company and its officers, directors, agents and employees, from and against all liabilities, damages, losses, fines, penalties, claims, demands, suits, costs and expenses (including reasonable attorney's fees and expenses) to or by third

persons, including the Company's employees or subcontractors, for injury or death, or for injury to property, arising out of the actions or inactions of the Owner/Operator (or those of anyone under their control or on their behalf) with respect to their obligations under this Agreement, and/or arising out of the installation, operation and maintenance of the Facility and/or the Facility Parties Interconnection Facilities, except to the extent that such injury, death or damage is attributable to the gross negligence or intentional act or omission of the Company or its officers, directors, agents or employees.

Section 6. Insurance: The Customer-Generator shall, at its own expense and during the term of the Agreement and any other time that the Generating Facility is interconnected with the Company's system, maintain in effect with a responsible insurance company authorized to do insurance business in Hawaii, the following insurance or its equivalent at Company's discretion that will protect the Customer-Generator and the Company with respect to the Generating Facility, the Generating Facility's operations, and the Generating Facility's interconnection with the Company's system:
A commercial general liability policy, covering bodily injury and property damage combined single limit of at least the following amounts based on the Total Rated Capacity of the generator (for solar systems—Total Rated Capacity of the generator or inverter, whichever is lower, can be used with appropriate technical documentation on inverter, if not higher Total Rated Capacity will be used) as indicated in Exhibit A, Section 3, for any occurrence.

Commercial General Liability Coverage Amount	Total Rated Capacity of the Net Energy Metering Facility
$1,000,000	Greater than 30 kW and less than or equal to 100 kW
$500,000	Greater than 10 kW and less than or equal to 30 kW

The Customer-Generator has responsibility to determine if higher limits are desired and purchased. Said insurance shall name the Company, its directors, officers, agents, and employees as additional insureds, shall include contractual liability coverage for written contracts and agreements including this Agreement, shall include provisions stating that the insurance will respond to claims or suits by additional insureds against the Customer-Generator or any other insured thereunder, and shall be non-cancelable and non-alterable without thirty (30) days prior written notice to the Company. "Claims made" policies are not acceptable, unless the Customer-Generator agrees to maintain coverage in full effect at all times during the term of this Agreement and for THREE (3) years thereafter. The adequacy of the coverage afforded by the required insurance shall be subject to review by the Company from time to time, and if it appears in such review that risk exposures require an increase in the coverages and/or limits of this insurance, the Customer-Generator shall make such increase to that extent and any increased costs shall be borne by the Customer-Generator. The insurance required hereunder shall provide that it is primary with respect to the Customer-Generator and the Company. The Customer-Generator shall provide evidence of such insurance, including insurer's acknowledgement that coverage applies with respect to this Agreement, by providing certificates of insurance to the Company within 30 days of any change. Initially, certificates of insurance must be provided to the Company prior to executing the Agreement and any parallel interconnection. The Customer-Generator's indemnity and

other obligations shall not be limited by the foregoing insurance requirements. Any deductible shall be the responsibility of the Customer-Generator.
Alternatively, to the extent applicable, as a governmental entity, Customer-Generator may elect to be self-insured for the amounts set forth above in lieu of obtaining insurance coverage to those levels from an insurance company.

Section 7. Continuity of Service: The Company may require the Customer-Generator to temporarily curtail, interrupt or reduce deliveries of energy: (a) when necessary in order for the Company to construct, install, maintain, repair, replace, remove, investigate or inspect any of its equipment or any part of its system; or (b) if the Company determines that such curtailment, interruption or reduction is necessary because of a system emergency, forced outage, or compliance with good engineering practices. Whenever feasible, Company shall give Customer-Generator reasonable notice of the possibility that interruption or reduction of deliveries may be required.
In any such event, the Company shall not be obligated to accept any energy from the Generating Facility except for such energy that the Company notifies the Customer-Generator that it is able to take during this period due to the aforesaid circumstances. The Company shall take all reasonable steps to minimize the number and duration of interruptions, curtailments or reductions.

Section 8. Personnel and System Safety: If at any time the Company determines that the continued operation of the Generating Facility may endanger any person or property, the Company's electric system, or have an adverse effect on the safety or power quality of other customers, the Company shall have the right to disconnect the Generating Facility from the Company's electric system. The Generating Facility shall remain disconnected until such time as the Company is satisfied that the endangering or power quality condition(s) has been corrected, and the Company shall not be obligated to accept any energy from the Generating Facility during such period. The Company shall not be liable directly or indirectly for permitting or continuing to allow an attachment of the Generating Facility for the acts or omissions of the Customer-Generator that cause loss or injury, including death, to any third party.

