TECHNICAL SPECIFICATIONS

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WINDWARD COMMUNITY COLLEGE
5986A & 5986B HALE ULUWEHI
AGRICULTURE FACILITY AND GREENHOUSE RENOVATION

PROJECT NO. CCR-17-6251B

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01001 - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

The RCUH's SPECIAL PROVISIONS and GENERAL PROVISIONS following these specifications shall be read by the Contractor as they form a part of the agreement to be entered into between the Contractor and the RCUH. These SPECIAL PROVISIONS and GENERAL PROVISIONS accompanying these specifications shall govern all work specified hereinafter in all Divisions and Sections.

1.02 DESCRIPTION OF BID PROPOSAL ITEMS

Basic Bid: The project shall in general consist of but is not limited to selective demolition, soil treatment, concrete, structural steel, cold formed metal framing, sheathing, finish carpentry, preservative treated lumber, membrane waterproofing, building insulation, preformed metal standing seam roof, preformed metal siding, flashing and sheet metal, sealants, Steel doors and frames, wood doors, finish hardware, electronic access controls, high security keying system, glazing, gypsum wall board with metal framing, acoustical ceiling, polyurethane flooring system, resilient flooring, painting, signage, fire extinguishers, toilet accessories, removal and disposal of asbestos containing materials, lead paint control measures, PCB ballast, mercury containing components, asbestos testing and monitoring, lead testing, fire alarm system, mechanical general requirements, plumbing, air conditioning, electrical work, engine generators, automatic transfer switch, underground electrical work, interior lighting and building telecommunication system as called for on the Plans and Technical Specifications.

1.03 CONTRACT TIME

The contract time for this project shall be 240 consecutive calendar days from the effective date designated in the Notice to Proceed. From the effective date noted in the Notice to Proceed (NTP) letter, the Contractor shall proceed with his preparatory work such as: preparing and forwarding submittals, obtaining approvals, obtaining permits, and other work as approved by the University. No work shall be allowed at the job site and no ordering of materials shall be allowed until receipt of the Notice to Proceed letter, or upon earlier written notice from the RCUH. The Contractor shall be responsible for any airfreight cost or overtime-cost differentials necessary to complete the project within the project contract time.

1.04 SUBSTITUTION OF MATERIALS AND EQUIPMENT

A. Request for substitutions shall be submitted within the time designated in the SPECIAL PROVISIONS.

B. The written request shall be submitted together with technical brochures and be accompanied by a statement of variances as shown on the attached 'Sample Request for Substitution'. **Only "Request for Substitutions" using the attached sample format will be considered.** Submit electronic documents via email to the Project Manager as indicated on the sample form.

The statement of variances must list all features of the proposed substitution, which differ from the plans; specifications and/or product(s) specified and must further certify that the substitute has no other variant features. The brochures shall be clearly marked showing make, model, size, options, etc., and must include sufficient evidence to enable the University to evaluate each feature listed as a variance. Any submittal with insufficient information for evaluation shall be rejected. Should an unlisted variance be discovered after installation of the product, the penalty shall be immediate replacement with the original specified product at no cost to the University.

If sufficient evidence from which a determination can be made for a particular model does not accompany a request for substitution, the request shall be denied. The decision of the University shall be final.

C. When submitting request for substitutions, if the Contractor elects to use materials and/or equipment other than those shown on plans and/or specifications, the Contractor shall be responsible to revise existing conditions and to coordinate work with other trades as may become necessary because of the substituted product. Any additional cost to implement such a change shall be borne by the Contractor at no cost to the University.

D. Bidders are cautioned to review the Technical Specifications carefully and thoroughly. Objections to or request for clarification of the specifications shall be emailed to the Project Manager, in accordance with the terms and conditions of this solicitation. The submittal of a bid shall be considered as acceptance of the specifications as published. Protest concerning the Technical Specifications lodged after bid opening shall not be considered.

1.05 PATENTED DEVICES, MATERIALS AND PROCESSES

If the Contractor is required or desires to use any design, device, material or process covered by letters of patent or copyright, the right for such use shall be procured by the Contractor from the patentee or owner. The Contractor and surety shall indemnify and hold harmless the State and its Departments and Agencies, any affected third party, or political subdivision from any and all

claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright in connection with the work to be performed under the contract. The Contractor and surety shall indemnify the State and its Departments and Agencies for any costs, expenses and damages which it may be obliged to pay by reason of any such infringement at any time during the prosecution or after the completion of the work.

1.06 GUARANTEE

A. All work shall be guaranteed against all deficiencies in construction and materials for a minimum of one (1) year after the date of project acceptance. Longer guarantees may be required as specified within each section of the specifications.

B. The surety shall not be held liable beyond two (2) years of the Project Acceptance date.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

S A M P L E

Date:_____

Email to:
Ray Teramae
University of Hawai'i Community Colleges
Facilities and Environmental Health at:
teramae@hawaii.edu

Gentlemen:

Subject: REQUEST FOR SUBSTITUTION

Project Title: _____

In accordance with the GENERAL REQUIREMENTS, I hereby submit for substitution two (2) sets of technical brochures and statement of variances for your review and approval for the item(s) shown below.

SECTION/ ITEM	SPECIFIED BRAND	SUBSTITUTE OR ALTERNATE BRAND	VARIANT[3] FEATURES

I further certify that my request for substitution of the above item(s) has no other variant features and complies with the plans and specifications for subject project.

_____
SIGNATURE

NOTE: 1. Please use own letterhead.
2. Submit one (1) original electronic PDF copy.
3. If no variant feature indicate "None."

END OF SECTION

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001-GENERAL REQUIREMENTS

1.02 SUMMARY OF PROJECT

A. The work to be done shall include performing all operations and furnishing all equipment, fixtures, appliances, tools, materials, and labor necessary to execute, complete, and deliver all of the work and related items required for the project as called for on the drawings and as hereinafter specified.

B. The project site is Windward Community College: 45-720 Keaahala Road, Kaneohe, Hawaii 96744.

C. The project shall in general consist of but is not limited to selective demolition, soil treatment, concrete, structural steel, cold formed metal framing, sheathing, finish carpentry, preservative treated lumber, membrane waterproofing, building insulation, preformed metal standing seam roof, preformed metal siding, flashing and sheet metal, sealants, Steel doors and frames, wood doors, finish hardware, electronic access controls, high security keying system, glazing, gypsum wall board with metal framing, acoustical ceiling, polyurethane flooring system, resilient flooring, painting, signage, fire extinguishers, toilet accessories, removal and disposal of asbestos containing materials, lead paint control measures, PCB ballast, mercury containing components, asbestos testing and monitoring, lead testing, fire alarm system, mechanical general requirements, plumbing, air conditioning, electrical work, engine generators, automatic transfer switch, underground electrical work, interior lighting and building telecommunication system as called for on the Plans and Technical Specifications.

D. Contractor shall visit the job site and make certain that he understands the extent of the work and existing job conditions before he submits a formal bid.

1.03 CODES AND ORDINANCES

The Contractor shall comply with all Federal, State, and local laws, ordinances, rules, and regulations pertaining to the project and shall obtain and pay for all permits, licenses, and certificates and publish or post all notices required.

1.04 SCHEDULING AND COORDINATION

A. The premises will be occupied by the faculty, staff, and students of the

Windward Community College.

B. Contractor shall submit schedule of work as called for in SECTION 01300 - SUBMITTALS. Work shall not commence until the Critical Path Method (CPM) schedule has been submitted and approved by the University. The Contractor shall be fully responsible for any delays caused by inadequate work schedules.

C. College Academic Calendar: (See attached calendar at end of this section.)

No on-site work will be permitted during study period, examination period, and commencement.