Section 9. Prevention of Interference: The Customer-Generator shall not operate equipment that superimposes a voltage or current upon the Company's system that interferes with the Company's operations, service to the Company's customers, or the Company's communication facilities. Such interference shall include, but not be limited to, overcurrent, voltage imbalance, and abnormal waveforms. If such interference occurs, the Customer-Generator must diligently pursue and take corrective action at its own expense after being given notice and reasonable time to do so by the Company. If the Customer-Generator does not take timely corrective action, or continues to operate the equipment causing interference without restriction or limit, the Company may, without liability, disconnect the Customer-Generator's equipment from the Company's system.

Section 10. Limitation of Liability: Neither by inspection, if any, or non-rejection, nor in any other way, does the Company give any warranty, express or implied, as to the adequacy, safety, or other characteristics of any structures, equipment, wires, appliances or devices owned, installed or maintained by the Customer-Generator or leased by the Customer-Generator from third parties, including without limitation the Generating Facility and any structures, equipment, wires, appliances or devices appurtenant thereto.

Section 11. Additional Information: The Company reserves the right to require additional information, where necessary, to serve the Customer-Generator under net energy metering service.

Section 12. Notice: The Customer-Generator shall provide the Company with an advance 30-day written notice of any proposed change in ownership of the Generating Facility. The Customer-Generator agrees that no material changes or additions to the Generating Facility (except with respect to a change in ownership of the Generating Facility) as reflected in the single-line diagram, relay list, trip scheme and settings of the Generating Facility, Generating Facility Equipment List, and three-line diagram (if the Generating Facility's capacity is greater than or equal to 30 kW), shall be made without having obtained prior written consent from the Company, which consent shall not be unreasonably withheld. In no event may the Total Rated Capacity of the Generating Facility exceed 100 kW. If a Generating Facility changes ownership, the Company may require the new owner to complete a new Net Energy Metering Agreement. Any notice required under this Agreement shall be in writing and mailed at any United States Post Office with postage prepaid and addressed to the Party, or personally delivered to the Party, at the address below. Changes in such designation may be made by notice similarly given. All written notices shall be directed as follows:

Customer-Generator

SOH Department of Defense, Hawaii Army National Guard

4087 Diamond Head Rd.

Honolulu, HI 96816-4413

Company

Hawaiian Electric Company, Inc. (HECO) / Net Energy Metering (CP10-SR)

PO Box 2750

Honolulu, HI 96840-0001

Section 13. Term: This agreement shall become effective upon execution by the Customer-Generator and the Company and shall continue in effect on a month-to-month basis, unless terminated by either party on 30 days' written notice in accordance with Section 14. The Customer-Generator may terminate the agreement at any time. Company may terminate the agreement at any time if the Customer-Generator fails to comply with any and all terms of this agreement or meet the definition of Eligible Customer-Generator under the Company's Rule 18 relating to Net Energy Metering. This Agreement shall terminate, without notice, upon: (a) termination of the electric service provided to Customer-Generator by Company; or (b) changes to Customer-Generator's electric load which cause Customer-Generator to no longer satisfy all requirements of the definition of an Eligible Customer-Generator set forth in the Company's Rule 18 relating to Net Energy Metering.

Section 14. Governing Law: This Agreement was executed in the State of Hawaii and must in all respects be interpreted, governed, and construed under the laws of the State of Hawaii. This Agreement is subject to, and the parties' obligations hereunder include, operating in full compliance with all valid, applicable federal, state, and local laws or ordinances, and all applicable rules, regulations, orders of, and tariffs approved by, duly constituted regulatory authorities having jurisdiction.

Section 15. Amendment, Modifications, or Waiver: This Agreement may not be altered or modified by either of the Parties, except by an instrument in writing executed by each of them. None of the provisions of this Agreement shall be considered waived by a Party unless such waiver is given in writing. The failure of a Party to insist in any one or more instances upon strict performance of any of the provisions of this Agreement or to take advantage of any of its rights hereunder shall not be construed as a waiver of any such provisions or the relinquishment of any such rights for the future, but the same shall continue and remain in full force and effect. This Agreement shall supersede any existing agreement under which Customer-Generator is currently operating the Generating Facility identified in Section 2, herein, and any such agreement shall be deemed terminated as of the date this Agreement becomes effective. This Agreement contains the entire agreement and understanding between the Parties, their agents, and employees as to the subject matter of this Agreement. Each party also represents that in entering into this Agreement, it has not relied on any promise, inducement, representation, warranty, agreement or other statement not set forth in this Agreement.

Section 16. Limitations: Nothing in this Agreement shall limit the Company's ability to exercise its rights or expand or diminish its liability with respect to the provision of electrical service pursuant to the Company's Tariff as filed with the Commission, or the Commission's Standards for Electric Utility Service in the State of Hawaii, which currently are included in the Commission's General Order Number 7, as either may be amended from time to time.

Section 17. Certification by Licensed Electrical Contractor: Generating and interconnection systems must comply with all applicable safety and performance standards of the National Electrical Code (NEC), Institute of Electrical and Electronic Engineers (IEEE), and accredited testing laboratories such as the Underwriters Laboratories (UL), and where applicable, the rules of the Commission, or other applicable governmental laws and regulations, and the Company's interconnection requirements, in effect at the time of signing this agreement. This requirement shall include, but not be limited to, the interconnection provisions of Company's Rule 14, Paragraph H. of the Company's tariff, as authorized by the Commission. Licensed Electrical Contractor, as agent for Customer-Generator, certifies in Exhibit A that the proposed Generating Facility will meet all preceding requirement(s).

Section 18. Net Energy Metering and Billing:

A. General:

(1) The net energy metering and billing arrangement covered by the Net Energy Metering Agreement shall be governed by the Company's Rule 18, as may be amended, revised and/or updated from time to time. If there is a conflict between any provision in the Net Energy Metering Agreement and the Company's Rule 18, as may be amended, revised and/or updated, the provisions of the Company's Rule 18 shall control.

(2) Customer-Generator's with Net Energy Metering service, pursuant to the Company's Rule 18, shall be billed monthly for the billing period, in accordance with the Company's Rule 8. Every 12 months, a reconciliation of the Customer-Generator's net energy consumption supplied by the Company with the net energy produced by the Generating Facility for that 12-month period will be performed as described in Section C.5. of the Company's Rule 18.

(3) For Customer-Generators with existing Net Energy Metering service, the measurement of kilowatthours supplied by the Company and the kilowatthours produced by the Customer-Generator for the first bill of the initial 12-month period under 2005 Haw. Sess. Laws Act 104 (effective July 1, 2005) shall begin at the start date of the billing period following the effective date of the Company's Rule 18. For all other Customer-Generators requesting Net Energy Metering service, the measurement of kilowatthours supplied by the Company and the kilowatthours produced by the Customer-Generator for the first bill of the initial 12-month period shall begin on the start date of the first billing period after the installation of the required meter(s).

B. Net Electricity Producer:

(1) When the electricity produced by the Generating Facility during a billing period exceeds the electricity supplied by the Company for the same period, the Customer-Generator is deemed to be a net electricity producer.

(2) In a billing period when the Customer-Generator is deemed to be a net electricity producer, the Customer-Generator will not be billed for the kilowatthours supplied by the Company during that billing period. For billing purposes, the Customer-Generator shall instead be charged the Minimum Charge provided in the applicable rate schedule in effect during the billing period.

(3) The excess kilowatthours produced by the Customer-Generator in each billing period, shall be carried over to the next billing period(s) within the current 12-month period, as a monetary credit and applied only to the Energy Charge, plus adjustments applicable to the Energy Charge, as well as adjustments based on kWh consumption, if any, for the Customer-Generator's net kilowatthour consumption in the succeeding billing period within the current 12-month period. Adjustments applicable to the Energy Charge include the Power Factor Adjustment, the Supply Voltage Delivery Adjustment, the IRP Cost Recovery Adjustment, Temporary Rate Adjustment and other similar adjustments applicable to the Energy Charge that are in effect. Adjustments based on kWh consumption include the Energy Cost Adjustment, the Residential DSM Adjustment, the Commercial & Industrial DSM Adjustment and other similar adjustments based on kWh consumption that are in effect. When the Customer-Generator is billed the Minimum Charge in any billing period, the Customer-Generator's cumulative net monetary credit shall <u>not</u> be applied to the Minimum Charge.

(4) The Customer-Generator's cumulative net monetary credit shall also not be applied to the Demand Charge, Customer Charge, adjustments applicable to the Demand and Customer Charges and other similar rate adjustments applicable to the Demand and Customer Charges that are in effect. See Section C.3. (a-e) of the Company's Rule 18 for the determination of monetary credit as applicable to the Customer-Generator's rate schedule.

C. Net Electricity Consumer:

(1) When the electricity supplied by the Company to the Customer-Generator during a billing period exceeds the electricity produced by the Generating Facility for the same period, and also exceeds any unused cumulative credits for excess electricity supplied by the Customer-Generator carried over from the prior months since the last 12-month reconciliation period, the Customer-Generator is deemed to be a net electricity consumer.

(2) For billing purposes, the Customer-Generator shall be charged for the excess kilowatthours supplied by the Company based on the applicable rate schedule in effect during the billing period. The payment for excess kilowatthours supplied by the Company, however, will take into consideration any unused cumulative credits to the extent provided for in Section C.3. of the Company's Rule 18.

(3) In a billing period in which the Customer-Generator is deemed to be a net electricity consumer, the Customer-Generator will also be billed for other applicable charges, base rate adjustments and non-base rate adjustments, to the extent the amount exceeds the Minimum Charge; if such amount does not exceed the Minimum Charge, the Customer-Generator will be billed the Minimum Charge, plus any rate adjustment that may apply to the Minimum Charge.