D. Contractor shall schedule all utility outages on weekends unless directed by the University otherwise. All such outages shall be reflected in the schedule of work as called for in SECTION 01300 – SUBMITTALS and proper notice shall be served as called for in SECTION 01040 – COORDINATION.

Electrical outages will be permitted only on Saturdays, Sundays and holidays, and subject to approval by the University.

Air conditioning outages will be permitted on Saturdays, Sundays, and holidays, and subject to approval by the University.

The number of outages and duration of each outage shall be kept to a minimum. Duration shall not exceed 12 hours.

1.05 SPECIFICATION LANGUAGE

These specifications are written in imperative and abbreviated form. This imperative language of the technical sections is directed at the Contractor, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting "shall", "the Contractor shall", and "shall be", and similar mandatory phrases by inference in the same manner as they are applied to notes on the drawings. The words "shall be" shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, perform all indicated requirements whether stated imperatively or otherwise.

1.06 DEFINITIONS

Definitions that govern this project are those specified in the GENERAL PROVISIONS of these contract documents. Except that the following words and terms shall be defined as follows, when used in this Attachment 1:

A. Approved: As accepted by the University.

B. Approved Equal/Equivalent: (see definition of "Pre-Approved").

C. As applicable: As appropriate for the particular condition, situation, or circumstance.

D. As required: As required by regulatory requirements, by referenced standards, by existing conditions, by accepted construction practice, or by the contract documents.

E. Contractor: The prime contractor and/or any or all of its subcontractors as the context requires.

F. Directed: As instructed by the University in writing.

G. Indicated: As shown and/or noted on the drawings.

H. Job Site: (see definition of "Site").

I. Manufacturer: The manufacturer of a product and/or of the main components of group of related products comprising a functional system specified or proposed to be used on the project.

J. Owner: University of Hawaii and/or their authorized representatives.

K. Pre-Approved: As approved by the University in accordance with SECTION 01001 - GENERAL REQUIREMENTS, paragraph entitled "SUBSTITUTION OF MATERIALS AND EQUIPMENT".

L. Provide: Furnish and install.

M. Site/Site of the Work: The area to be occupied by the project(s) and all exterior areas occupied or used by the Contractor or his subcontractors during performance of the work, including storage areas, temporary buildings and staging areas.

N. Superintendent: The Contractor's representative who is responsible for continuous field supervision, coordination, and completion of the work.

O. Technical Representative: A person knowledgeable of all significant technical considerations relating to the design, specification, installation, functionality, longevity and warranty of a manufacturer's product or product system and authorized by the manufacturer to act in its behalf on all technical matters on the project including approval of plans and specifications, observation or installation and certification for warranty.

P. University: Shall refer to the Research Corporation of the University of Hawaii (RCUH) and/or the University of Hawaii and/or their authorized representatives. Wherever the word "Engineer", "Architect", or "Owner" is used, it shall refer to a representative of the RCUH or the University of

Hawaii, as applicable.

1.07 PERMITS/FEES

The Building Permit will be processed by the University for Contractor to pick up. The cost of building and all other permits and fees required for the construction and completion of the project shall be paid for by the Contractor.

1.08 SAFETY

A. The Contractor shall be responsible for complete compliance with Federal, State, and County safety laws and ordinances, and in particular with OSHA requirements with all latest amendments and supplements as applicable to this project.

B. The Contractor shall submit three (3) copies or electronic PDF copies of Material Safety Data Sheets (MSDS) on all chemical products to be used on the project for review and approval by the University's Environmental Health and Safety Office prior to their use. No chemical products shall be used without prior approval by the University.

1.09 CONTRACTOR/SUBCONTRACTORS

Contractor/Subcontractor shall be listed with the Department of Commerce & Consumer Affairs as being ACTIVE with the following STATUS: CURRENT, VALID & IN GOOD STANDING. Contractor/Subcontractor shall also be properly licensed, certified, and qualified by all other appropriate State and County agencies to perform their specific trade or particular type of work. At the time of bid opening, if the Contractor/Subcontractor is not in compliance with all of the above requirements, the Contractor/Subcontractor shall be considered “non-responsive” and shall be disqualified.

1.10 CONTRACTOR RESPONSIBILITIES

A. Responsibilities shall include general supervision, management, and control of the work of this project, and in addition to other items more specifically noted throughout the specifications.

B. Superintendent/Staff: The Contractor shall provide a competent superintendent on the job at all times during the progress of work with authority to act on behalf of the Contractor. The Contractor shall also provide an adequate staff to coordinate and expedite all work properly and orderly in compliance with the plans and specifications in accordance with the General Provisions. In addition, all workers shall dress neatly and conduct themselves with propriety at all times; loud abusive behavior, sexual harassment, and unacceptable conduct will not be tolerated. Workers found in violation of the above shall be removed from the job site as directed by the University.

C. Existing Conditions: Before commencing any work on this project, the Contractor shall verify if existing site and building conditions are the same as presented on the drawings and immediately report to the University any apparent discrepancies or inconsistencies.

D. Shop Drawings: Shop drawings, samples, color chips, schedules, catalogs, manufacturer's literature, certificates, guarantees, bonds, as-built prints, and other items requiring University's review or acceptance shall be submitted through the Contractor as part of the control of work. It is the Contractor's responsibility to verify that all submitted items comply with the project's plans and specifications prior to submitting to the University.

E. Record Drawings: Contractor's field superintendent is required to keep current one set of marked prints containing field changes made to or deviations taken from the construction documents during the construction period and shall enforce Subcontractors with the same requirements. See SECTION 01300 - SUBMITTALS paragraph entitled "RECORD DRAWINGS ("AS-BUILTS")".

F. Laying Out Work

1. Bench Marks and Reference Points: The Contractor shall establish bench marks and other reference points and keep them intact throughout the work of the project. The Contractor shall correctly locate all grades, lines, and levels as required for the construction and completion of the project; be solely responsible for the accuracy and correctness of all lines, levels, and grades; and for establishing the location of utilities at the site.

2. Minor Changes: Minor changes necessary to adjust conditions at the site to conform to the contract documents or vice versa will not be grounds for the Contractor to claim additional charges or additional time.

3. Measurements: Before ordering any material, or doing any work, each Contractor shall verify all measurements at the building and shall be responsible for the correctness of same. No extra charge or compensation will be allowed because of differences of actual dimensions and the measurements indicated on the drawings.

G. Protection: The Contractor shall be responsible for the protection and safeguarding of all new work until after final inspection and acceptance by the University. Whenever new concrete slabs, walks, etc., are a part of the project, the Contractor shall provide job site security for the first 24-hour period after each concrete pour.

PART 2 - PRODUCTS

2.01 ASBESTOS PROHIBITION

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

2.02 QUALITY

Materials, equipment, furnishings, fixtures, hereinafter specified in the various divisions and sections of the specifications shall be new, best, commercial grade, class, kind, and type available.

2.03 HANDLING

The Contractor shall supervise job site delivery and handling, and assign storage space for materials, equipment, furnishings, and fixtures of all trades. Contractor is responsible for delivery, unloading, unpacking, handling, storage, distribution, installation, and protection of materials at the job site until acceptance by the University.

PART 3 - EXECUTION

3.01 INSTALLATION

Materials, equipment, furnishings, and fixtures hereinafter specified in the various divisions and sections of the specifications shall be installed in accordance with manufacturer's current specifications, recommendations, instructions, and directions by workers specially trained and skilled in the performance of the particular type of work, to meet guarantee and regulatory agency requirements specified.

3.02 ENVIRONMENTAL

Contractor shall oversee that proper environmental conditions are met regarding temperature, humidity, lighting, and ventilation.