(4) The kilowatthours supplied by the Company and the kilowatthours produced by the Customer-Generator for each billing period shall be recorded in each billing period of the 12-month period. Coincident with the last bill of the 12-month period following the start date of the Customer-Generator's billing under the Net Energy Metering contract, and for each 12-month period thereafter, the (i) Energy Charge plus adjustments applicable to the Energy Charge and adjustments based on kWh consumption, less any monetary credits applied during the 12-month period for net kilowatthours produced by the Customer-Generator ("Remaining Energy Charge Balance"), and (ii) the available cumulative credit balance (i.e., cumulative net monetary credit for net kilowatthours produced by the Customer-Generator for the 12-month period remaining after the subtraction of the monetary credits previously credited to the Customer-Generator during the 12-month period for net kilowatthours produced by the Customer-Generator) will be compared to determine whether the Customer-Generator is entitled to a refund of remaining Energy Charges plus adjustments applicable to the Energy Charge and adjustments based on kWh consumption. If the available cumulative credit balance equals, or exceeds the Remaining Energy Charge Balance, the Remaining Energy Charge Balance will be refunded. If the Remaining Energy Charge Balance is greater than the available cumulative credit balance at the end of the 12-month period, the amount of the refund will be capped at the available cumulative credit balance.

(5) The Energy Charge shall include the Customer-Generator's Energy Charge for each billing period within the 12-month period, plus adjustments applicable to the Energy Charge and adjustments based on kWh consumption, except for those billing periods when the Customer-Generator was billed the Minimum Charge provided in the applicable rate schedule. Any monetary credits for excess kilowatthours produced by the Customer-Generator that remain unused at the end of each 12-month period shall expire and not be carried over to the next 12-month period. The Customer-Generator shall not be compensated for such excess kilowatthours produced by the Customer-Generator unless the Company enters into a purchase power agreement with the Customer-Generator.

D. Other:

(1) If a Customer-Generator terminates its Net Energy Metering service under Rule 18 prior to the end of any 12-month period, the Company shall reconcile the Energy Charge plus adjustments applicable to the Energy Charge and adjustments based on kWh consumption, less monetary credits previously applied, to the cumulative credit balance at the end of the billing period when service was terminated, similar to the reconciliation that would have been performed at the end of the normal 12-month period.

(2) The kilowatthours supplied by the Company and, if any, the kilowatthours produced by the Customer-Generator, including an accounting of the cumulative monetary credits for the excess kilowatthours produced by the Customer-Generator since the last 12-month period reconciliation, the credits applied in each billing period of the current 12-month period and the remaining unused credits, if any, will be included in the Customer-Generator's regular billing statement.

SIGNATURES:

IN WITNESS WHEREOF, the Parties hereto have caused two originals of this Agreement to be executed by their duly authorized representatives. This Agreement is effective as of the latter of the two dates set forth below.

CUSTOMER-GENERATOR		**HAWAIIAN ELECTRIC COMPANY, INC.**	
By:	_____	By:	_____
Name:	_____	Name:	_____
Title:	_____	Title:	_____
Date:	_____	Date:	_____

OWNER/OPERATOR OF GENERATING FACILITY

By:	_____
Name:	_____
Title:	_____
Date:	_____

EXHIBIT A

DESCRIPTION OF GENERATING FACILITY
(To Be Filled Out By Customer-Generator)

Section 1, Applicant Information

Customer-Generator

Name: SOH Department of Defense, Hawaii Army National Guard

Mailing Address: 4087 Diamond Head Rd

City: Honolulu State: Hawaii Zip Code: 96816-4413

Telephone (Daytime): Area Code _____ Number _____ (Evening) Area Code _____ Number _____

Generating Facility Location (if different from above)/Tax Map Key: (1) 3-1-042:040

Electric Service Account or Meter #: PX00529459

Owner (if different from Customer-Generator)

Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone (Daytime): Area Code _____ Number _____ (Evening) Area Code _____ Number _____

Operator (if different from Customer-Generator)

Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone (Daytime): Area Code _____ Number _____ (Evening) Area Code _____ Number _____

Section 2, Generator Qualifications

Type of Generating Facility or Nonfossil Fuel Source

[✓] Solar [ ] Wind [ ] Hydro

[ ] Biomass [ ] Hybrid System (consisting of 2 or more other types of systems)

Maximum Site Load without Generation: 95.1 kW

Maximum Generating Capability: 52.5 (STC) kW

Minimum Site Load without Generation: 44.5 kW

Maximum Export: 43 (STC) kW

Section 3, Generator Technical Information

Type of Generator: ☐ Synchronous ☐ Induction ☑ DC Generator or Solar with Inverter

Generator (or solar collector) Manufacturer, Model Name & Number: Suntech #STP250S-20/Wd, Quantity 210
(A copy of Generator Nameplate and Manufacturer's Specification Sheet may be substituted)

.225 kW (PTC) x 210 = 47.25 kW

Total Capacity Rating in kW (for solar kW_{DC}): 47.25 kW (PTC)

Inverter Manufacturer, Model Name & Number (if used): AR (Advanced Energy) PVP-50kW
(A copy of Inverter Nameplate and Manufacturer's Specification Sheet may be substituted)

50 kW x .96 (CEC) = 48 kW

Rating in kW: 48 kW

Energy Storage Device Capacity (if used):

Rating in kW: _____

Fault Current Contribution of Generator: _____ Amps

[If generator type is DC Generator or Solar with Inverter, example – photovoltaic (PV) system, go to Section 5.]

Section 4, Technical Information for Synchronous and Induction Generators

Number of Starts Per Day: _____ Maximum Starting kVA: _____
Generator Operating Power Factor:_____
Generator Grounding Method:

☐ Effectively Grounded ☐ Resonant Grounded
☐ Low-Inductance Grounded ☐ High-Resistance Grounded
☐ Low-Resistance Grounded ☐ Ungrounded

Generator Characteristic Data
(Not needed if Generator Nameplate and Manufacturer's Specification Sheet are provided)

Direct Axis Synchronous Reactance, X_d: _____ P.U. Negative Sequence Reactance: _____ P.U.
Direct Axis Transient Reactance, X'_d: _____ P.U. Zero Sequence Reactance: _____ P.U.
Direct Axis Subtransient Reactance, X''_d: _____ P.U. KVA Base: _____
Inertia Constant, H: _____ P.U.
Excitation Response Ratio: _____
Direct Axis Open-Circuit Transient Time Constant, X_d: _____ Seconds

Direct Axis Open-Circuit Subtransient Time Constant, T"do: _____ Seconds

Section 5, Interconnecting Equipment Technical Data

Will an interposing transformer be used between the generator and the point of interconnection? ☐ Yes ☑ No

Transformer Data (if applicable):
(A copy of transformer Nameplate and Manufacturer's Test Report may be substituted)

Size: _____ KVA. Transformer Primary: _____ Volts ☐ Delta ☐ Wye ☐ Wye Grounded

Transformer Secondary: _____ Volts ☐ Delta ☐ Wye ☐ Wye Grounded

Transformer Impedance: _____ % on _____ KVA Base

Transformer Fuse Data (if applicable):
(Attach copy of fuse manufacturer's Minimum Melt & Total Clearing Time-Current Curves)

At ☐ Primary Voltage ☐ Secondary Voltage

Manufacturer: _____ Type: _____ Size: _____ Speed: _____

Transformer Protection (if not fuse):

Please describe: _____

Generator Circuit Breaker (if applicable):
(A copy of circuit breaker's Nameplate and Specification Sheet may be substituted)

Manufacturer: _____ Type: _____

Continuous Load Rating: _____ **(Amps)** Interrupting Rating: _____ **(Amps)** Trip Speed: _____ **(Cycles)**

Circuit Breaker Protective Relays (if applicable):
(Enclose copy of any proposed Time-Overcurrent Coordination Curves)

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Current Transformer Data (if applicable):
(Enclose copy of Manufacturer's Excitation & Ratio Correction Curves)

Manufacturer: _____ Type: _____ Accuracy Class: _____ Proposed Ratio Connection: _____ /5

Manufacturer: _____ Type: _____ Accuracy Class: _____ Proposed Ratio Connection: _____ /5

Generator Disconnect Switch:

A generator disconnect device (isolation device) must be installed with features as described in the "HECO, HELCO, MECO Distributed Generating Facility Interconnection Standards, Technical Requirements" as set forth in Rule 14 (Paragraph H.1) of the Company's tariff, and which is accessible to Company.

Manufacturer: _____ Type: _____ Catalog No.: _____ Rated Volts: _____ Rated Amps: _____

Single or 3 Phase: _____ Mounting Location: _____

Section 6, General Technical Information

Enclose copy of site single-line diagram showing configuration and interconnection of all equipment, current and potential circuits and protection and control schemes.

Is Single-Line Diagram Enclosed? Yes ☑

Enclose copy of site relay list and trip scheme, which shall include all protection, synchronizing and auxiliary relays that are required to operate the Generating Facility in a safe and reliable manner.

Are Relay List and Trip Scheme Enclosed? Yes ☑

Enclose copy of site three-line diagram (if the Generating Facility's capacity is greater than or equal to 30 kW) showing potential transformer and current transformer ratios, and details of the Generating Facility's configuration, including relays, meters, and test switches.