3.03 PREPARATION AND PROTECTION

A. Before starting work on previously erected constructions, Contractor shall make a thorough and complete investigation of such recipient surfaces and determine their suitability to receive required additional construction and finishes. Contractor, at their own expense, shall make whatever repairs and conditioning required to properly prepare such surfaces. Contractor shall coordinate the work to provide suitable surfaces to receive subsequent work.

B. Commencement of work by any trade will be construed as acceptance of existing conditions and surfaces being satisfactory for application of subsequent work. Contractor shall be responsible for finished results and

assumption of warranty obligations under the contract.

C. Contractor shall protect existing work in a manner to prevent any damage and take positive measures to prevent breakage of glass and damage to aluminum finishes.

D. Contractor shall exercise all required precautions necessary to protect all buildings and other construction on property adjacent to that of the work under the contract.

E. Prior to work affecting the interior of the building, the Contractor shall be responsible for covering door, window, hatch, louver, and similar openings in walls and overhead construction with plastic cloth or plywood to prevent interior work from damage by vandals or the elements. Contractor shall provide temporary lockable doors and temporary walls for complete protection of enclosed areas of the building. Throughout entire construction period, the Contractor shall provide adequate measures to fully protect all University property, students, staff, and public.

F. Contractor shall be responsible to trim any shrubbery, plants, and/or trees that may be affected by construction. Shrubbery and plants shall be trimmed twelve (12) inches or as required from the surfaces to be protected from damage. Tree trimming shall be to the minimum extent required to protect surfaces from damage. Contractor shall be responsible for having an arborist supervise all trimming of shrubbery, plants, and/or trees. Contractor shall notify the University fourteen (14) days prior to any scheduled trimming work as to the extent of work for approval.

3.04 CLEAN-UP

Rubbish and debris resulting from work of the various divisions and sections of the specifications shall be collected daily and disposed of by the Contractor in compliance with appropriate government laws. Contractor(s) or trade(s) specifically involved shall remove materials, debris, and rubbish from the site daily and dispose of at legal disposal areas away from the premises. Permission to provide on-site trash containers shall be granted by the University and shall be placed where directed by the University.

UNIVERSITY OF HAWAI'I ACADEMIC CALENDAR 2018-2021

FALL SEMESTER	FALL 2018	FALL 2019	FALL 2020
Official Faculty Duty Start Date [1]	T Aug 14	M Aug 19	M Aug 17
Holiday (Statehood Day)	F Aug 17	F Aug 16	F Aug 21
First Day of Instruction [2]	M Aug 20	M Aug 26	M Aug 24
Holiday (Labor Day)	M Sept 3	M Sep 2	M Sep 7
Holiday (Election Day)	T Nov 6	N/A	T Nov 3
Holiday (Veterans Day)	M Nov 12	M Nov 11	W Nov 11
Holiday (Thanksgiving)	Th Nov 22	Th Nov 28	Th Nov 26
Non-instructional Day	F Nov 23	F Nov 29	F Nov 27
Last Day of Instruction [3]	Th Dec 6	Th Dec 12	Th Dec 10
Study Period [4]			
Examination Period [4]			
Commencement [4]			

SPRING SEMESTER	SPRING 2019	SPRING 2020	SPRING 2021
Faculty Duty Start Date for New Faculty	W Jan 2	Th Jan 2	M Jan 4
First Day of Instruction [2]	M Jan 7	M Jan 13	M Jan 11
Holiday (Martin Luther King Jr. Day)	M Jan 21	M Jan 20	M Jan 18
Holiday (Presidents' Day)	M Feb 18	M Feb 17	M Feb 15
Spring Recess	M-F Mar 18-22	M-F Mar 16-20	M-F Mar 15-19
Holiday (Kūhiō Day)	T Mar 26	Th Mar 26	F Mar 26
Holiday (Good Friday)	F Apr 19	F Apr 10	F Apr 2
Last Day of Instruction [3]	Th May 2	Th May 7	F May 7
Study Period [4]			
Examination Period [4]			
Commencement [4]			
Official Faculty Duty End Date [1]	T May 14	T May 19	M May 17

SUMMER SESSION I [5]	M May 20 - F Jun 28	T May 26 - Th Jul 2	M May 24 - F Jul 2
SUMMER SESSION II [5]	M Jul 1 - F Aug 9	M Jul 6 - F Aug 14	T Jul 6 - F Aug 13

Su - Sunday
M - Monday
T - Tuesday
W - Wednesday
Th - Thursday
F - Friday

END OF SECTION

SECTION 01040 - COORDINATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001-GENERAL REQUIREMENTS

1.02 COORDINATION REQUIREMENTS

A. Provide project interface and coordination as required to properly and accurately bring together the several parts, components, systems, and assemblies and as required to complete the work and the project, pursuant to the General Provisions. Contractor and Subcontractors shall cooperate with others engaged on the premises as may be necessary to facilitate progress and to provide coordination and integration of the entire work.

B. Provide interface and coordination of all trades, crafts, and subcontracts as required to provide correct and accurate connection of abutting, adjoining, overlapping, and related work, and provide all anchors, fasteners, accessories, appurtenances, and incidental items as required to complete the work properly, fully, and correctly in accordance with the Contract Documents.

C. Provide additional structural components, bracing, blocking, miscellaneous metal, backing, anchors, fasteners, and installation accessories required to properly anchor, fasten, or attach materials, equipment, hardware, systems and assemblies to the structure.

D. Provide excavation and backfill, trenching and drilling for all trades as required for the installation of their work.

E. Provide concrete foundations, pads, supports, bases, and grouting for all trades as required for the installation of their work.

F. Provide sealing, and flashing as required to waterproof the building complete and as required to insulate thermally and acoustically. Include sealing, flashing, and related work as required to prevent moisture intrusion, air infiltration, and light leakage.

G. Equipment, appliances, fixtures, hardware, and systems requiring plumbing and mechanical services, rough-in, and connections, or other utilities and services, shall be provided with such services, rough-in, and final connections.

H. Equipment, appliances, fixtures, hardware, and systems requiring electrical services shall be provided with such electrical services, including outlets, switches, overload protection, interlocks, panel board

space, disconnects, circuit breakers, and connections.

I. 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.

1.03 WORK SEQUENCE

A. Construct work in stages to accommodate the University's occupancy requirements during the construction period. Work required of this contract to be performed in pedestrian and vehicular traffic areas or interfering with pedestrian and vehicular traffic flow shall be scheduled to minimize disturbances. Contractor shall confine all work, equipment, materials and personnel as much as possible within the Contract Zone Limits so as not to interfere with the normal function of the facility. Coordinate schedule and operations with University.

B. The facilities will be occupied and in use during the construction period. Therefore, the Contractor shall take every precaution to protect the students, staff, public and property from harm and/or damage. The Contractor shall schedule and coordinate his work and that of his Subcontractors to minimize disturbance to the University's daily operation.

C. The sequence of work shall be based on the CPM schedule approved by the University as called for in SECTION 01300 - SUBMITTALS.

1.04 CONTRACTOR USE OF PREMISES

A. Use of premises shall be limited to work and construction operations, to allow for University occupancy. Access to site shall be limited as directed by the University.

B. Parking: The Contractor may be allowed parking on campus in designated areas close to the work site subject to approval by the campus Vice Chancellor for Administrative Affairs/Services. Parking citations shall be issued to illegally parked vehicles whenever vehicles are parked outside or beyond the parking limits.

There are times the Contractor may be responsible for finding off-campus parking. Subject to approval by the University, striped stalls maybe assigned and used for the project.

Any damage to property by construction vehicles shall be restored at no cost and to the satisfaction of the University. Construction vehicles will not be permitted to park in University employee parking areas or any striped parking stalls.