Is Three-Line Diagram Enclosed? Yes ☑

Section 7, Installation Details

Installing Electrical Contractor: _____ Firm: _____ License No.: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone: Area Code: _____ Number: _____

Installation Date: _____ Interconnection Date: _____

Supply certification that the generating system has been installed and inspected in compliance with the local Building/Electrical code of the county of _____

Generating System Building Permit # (Certificate of Completion or Notice of Electrical Inspection?): _____

Signed (Inspector): _____ Date: _____

(In lieu of signature of Inspector, a copy of the final inspection certificate may be attached)

Section 8, Generator/Equipment Certification

Generating systems that utilize inverter technology must be compliant with *Institute of Electrical and Electronics Engineers IEEE Std 1547* and *Underwriters Laboratories UL 1741* in effect at the time this Agreement is executed. Generating systems that use a rotating machine must be compliant with applicable National Electrical Code, Underwriters Laboratories, and Institute of Electrical and Electronics Engineers standards and rules and orders of the Public Utilities Commission of the State of Hawaii in effect at the time this Agreement is executed**. By signing below, the Applicant certifies that the installed generating equipment meets the appropriate preceding requirement(s) and can supply documentation that confirms compliance.**

Signed (Customer-Generator): _____ Date: _____

Section 9, Insurance

Insurance Carrier: _____

EXHIBIT B

GENERATING FACILITY OWNED BY THE CUSTOMER-GENERATOR OR THIRD PARTY OWNER

(To Be Filled Out by Customer-Generator)

1. Generating Facility

a. Compliance with laws and standards. The Generating Facility, Generating Facility design, and Generating Facility design drawings shall meet all applicable national, state, and local laws, rules, regulations, orders, construction and safety codes, and shall satisfy the Company's Distributed Generating Facility Interconnection Standards, Technical Requirements ("Interconnection Standards"), as set forth in Rule 14, Paragraph H.1 of the Company's tariff.

b. Avoidance of adverse system conditions. The Generating Facility shall be designed, installed, operated and maintained so as to prevent or protect against adverse conditions on the Company's system that can cause electric service degradation, equipment damage, or harm to persons, such as:

(i) Unintended islanding.

(ii) Inadvertent and unwanted re-energization of a Company dead line or bus.

(iii) Interconnection while out of synchronization.

(iv) Overcurrent.

(v) Voltage imbalance.

(vi) Ground faults.

(vii) Generated alternating current frequency outside of permitted safe limits.

(viii) Voltage outside permitted limits.

(ix) Poor power factor or reactive power outside permitted limits.

(x) Abnormal waveforms.

c. Specification of protection, synchronizing and control requirements. The Customer-Generator shall provide the design drawings, operating manuals, manufacturer's brochures/instruction manual and technical specifications, manufacturer's test reports, bill of

material, protection and synchronizing relays and settings, and protection, synchronizing, and control schemes for the Generating Facility to the Company for its review, and the Company shall have the right to specify the protection and synchronizing relays and settings, and protection, synchronizing and control schemes that affect the reliability and safety of operation and power quality of the Company's system with which the Generating Facility is interconnected ("Facility Protection Devices/Schemes"). After the implementation of the protection and synchronizing relays and settings, and protection, synchronizing and control schemes, the Company may require changes in the protection and synchronizing relays and settings, and protection, synchronizing and control schemes, when required by the Company's system operations, at the Company's expense.

d. Generating Facility protection. The Customer-Generator is solely responsible for providing adequate protection for the Generating Facility.

e. Customer-Generator Interconnection Facilities.

(i) The Customer-Generator shall furnish, install, operate and maintain interconnection facilities (such as circuit breakers, relays, switches, synchronizing equipment, monitoring equipment, and control and protective devices and schemes) designated by or acceptable to the Company as suitable for parallel operation of the Generating Facility with the Company's system ("Customer-Generator Interconnection Facilities"). Such facilities shall be accessible at all times to authorized Company personnel.

(ii) The Customer-Generator shall comply with the Company's Interconnection Standards. If a conflict exists between the Interconnection Standards and this Agreement, this Agreement shall control.

(iii) 1) Single-line diagram of the Generating Facility, 2) relay list, trip scheme and settings of the Generating Facility, 3) Generating Facility Equipment List, and 4) three-line diagram (if the Generating Facility's capacity is greater than or equal to 30 kW), which identify the circuit breakers, relays, switches, synchronizing equipment, monitoring equipment, and control and protective devices and schemes, shall, after having obtained prior written consent from the Company, be attached to this Exhibit B and made a part hereof at the time the Agreement is signed. The single-line diagram shall include pertinent information regarding operation, protection, synchronizing, control, monitoring and alarm requirements. The single-line diagram and three-line diagram shall expressly identify the point of interconnection of the Generating Facility to the Company's system. The relay list, trip scheme and settings shall include all protection, synchronizing and auxiliary relays that are required to operate the Generating Facility in a safe and reliable manner. The three-line diagram shall show potential transformer and current transformer ratios, and details of the Generating Facility's configuration, including relays, meters, and test switches.

f. Approval of Design Drawings. If the Generating Facility's capacity is greater than or equal to 30 kW, the single-line diagram, relay list, trip scheme and settings of the Generating Facility, and three-line diagram shall be approved by a Professional Electrical Engineer registered in the State of Hawaii prior to being submitted to the Company. Such approval shall be indicated by the engineer's professional seal on all drawings and documents.