Private vehicles belonging to construction workers shall not be allowed to park on the University grounds. All company vehicles shall display

company logos without exceptions.

1.05 CONTRACT ZONE LIMITS

The Contract Zone Limits shown on the drawings indicate only in general the limits of the work involved. The Contractor, however, is required to perform any and all necessary and incidental work which may fall outside of these demarcation lines. The Contractor is also expected to confine all of his construction activities within the Contract Zone limits and not to spread his equipment and materials indiscriminately about the area.

1.06 UNIVERSITY OCCUPANCY

University will occupy premises during entire period of construction for the conduct of normal operations. Cooperate with the University to minimize conflict, and to facilitate University's operations. Any interruption or interference caused by the Contractor which hampers the University's operations, shall be halted and re-scheduled to evenings and/or weekends at no additional cost to the University.

1.07 NOTICES

The Contractor shall schedule all temporary disconnection of electrical, air conditioning, and other utility services in such a manner so as to minimize such interruption to University operations. Interruptions shall be permitted only on Saturday, Sundays, and holidays. The Contractor shall request for outages in writing stating the proposed weekend for temporary disconnection, state the length of outage at least fifteen (15) days prior to outage and shall obtain the approval of the University prior to outage. Request for outage shall be submitted to the Architect or Engineer of the University of Hawaii Community College's Facilities and Environmental Health.

All such services, where necessary, shall be properly disconnected before commencing with the work.

1.08 PROJECT MEETINGS

University will schedule and administer all project meetings throughout the progress of the work including pre-construction meetings. University will make physical arrangements for meetings, prepare agenda, and preside at meetings. Those in attendance shall include: Job superintendent, major subcontractors and suppliers, Architect/Engineer and the University as appropriate to agenda topics for each meeting.

1.09 SUSPENSION OF WORK

University shall have the right to suspend work of the Contractor or its subcontractors whenever the University's Facilities and Environmental Health determines that the Contractor's or subcontractor's practices (1) jeopardize

health and safety or University property; (2) unreasonably disrupts University operations; and (3) are not in compliance with the plans and specifications herein. Only personnel of the University of Hawaii Community College's Facilities and Environmental Health shall be authorized to order the suspension of work. Contractor shall not be entitled to any compensation for suspensions ordered by unauthorized personnel or for suspension due to the reasons stated herein.

1.10 FIELD MEASUREMENTS AND TEMPLATES

A. Contractor shall obtain all field measurements required for the accurate fabrication and installation of the work included in this contract. Exact measurements are the Contractor's responsibility.

B. Contractor shall also furnish or obtain templates, patterns, and setting instructions as required for the installation of all work. All dimensions shall be verified in the field.

1.11 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall be in charge of this Contract and the site, as well as the directing and scheduling of all work.

It shall be the responsibility of the Contractor to provide the Facilities and Environmental Health, with the following information on a daily basis or as agreed upon at the pre-construction meeting. Reports are due by 9:00 a.m.:

1. Status of project (location, phase of work, etc.).

2. A list of trades including the number of workmen and their title(s) present at the job site.

Note: No rain out or delay days will be granted the Contractor if Paragraph 1.12.A., Items 1 and 2 above are not complied with.

3. Digital photographs, minimum 10 photographs attached to daily log once every week. Each photo shall include date, time, and reference work operations.

B. Final responsibility for performance, interface, and completion of the work and the project shall be the Contractor's.

C. After hour call back and/or emergency: The Contractor shall provide the University of Hawaii Community Colleges Facilities and Environmental Health, with a 24-hour emergency phone number where he can be contacted in the event of an emergency. The Contractor shall respond and take corrective action (within 4 hours) to calls made by the University regarding safety and/or hazardous situations directly related to their work.

If the Contractor fails to respond or take proper corrective action, they shall be responsible for all costs incurred by the University.

D. Penalties for Utility and/or Air Conditioning Outages

The work under this project may include utility and/or air conditioning outages which must occur within the time frames specified in SECTION 01010, Summary of Work; SECTION 15000, General Mechanical Requirements; and SECTION 16010, General Electrical Requirements of the Technical Specifications, as applicable. Inasmuch as University operations will not permit outages to exceed the established time frames, Contractor shall be assessed liquidated damages in the amount of $500 per HOUR for each hour of delay. Damages hereunder shall be separate from any other liquidated damages which may be assessed under this contract and shall not be used to offset or mitigate the same.

1.12 JOB SITE ADMINISTRATION

Job site administration shall be the responsibility of the Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001-GENERAL REQUIREMENTS.

1.02 PROCEDURES

A. Unless otherwise specified, deliver submittals to the Facilities and Environmental Health, 1601 East-West Road, Room 4020, Honolulu, HI 96848, or mail to 2327 Dole Street, Honolulu, HI 96822.

B. Transmit all items using form which identifies project, Contractor, Subcontractor, and major supplier. Identify pertinent drawing sheet, detail number, and specification section number, as appropriate. Identify deviations from contract documents. Provide space for Architect/Engineer review stamps.

C. All submittals shall consist of a minimum of four (4) copies or electronic PDF copy.

D. Comply with the Schedule of Operations in making submittals. Coordinate submittals of related work.

E. After the University's review of the submittals, revise and resubmit as required, identifying changes made since previous submittal.

1.03 SCHEDULE OF WORK

Contractor shall submit schedule of work within two (2) weeks from the effective date noted in the "Notice to Proceed" letter, identifying first workday of each week. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities. Show submittal dates required for shop drawings, product data, samples and product delivery dates. The Schedule of Work shall follow the Critical Path Method (CPM) and shall be updated on a regular basis to include all changes. Project shall not commence until the CPM schedule is submitted and approved. No claims for extension shall be granted if the CPM schedule is not submitted. Also, submit a three week schedule of work indicating areas, floors and rooms to be worked on and the various trades or type of work to be undertaken daily, Monday through Friday. Three-week work schedule shall be updated every week.

1.04 SUBMITTAL LIST

Contractor shall submit all submittals as listed on the Submittal List included under this section.

1.05 SHOP DRAWINGS AND SAMPLE SUBMITTALS

A. All submittals shall be made in accordance with the following unless otherwise specified. Minimum sheet size is 8-1/2" x 11". Maximum sheet size is same size as the Contract Drawings. Drawings shall be presented in a clear and thorough manner. Details shall be identified by reference to sheet, schedule, and detail shown on Contract Drawings.

B. Mark each copy to identify applicable products, models and other data. Supplement manufacturers' standard data to provide information unique to the work. Include manufacturers' installation instructions when required by the specification.

1. The Contractor shall review, stamp with his approval and submit with reasonable promptness and in orderly sequence so as to cause no delay in work of any other Subcontractor, all shop drawings, product data, and samples required by the Contract Documents or subsequently by the University as covered by the modifications.

2. Properly identify shop drawings and samples as specified, or as the University may require. At the time of submission, the Contractor shall inform the University in writing of any deviation in the shop drawings or samples from requirements of the Contract Documents.

3. By approving and submitting the shop drawings and samples, the Contractor thereby represents that he has determined and verified all field measurements, field criteria, materials, catalog numbers and similar data, or will do so, and that he has checked and coordinated each shop drawing and sample with the requirements of the Contract Documents.

4. Four (4) copies minimum or Three (3) copies plus amount needed by the contractor of the Shop Drawings shall be submitted for review.

5. When requested by the University, the Architect (and/or his Consultant) will review the shop drawings and samples with reasonable promptness so as to cause no delay but only for conformance with the design concept of the Project and with the information given in the Contract Documents. The Architect's (and/or his Consultant's) review of a separate item shall not indicate approval of an assembly in which the item functions.