2. Verification Testing.

a. Upon initial parallel operation of the Generating Facility, or any time interface hardware or software is changed, a verification test shall be performed. A licensed professional engineer or otherwise qualified individual shall perform verification testing in accordance with the manufacturer's published test procedure. Qualified individuals include professional engineers, factory trained and certified technicians, and licensed electricians with experience in testing protective equipment. The Company reserves the right to witness verification testing or require written certification that the testing was performed.

b. Verification testing shall be performed every four years. All verification tests prescribed by the manufacturer shall be performed. If wires must be removed to perform certain tests, each wire and each terminal shall be clearly and permanently marked. The Customer-Generator shall maintain verification test reports for inspection by the Company.

c. Inverters shall be verified once per year as follows: once per year the Customer-Generator shall operate the customer generator system disconnect switch and verify the Generating Facility automatically shuts down and does not reconnect with the Company's system until the Company's system continuous normal voltage and frequency have been maintained for a minimum of 5 minutes. The Customer-Generator shall maintain a log of these operations for inspection by the Company.

d. Any system that depends upon a battery for trip power shall be checked once per month for proper voltage. Once every four (4) years the battery shall either be replaced or have a discharge test performed. The Customer-Generator shall maintain a log of these operations for inspection by the Company.

e. Tests and battery replacements as specified in this section 2 of Exhibit B shall be at the Customer-Generator's expense.

3. Inspection of the Generating Facility.

a. The Company may, in its discretion and upon reasonable notice not to be less than 24 hours (unless otherwise agreed to by the Company and the Customer-Generator), observe

the construction of the Generating Facility (including but not limited to relay settings and trip schemes) and the equipment to be installed therein.

b. Within fourteen days after receiving a written request from the Customer-Generator to begin producing electric energy in parallel with the Company's system, the Company may inspect the Generating Facility (including but not limited to relay settings and trip schemes) and observe the performance of the verification testing. The Company may accept or reject the request to begin producing electric energy based upon the inspection or verification test results.

c. If the Company does not perform an inspection of the Generating Facility (including but not limited to relay settings and trip schemes) and observe the performance of verification testing within the fourteen-day period, the Customer-Generator may begin to produce energy after certifying to the Company that the Generating Facility has been tested in accordance with the verification testing requirements and has successfully completed such tests. After receiving the certification, the Company may conduct an inspection of the Generating Facility (including but not limited to relay settings and trip schemes) and make reasonable inquiries of the Customer-Generator, but only for purposes of determining whether the verification tests were properly performed. The Customer-Generator shall not be required to perform the verification tests a second time, unless irregularities appear in the verification test report or there are other objective indications that the tests were not properly performed in the first instance.

d. The Company may, in its discretion and upon reasonable notice not to be less than 24 hours (unless an apparent safety or emergency situation exists which requires immediate inspection to resolve a known or suspected problem), inspect the Generating Facility (including but not limited to relay settings and trip schemes) and its operations (including but not limited to the operation of control, synchronizing, and protection schemes) after the Generating Facility commences operations.

4. <u>Operating Records and Procedures</u>.

a. The Company may require periodic reviews of the maintenance records, and available operating procedures and policies of the Generating Facility.

b. The Customer-Generator must separate the Generating Facility from the Company's system whenever requested to do so by the Company's System Operator pursuant to Sections 9, 10 and 11 of the Agreement. It is understood and agreed that at times it may not be possible for the Company to accept electric energy due to temporary operating conditions on the Company's system, and these periods shall be specified by the Company's System Operator. Notice shall be given in advance when these are scheduled operating conditions.

c. Logs shall be kept by the Customer-Generator for information on unit availability including reasons for planned and forced outages; circuit breaker trip operations, relay operations, including target initiation and other unusual events. The Company shall have the right to review these logs, especially in analyzing system disturbance.

5. Changes to the Generating Facility, Operating Records, and Operating Procedures.

a. The Customer-Generator agrees that no material changes or additions to the Generating Facility as reflected in the single-line diagram, relay list, trip scheme and settings of the Generating Facility, Generating Facility Equipment List, and three-line diagram (if the Generating Facility's capacity is greater than or equal to 30 kW), shall be made without having obtained prior written consent from the Company, which consent shall not be unreasonably withheld.

b. As a result of the observations and inspections of the Generating Facility (including but not limited to relay list, trip scheme and settings) and the performance of the verification tests, if any changes in or additions to the Generating Facility, operating records, and operating procedures and policies are required by the Company, the Company shall specify such changes or additions to the Customer-Generator in writing, and the Customer-Generator shall, as soon as practicable, but in no event later than thirty (30) days after receipt of such changes or additions, respond in writing, either noting agreement and action to be taken or reasons for disagreement. If the Customer-Generator disagrees with the Company, it shall note alternatives it will take to accomplish the same intent, or provide the Company with a reasonable explanation as to why no action is required by good engineering practice.

(Additional terms and provisions to be added as necessary. Note: This parenthetical phrase should be deleted when the agreement is finalized.)

Generating Facility Equipment List

The Generating Facility shall include the following equipment:

(Specific items to be added as necessary. Note: This parenthetical phrase should be deleted when the agreement is finalized.)

(This Generating Facility Equipment List, together with the single-line diagram, relay list and trip scheme, and three-line diagram (if the Generating Facility's capacity is greater than or equal to 30 kW), should be attached behind Exhibit B. Note: This parenthetical phrase should be deleted when the agreement is finalized.)

EXHIBIT C

INTERCONNECTION FACILITIES OWNED BY THE COMPANY
(To Be Filled Out By Company)

1. Description of Company Interconnection Facilities

The Company will purchase, construct, own, operate and maintain all interconnection facilities required to interconnect the Company's system with the Generating Facility at ___ volts, up to the point of interconnection.

The Company Interconnection Facilities, for which the Customer-Generator agrees to pay, include:

[Need to specify the interconnection facilities. If no interconnection facilities, state "None".]

2. Customer-Generator Payment to Company for Company Interconnection Facilities, Review of Generating Facility, and Review of Verification Testing

The Customer-Generator shall pay to the Company the total estimated interconnection cost to be incurred by the Company (Total Estimated Interconnection Cost), which is comprised of (i) the estimated cost of the Company Interconnection Facilities, (ii) the estimated engineering costs associated with a) developing the Company Interconnection Facilities and b) reviewing and specifying those portions of the Generating Facility which allow interconnected operations as such are described in Exhibit B, and iii) reviewing the verification testing. The following summarizes the Total Estimated Interconnection Cost:

Description	Estimated Cost ($)

[Need to specify the estimated interconnection cost. If no cost, state "None".]

Total Estimated Interconnection Cost $

The Total Estimated Interconnection Cost, which, except as otherwise provided herein, is non-refundable, shall be paid by the Customer-Generator fourteen (14) days after receipt of an invoice from the Company, which shall be provided not less than thirty (30) days prior to start of procurement of the Company Interconnection Facilities.

Within thirty (30) days of receipt of an invoice, which shall be provided within fourteen (14) days of the final accounting, which shall take place within sixty (60) days of completion of construction of the Company Interconnection Facilities, the Customer-Generator shall remit to the Company the difference between the Total Estimated Interconnection Cost paid to date and the total actual

interconnection cost (Total Actual Interconnection Cost). The latter is comprised of (i) the total costs of the Company Interconnection Facilities, and (ii) the total engineering costs associated with a) developing the Company Interconnection Facilities and b) reviewing and specifying those portions of the Generating Facility which allow interconnected operations as such are described in Exhibit B, and iii) reviewing the verification testing. If in fact the Total Actual Interconnection Cost is less than the payments received by the Company as the Total Estimated Interconnection Cost, the Company shall repay the difference to the Customer-Generator within thirty (30) days of the final accounting.

If the Agreement is terminated prior to the Customer-Generator's payment for the Total Actual Interconnection Cost (or the portion of this cost which has been incurred) or prior to the Company's repayment of the overcollected amount of the Total Estimated Interconnection Cost (or the portion of this cost which has been paid), such payments shall be made by the Customer-Generator or Company, as appropriate. If payment is due to the Company, the Customer-Generator shall pay within thirty (30) days of receipt of an invoice, which shall be provided within fourteen (14) days of the final accounting, which shall take place within sixty (60) days of the date the Agreement is terminated. If payment is due to the Customer-Generator, the Company shall pay within thirty (30) days of the final accounting.

All Company Interconnection Facilities shall be the property of the Company.

3. <u>Operation, Maintenance and Testing Costs</u>

The Company will bill the Customer-Generator monthly and the Customer-Generator will, within 30 days after the billing date, reimburse the Company for any costs incurred in operating, maintaining or testing the Company Interconnection Facilities. The Company's costs will be determined on the basis of outside service costs, direct labor costs, material costs, transportation costs, applicable overheads at time incurred and applicable taxes. Applicable overheads will include such costs as vacation, payroll taxes, non-productive wages, supervision, tools expense, employee benefits, engineering administration, corporate administration, and materials handling. Applicable taxes will include the Public Service Company Tax, and Public Utility Fee.