6. The Contractor shall make any corrections required by the University and shall resubmit the required number of corrected copies of shop drawings or new samples for review. The Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other that the corrections requested by

the University on previous submissions.

7. The Architect's (and/or Consultant's) review of shop drawings or samples shall not relieve the Contractor of responsibilities for any deviation from the requirements of the Contract Documents unless the Contractor has informed the University in writing of such deviation, at time of submission, and the University has given written approval to the specific deviation; nor shall the Architect's (and/or his Consultant's) review relieve the Contractor from responsibility for errors or omissions in the shop drawings or samples.

8. No portion of the work requiring a shop drawing or sample submission shall be commenced until the submission has been reviewed by the University. All such portions of the work shall be in accordance with reviewed shop drawings and samples.

C. Samples: Submit full range of manufacturers' standard textures, colors, and patterns for the University's selection. Submit samples as specified in the respective Specifications sections and as noted above. Samples shall illustrate functional characteristics of the Product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work. Include identification on each sample, giving full information

1.06 MANUFACTURERS' CERTIFICATES

Submit certificates, warranties, operating and maintenance instructions in accordance with requirements of each specifications section. Submit in duplicate.

1.07 RECORD DRAWINGS ("AS BUILTS")

A. The Contractor shall provide Record Drawings, as follows: Provide and keep current a complete set of record drawings showing every architectural, structural, plumbing, fire protection, mechanical, and electrical change from the original Contract Documents, including all addenda, change order, job decision, etc. The intent of Record Drawings is to record the actual in-place construction so that any future renovations or tie-ins can be anticipated accurately.

B. All changes authorized by the University and recorded by the Contractor under SECTION 01010 – SUMMARY OF WORK.

C. All deviations, changes, invert, location, etc., from alignment, elevations and dimensions which are stipulated on the Drawings and Shop Drawings, Specifications, addendum(a) and modification(s) during construction of the work shall be recorded on the Record Drawings.

D. The following procedure shall be followed:

1. Immediately after these changes are constructed in place, the Contractor shall record them on the field office plans. This is to assure that changes are recorded before they are forgotten.

2. Plans shall also record the location of all concealed water and electric services, water piping, sewers, wastes, vents, ducts, conduit and other piping; by indication of measured dimensions to each such line from readily identifiable and accessible walls, columns, partitions, or corners of the buildings.

3. The Contractor shall submit the record drawings together with all other required close out documents to the University.

4. Any record drawings or field office plans which the University determines does not accurately record the deviation shall be corrected by the Contractor and resubmitted to the University.

1.08 SUBMITTAL LIST FORM

See following page.

SUBMITTAL LIST

PROJECT NAME: 5986A & 5986B Hale Uluwehi Agriculture Facility and Greenhouse Renovation

PROJECT NO.: CCR-17-6251B

ITEM NO.	SECTION	SAMPLES	PROOF OF CERTIFICATION PRIOR TO BID OPENING	SCHEDULE OF WORK (CPM)	WEEKLY ACTIVITY SCHEDULE	SHOP DRAWINGS	PRODUCT DATA - MANUFACTURER' S LITERATURE	CERTIFICATES	GUARANTEES/WARRANTIES	GUARANTEES/WARRANTIES EXCEEDING 2 YEARS	TEST REPORTS	RECORD DRAWINGS	MISCELLANEOUS
	02070 – Selective Demolition			X									X
	02281 – Soil Treatment for Termites						X						
	03300 – Cast-In-Place Concrete						X	X					X
	05120 – Structural Steel					X	X	X			X		X
	05400 – Cold-Formed Metal Framing						X				X		
	06160 – Sheathing						X		X				
	06200 – Finish Carpentry	X				X	X	X					
	06311 – Preservative treated lumber			X		X	X	X	X				
	07110 – Membrane Waterproofing						X		X				X
	07210 – Building Insulation						X						
	07410 – Preformed Metal Standing Seam Roof	X				X	X			X	X		
	07411 – Preformed Metal Siding					X	X		X		X		
	07600 – Flashing and Sheetmetal					X	X		X				
	07920 – Sealants					X	X		X				
	08110 – Steel Doors and Frames			X		X	X						
	08210 – Wood Doors					X	X		X				
	08710 – Finish Hardware			X			X	X	X				X
	08715 – High Security Keying System						X					X	X

ITEM NO.	SECTION	SAMPLES	PROOF OF CERTIFICATION PRIOR TO BID OPENING	SCHEDULE OF WORK (CPM)	WEEKLY ACTIVITY SCHEDULE	SHOP DRAWINGS	PRODUCT DATA - MANUFACTURER' S LITERATURE	CERTIFICATES	GUARANTEES/WARRANTIES	GUARANTEES/WARRANTIES EXCEEDING 2 YEARS	TEST REPORTS	RECORD DRAWINGS	MISCELLANEOUS
	08800 – Glazing						X			X			
	08710 – Electronic Access Control						X		X				
	09250 – Gypsum wallboard					X	X						
	09510 – Acoustical Ceiling	X				X	X						X
	09620 – Polyurethane Flooring System						X	X					X
	09651 – Resilient Base	X					X						
	09760 – Decorative Fiberglass Reinforced Panel	X				X	X						
	09900 - Painting	X					X	X	X				X
	10440 – Signage	X				X	X						
	10520 – Fire Extinguisher						X	X					
	10880 – Toilet Accessories							X					
	13281 – Removal & Disposal of Asbestos												X
	13282 – Lead Paint Control Measures												X
	13285 – PCB Ballasts												X
	13286 – Mercury Containing Components												X
	13288 – Asbestos Testing & Monitoring												X
	13289 – Lead Testing and Monitoring												X
	13851 – Fire Alarm					X	X				X	X	
	15010 – Mechanical General Requirements					X	X	X				X	X
	15400 – Plumbing					X	X	X			X	X	
	15800 – Air Conditioning					X	X			X		X	

ITEM NO.	SECTION	SAMPLES	PROOF OF CERTIFICATION PRIOR TO BID OPENING	SCHEDULE OF WORK (CPM)	WEEKLY ACTIVITY SCHEDULE	SHOP DRAWINGS	PRODUCT DATA - MANUFACTURER' S LITERATURE	CERTIFICATES	GUARANTEES/WARRANTIES	GUARANTEES/WARRANTIES EXCEEDING 2 YEARS	TEST REPORTS	RECORD DRAWINGS	MISCELLANEOUS
	16402 – Electrical Work					X	X		X			X	
	16011 – General Electrical Requirements							X	X			X	
	16100 – Electrical Work					X	X				X		
	16208 – Engine Generators					X	X		X				
	16262 – Automatic Transfer Switch					X			X				X
	16301 – Underground Electrical Work						X				X		
	16510 – Interior Lighting					X	X						
	16701 – Building Telecommunication System					X	X				X		

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001- GENERAL REQUIREMENTS.

1.02 APPLICABLE CODES AND STANDARDS

A. All work shall meet or exceed the requirements of the International Building Code (IBC), Uniform Plumbing Code (UPC), National Electrical Code (NEC), latest adopted editions and the applicable codes and ordinances having jurisdiction of the County, State, and Federal governments.

B. References in the specifications to "code" or to "building code" not otherwise identified shall mean the foregoing specified codes, together with the additions, changes, amendments, and interpretations adopted by the enforcing agency, and in effect on the date of these contract documents. Nothing on the drawings or in the specifications shall be interpreted as requiring or permitting work that is contrary to these rules, regulations, and codes. Any such discrepancies shall be brought to the attention of the University immediately.

C. Where other codes or standards are referenced hereinafter in these specifications, the affected work shall meet or exceed the applicable requirements of such codes and standards. When latest edition of a standard is specified, it shall mean the latest edition in effect as of the date of these contract documents. When the documents are not dated, the date of execution of the agreement shall establish the date of the contract documents.

D. The code, specification, or standard referred to shall have full force and effect as though printed in these specifications, except as modified in these specifications.

E. Where the drawings or specifications call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by said laws, codes, rules, and regulations, the provisions of the drawings and specifications shall take precedence over said laws, codes, rules, and regulations.

1.03 OTHER APPLICABLE LAWS AND REGULATIONS

All applicable Federal, State, and local laws, and the regulations of governing utility districts and the various other authorities having jurisdiction over the construction and completion of the project shall apply to the contract throughout, and they shall be deemed to be included in the contract the same

as though printed in the specifications.

1.04 REFERENCES

A. The contract documents contain references to various standard specifications, codes, practices, and requirements for materials, work quality, installation, inspections, and tests, which references are published and issued by the organizations, societies, and associations listed below by abbreviation and name. Such references are hereby made a part of the contract documents to the extent required.

B. Referenced specifications and standards of the American Society for Testing and Materials (ASTM) and the American National Standards Institute (ANSI), are identified in the various sections by abbreviation and number only (not by title) and are not further identified.

C. When the effective date of a reference standard is not given, if the date given has been superseded, it shall be understood that the current edition or latest revision thereof, and any amendments or supplements thereto, in effect shall govern the work.

D. Reference standards are not furnished with the contract documents. The Contractor shall obtain copies of referenced standards direct from publication sources as needed for proper performance and completion of the work and provide and maintain referenced standards at the job site field office. The Architect/Engineer will furnish, upon request, information as to how copies of specified standards may be obtained.

1.05 ABBREVIATIONS

Whenever in the specifications the abbreviation or acronym is specified, it shall be understood to mean the full name
of the respective organization, as follows:

AAMA	American Architectural Manufacturer's Association
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AIA	American Institute of Architects
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
APA	American Plywood Association
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWPB	American Wood Preservers Bureau

AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWI	Architectural Woodwork Institute
BHMA	Builders' Hardware Manufacturer's Association
CRSI	Concrete Reinforcing Steel Institute
CDA	Copper Development Association
DHI	Door and Hardware Institute
FGMA	Flat Glass Marketing Association
FS	Federal Specification (also abbreviated Fed. Spec.)
HMMA	Hollow Metal Manufacturer's Association
IBC	International Building Code
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IFB	Invitation for Bids
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board of Fire Underwriters
NCMA	National Concrete Masonry Association
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NWMA	National Woodwork Manufacturer's Association
MBMA	Metal Building Manufacturer's Association
PCA	Portland Cement Association
PDCA	Painting and Decorating Contractors of America
PIB	Plastering Industry Bureau
PS	U.S. Department of Commerce Product Standard
PUC	Public Utilities Commission
RIS	Redwood Inspection Service
SMDI	Steel Door Institute
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SWI	Sealant and Waterproofers Institute
SSPC	Steel Structures Painting Council
TCA	Tile Council of America
UBC	Uniform Building Code
UMC	Uniform Mechanical Code
UL	Underwriters' Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WWPA	Western Wood Products Association

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01500 - CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001- GENERAL REQUIREMENTS.

1.02 CONSTRUCTION REQUIREMENTS

A. Consult with the University, review site conditions and factors which affect construction procedures and construction aids, including adjacent public facilities and properties which may be affected by execution of the work.

B. Relocate construction aids as required by progress of construction, by storage, or by work requirements, and to accommodate legitimate requirements of the University and other Contractors employed at the site.

1.03 ELECTRICITY AND WATER

All temporary electrical wiring and connection to existing service shall be furnished and paid for by the Contractor. Provide branch wiring and distribution boxes located to allow service and lighting by means of construction type power cords. All temporary water lines and appurtenances required for construction shall be supplied and paid for by the Contractor. The University will pay for electrical and water use.

1.04 SANITARY FACILITIES

Upon request of the Contractor, the University may designate an existing sanitary facility to be used during construction operations, provided that the Contractor agrees to be responsible in maintaining such facility in clean sanitary condition daily. Any construction material that is tracked onto facility's surfaces shall be cleaned immediately to prevent staining or discoloration of surfaces. Existing facilities shall not be used for clean up of construction materials, tools, and equipment.

1.05 CONSTRUCTION AIDS

Provide construction aids and equipment required by construction personnel and to facilitate execution of the work including: scaffolds, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment.

1.06 TEMPORARY PROTECTION

A. Safety Barricades: The Contractor shall erect and maintain a temporary safety barricade a minimum of 5'-0" outside the project area as

applicable, encompassing the project area to protect the occupants and the public. The barricade shall remain during the duration of the project or until approval is given by the University for its removal.

B. Dust Barricade: When instructed by the University, the Contractor shall provide a dust barricade enclosure to confine the dust from spreading from its immediate area.

C. Any damage to the surrounding buildings, its contents, etc., from failure to provide the protection as mentioned in the above paragraphs shall be made good by the Contractor to the satisfaction of the University and at no cost to the University.

D. Signs: The Contractor shall provide, post, and maintain any and all required warning signs. All warning signs shall meet OSHA requirements regarding color, size, and lettering. Signs shall be clearly legible at all times. Signs with freehand lettering are not permitted.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01567 – POLLUTION CONTROL

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

B. List of Odors: Contractor shall submit a list of all products with potentially noxious odors and pertinent data on each product.

C. Hydro-testing/Dewatering Permits. (As applicable)

D. NPDES Permits for storm water associated with construction activities. (If applicable, for projects with over 1 acre of soil disturbance.)

E. Erosion/Sediment Control Plan: Prior to the start of work, Contractor shall develop a project specific "Erosion/Sediment Control Plan (Plan)." The Plan shall be submitted to the University for review prior to start of work.

F. Best Management Practices Plan: Prior to start of work, Contractor shall develop a "Best Management Practices Plan (BMPP)" for all applicable construction items. The BMPP shall be submitted to the University for review prior to start of work.

G. Submit UHCC Facilities & Environmental Health Construction Inspection Sheet for Stormwater Management weekly.

1.03 RUBBISH DISPOSAL

A. No burning of debris and/or waste materials shall be permitted on the project site.

B. No burying of debris and/or waste materials.

C. All unusable debris and waste materials shall be hauled away to an appropriate off-site dump area. During loading operations, debris, and waste materials shall be watered down to allay dust.

D. No dry sweeping shall be permitted in cleaning rubbish and fines which can become airborne from floors or other paved areas. Vacuuming, wet mopping, or wet or damp sweeping is permissible.

E. Enclosed chutes and/or containers shall be used for conveying debris from above ground floor level.

1.04 DUST

A. Dust shall be kept within acceptable levels at all times, including non-working hours, weekends and holidays in conformance with Chapter 11-60.1-33 FUGITIVE DUST, as amended, of the State Department of Health, Hawaii Administrative Rules.

B. The method of dust control and all costs incurred thereof shall be the responsibility of the Contractor.

C. The Contractor shall be responsible for all damage claims in accordance with provisions pertaining to INDEMNIFICATION and INSURANCE of the IFB/Contract.

1.05 NOISE

A. Noise shall be kept within acceptable levels at all times in conformance with Chapter 46 – Community Noise Control, State Department of Health, Hawaii Administrative Rules. The Contractor shall obtain and pay for community noise permits from the State Department of Health when the construction equipment or other devices emit noise at levels exceeding the allowable limits.

B. All internal combustion engine-powered equipment shall have mufflers to minimize noise and shall be properly maintained to reduce noise to acceptable levels.

C. Starting up of on-site vehicular equipment meeting allowable noise limits shall not be done prior to 7:30 a.m. or after 4:30 p.m. without prior approval of the University. Equipment exceeding allowable noise limits shall not be started up prior to 8:00 a.m.

D. All noise producing activities and vibration producing activities shall be scheduled with the University.

1.06 ODORS

A. Construction involving products generating noxious odors shall be scheduled with the University so as to reduce high levels of exposure to occupants. Products with noxious odors include but are not necessarily limited to the following: carpet adhesives, paint, asphalt, epoxy, and various resins etc. At the commencement of project, Contractor shall submit a list of all products with potentially noxious odors and pertinent data on each product.

B. Construction involving the use of a roofing kettle shall be required to use an emission reducer.

1.07 HYDROTESTING & DEWATERING

A. The Contractor is responsible for obtaining all necessary construction hydrotesting and dewatering permits prior to the discharge of any piping. Submit copy of permit to the University prior to the start of work.

1.08 NPDES MS4 REQUIREMENTS

A. Pre-Construction, Construction, and Post-Construction "Standard Operating Procedures" for the National Pollutant Discharge Elimination system (NPDES) Municipal Separate Storm Sewer System (MS4) shall apply to all University of Hawaii projects. NPDES MS4 requirements apply to all projects unless the project is exempted by the Contractor (refer to "Contractor Exemption Form for UHCC Facilities & Environmental Health NPDES MS4 Requirements" at the end of this section).

B. The Contractor shall complete a project-specific Erosion/Sediment Control Plan. This plan shall include the following (at minimum):

1. Type and location of each project-specific erosion/sediment control;

2. Installation detail for each erosion/sediment control selected for project;

3. Location of stabilized construction ingress/egress (if applicable);

4. Location of staging area (if applicable);

5. "NOTES" Section, which contains the following (at minimum):

a. "This plan shall be posted in a visible location (e.g., project trailer), and shall be appropriately modified to reflect current site conditions."
b. "Ensure temporary soil stabilization is applied on any bare soiled area that will remain unfinished for more than 30 calendar days."
c. "Ensure permanent soil stabilization is applied as soon as practical after grading. Irrigation and maintenance of the perennial vegetation must be provided for 30 calendar days of until the vegetation takes root, whichever is shorter."

C. The Contractor shall complete a site-specific "Best Management Practices Plan (BMPP)." The BMPP shall include all of the following items. (NOTE: The Contractor can use the below outline to develop their BMPP.)

1. General Contractor Information: Include address and phone number.

2. Name of individuals responsible for water pollution and sediment control on the project site (include phone numbers).

3. Name of individuals who will be conducting inspections and completing corrective measures (include phone numbers).

4. List of all potential pollutants that will be stored and/or used outside, such as:

    a. Sanitary waste from portable toilets;
    b. Diesel fuel, motor oil, brake fluid and hydraulic oil in heavy equipment;
    c. Paints, epoxies, cement, and concrete add mixtures;
    d. Dust from construction activities; and/or,
    e. Oil, fuel, or any hazardous material storage sites and containment structures.

5. List of heavy equipment to be used during construction.

6. Procedures to be used for the maintenance and removal of all BMPs, including:

    a. Name and title of individual responsible for the inspection of all control measures at least once a week and following any rainfall event of 0.5 inches or greater. This individual will promptly record the inspection and repairs.
    b. Name and title of individual responsible for the actual maintenance and repair of the control measures.
    c. This individual(s) will promptly record the inspection and repairs.

7. Procedures to be used to prevent off-site tracking of sediment from the project ingress/egress, to include:

    a. Inspections weekly and after each rainfall.
    b. Proper maintenance by cleaning or replacing gravel when: off-site sediment is noticed; and, or, bare soil is observed within the ingress/egress area.

8. Procedures to be used to install, inspect, repair, and clean silt fences, including:

    a. Inspections weekly and after each rainfall. Repairs to be made whenever damaged or ripped.
    b. Sediments will be removed and disposed of appropriately.

9. Procedures to be used to install, inspect, repair, and clean storm drain inlet, roof drain, and floor drain protection, including:

a. Inspections weekly and after each rainfall.
b. Repairs made whenever damaged or no longer effective.
c. Cleaned daily or on an as needed basis to remove accumulated sediment and debris.

10. Procedures to be used for the design and use of concrete washouts, including:

    a. Use of concrete washout containers.
    b. Container will be placed at location approved by University.
    c. Concrete trucks will wash the chutes and equipment only into a container
    d. Concrete washing will never occur near any storm drain, even one protected by controls. Alkalinity in the rinse water is not filterable by controls.
    e. The concrete wastewater will be dried and disposed of as typical construction debris.

11. Methods of handling hazardous materials and/or disposing hazardous waste generated during construction, including:

    a. MSDS sheets will be kept on file in the project field office; or, with contractor supplies.
    b. All materials will be stored under cover, or in a storage container or shed.
    c. All opened hazardous materials and/or waste containers shall be placed under cover and in secondary containment.
    d. Hazardous materials and/or waste will not be mixed. This can create chemical reactions, and complicate disposal.
    e. Hazardous waste shall be managed by contractor; disposal shall be approved by FEH Office. Disposal of hazardous waste shall be by a certified hazardous waste contractor to an EPA certified disposal site. Uniformed hazardous waste manifest and supporting documents shall be reviewed by FEH Office and signed by FEH Office Environmental Safety Specialist.

12. Procedures to be used for vehicle refueling and maintenance, including:

    a. Vehicles will be fueled off-site at nearby gas station, when possible.
    b. Only minor/emergency repairs of equipment may be conducted on the project site in a designated area (e.g., graveled ingress/egress).
    c. On-site refueling and minor/emergency repairs shall only be done in a designated area (e.g., graveled ingress/egress) with spill kit nearby. If leaks or spills occur, the spill kit shall be immediately deployed. Any oil and/or fuel soaked items will be properly disposed of by the Contractor.

13. Procedures for use of form oils, paints, and other jobsite products, including:

    a. Spills shall be immediately cleaned up.
    b. Over-spray of paints and form oil should be avoided.
    c. Excess paint cans shall be placed on secondary containment or drop cloth and away from drains when opening, during mixing and pouring into sprayer.

14. Procedures to be used for construction vehicle storage:

    a. Place drip pans under all vehicles involved in project at the end of a work day and over weekends.
    b. Drip plans will be checked at the start of each work day.
    c. Contents of drip pans shall be placed in larger collection containers, and removed off-site for proper disposal.

15. Procedures to be used for litter management, including:

    a. Daily site clean-up, especially during windy and/or rainy conditions.
    b. Trash and debris will be collected and placed in a metal dumpster in the Contractor's staging area.
    c. The dumpster will be emptied as necessary.
    d. No construction waste material will be buried on-site.
    e. Liquid wastes will not be disposed of in the dumpster.

16. Procedures to be used for dust control, including:

    a. Open/unpaved areas and stockpiled soil will be watered as needed to prevent dust.
    b. Inactive soil piles will be covered with polyethylene plastic and anchored with sediment barriers.

D. UHCC Project Manager, Campus Facilities Manager and Contractor shall meet to discuss all project compliance elements and review erosion/sediment control placement prior to the start of work.

E. The Contractor shall comply with all aspects of any required NPDES permit and NPDES MS4 permit for storm water associated with construction activity. The Campus Facilities Manager shall conduct on-site inspections and provide other compliance oversight, as needed.

F. UHCC uses the City & County of Honolulu's "Storm Water Best Management Practice Manual for Construction" (Final Version, Dated November 2011) as a compliance-based reference.

1.09 EQUIPMENT RINSING / PRESSURE WASHING

A. Contractor equipment must be cleaned in a manner that does not create any discharge of cleaning agents, paints, oil, or other pollutants to a storm sewer or waterway.

B. When rinsing latex paint equipment outside, rinse water must be contained in a bucket or container; and, taken off site for disposal. Oil-based paint wastes, including solvents and thinners, must not be disposed of in the sanitary sewer or storm drain system. They must be collected and properly disposed of by the Contractor.

C. Discharges from pressure washing must not be allowed to enter a storm sewer or waterway. Contractors shall vacuum up the water or berm the process water an allow it to evaporate. If the rinsate only contains water and dirt or sediment, it may be spread on the ground with prior permission from UHCC.

1.10 CONCRETE WASHOUT & DISPOSAL

A. No dumping of waste concrete will be permitted at the job site.

B. No rinsing of concrete items shall occur on-site without the use of an adequately sized concrete washout container. The Contractor is responsible for off-site disposal of concrete wash water and/or sludge in the concrete washout container.

1.11 STOCKPILING

A. Cold patch shall be stored on top of polyethylene plastic; and, covered with an additional sheet of polyethylene plastic at the end of each work day; or, prior to the onset of precipitation.

B. Stockpiled materials, such as soil, Portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, and pressure treated wood, are to be located away from roadways and storm drains; protected with a temporary perimeter sediment barrier at all times; and, covered at the end of each work day or prior to the onset of precipitation.

1.12 EQUIPMENT REFUELING & REPAIRS

A. Except in an emergency, such as mechanical breakdown, all vehicle fueling and maintenance shall be done in a designated area approved by UHCC and the Campus Facilities Manager. A temporary berm shall be constructed around the area when runoff can cause problems.

1.13 VEHICLE STORAGE

A. The Contractor shall place drip pans under all construction vehicles at the end of each workday and over weekends.

B. The contents of all liquids found in drip pans shall be properly containerized and disposed of offsite by the Contractor.

1.14 SEDIMENT & MATERIAL TRACKING

A. Wherever trucks and/or vehicles leave the site and enter surrounding paved streets, the Contractor shall prevent any material from being carried onto the pavement. Waste water shall not be discharged into existing streams, waterways or drainage systems.

B. Trucks hauling debris shall be covered as required by PUC Regulations. Trucks hauling fine materials shall be covered.

1.15 DAILY CLEAN-UP

A. Execute cleaning to keep work, the site and adjacent properties or areas free from accumulation of waste materials, rubbish and windblown debris, resulting from construction operation. Follow all current applicable laws.

B. Provide on-site containers for the collection of waste materials, debris and rubbish. Coordinate location of containers with the University.

1.16 SUSPENSION OF WORK

A. Violation of any of the above requirements or any other pollution control requirement which may be specified in the Technical Specifications herein shall be cause for suspension of the work creating such violation. No additional compensation shall be due the Contractor for remedial measures to correct the offense. Also, no extension of time will be granted for delays caused by such suspensions.

B. If no corrective action is taken by the Contractor within 24-hours after a suspension is ordered by the University, the University reserves the right to take whatever action is necessary to correct the situation and to deduct all costs incurred by the University in taking such action from monies due the Contractor.

PART 2 – PRODUCTS

(NOT APPLICABLE TO THIS SECTION)

PART 3 – EXECUTION

(NOT APPLICABLE TO THIS SECTION.

S A M P L E

UHCC CONSTRUCTION INSPECTION SHEET FOR STORMWATER MANAGEMENT

The purpose of this weekly inspection is to ensure compliance with all below-listed checklist items. This checklist must be given to the UHCC Project Manager every week.

Project Name/Location: _____

Date: _____

UHCC Project Manager: _____

Name of Individual Performing Inspection: _____

BMPs	Comply	Not Applicable	Does Not Comply	Comments
Dust Control				
Dust screen				
Stabilized construction entrance				
Inlet Protection				
Street Sweeping and Vacuuming				
Exit Tire Washing				
Soil Stabilization Control				
Grass/Vegetation				
Mulching/Seeding				
Plastic or Geotextile Covering				
Slope Protection				
Sediment Control				
Silt Fence/Barrier				
On-Site Inlet Protection				
Dikes/Swales/Ditches				
Sediment Trap/Basin				
Catch Basin Insert				
Pollution Prevention/Housekeeping				
Vehicle & Equipment Cleaning				
Vehicle & Equipment Fueling				
Vehicle & Equipment Maintenance				
Material & Chemical Storage				
Spill Prevention & Control				
Trash Collection Areas				
Stockpiles				

All areas of non-compliance MUST be immediately corrected or the contractor is in direct violation with the *[Campus]* National Pollutant Discharge System (NPDES) permit for Municipal Separate Storm Sewer Systems (MS4); and, subject to fines and penalties from the State of Hawaii Department of Health. An undisclosed follow-up visit verifying non-compliance correction will take place by both the UHCC Project Manager and Campus Facilities (phone: _____) or email: _____

END OF SECTION

SECTION 01570 – SOIL EROSION CONTROL

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS:

As specified in SECTION 01001.

1.02 SUMMARY

A. Provide temporary control measures as indicated on the Erosion Control and Sedimentation Plan, as required by these Specifications, or as ordered by the University during the life of the Contract to control dust and water pollution through the use of silt fences, and other erosion control devices or methods.

1. Temporary erosion and siltation control measures as described herein shall be applied to any erodible material within this project, including local material sources and work areas.

2. Contractor shall be responsible for removing all silt and debris resulting from the work and deposited in drainage facilities, roadways, neighboring lands, and other areas.

3. All costs incurred in complying with the provisions of this Section shall be borne by the Contractor. No separate payment will be made to the Contractor for measures required for environmental control during construction.

B. Related Work Specified Elsewhere

1. Environmental Controls are specified in Section 01560 – ENVIRONMENTAL CONTROLS.

2. Earthwork is specified in Section 02315 – UTILITY TRENCH EXCAVATION AND BACKFILL.

1.03 SUBMITTALS:

A. Submit in accordance with Section 01300 - SUBMITTALS.

B. Best Management Practice (BMP) Plan: A written site-specific BMP describing activities to minimize water pollution and soil erosion into State waters and/or drainage systems. The BMP shall conform to the requirements of Section 209 of the State Standard Specifications.

1.04 WATER POLLUTION AND EROSION CONTROL CONFERENCE:

Schedule a water pollution and erosion control conference with the University at least fourteen (14) calendar days before the start of construction work to discuss the

sequence of work, plans and proposals for water pollution and erosion control. Submit a Best Management Practice (BMP) plan, as described in paragraph 1.05 of this section, a minimum of ten (10) calendar days before the scheduled conference.

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Mulches

1. Bagasse, hay, straw, fiber mats, netting, wood cellulose, bark, wood chips, or other suitable material acceptable to the University and shall be reasonably clean and free of noxious weed and deleterious materials.

2. Mulch shall be specially processed fiber containing no growth or germination inhibiting factors. It shall be such that after addition and agitation in the hydraulic equipment with seed, fertilizer, water and other additives not detrimental to plant growth, the fibers will form a homogeneous slurry.

3. When hydraulically sprayed on the soil, mulch fibers shall form a blotter-like ground cover which readily absorbs water and allows infiltration to the underlying soil. In every application, complete coverage of the soil shall be attained. Mulch shall be applied at the minimum rate of 1,500 pounds per acre.

B. Compost filter sock shall be as indicated.

C. Grass

1. Quick growing species (such as rye grass, Italian rye grass, or cereal grasses) suitable to the area and which provide a temporary cover that does not later compete with the permanent cover.

2. Obtained grass digging up luxuriant growths from areas that are free of seeds, roots, plants, and grasses that are foreign to the specified grass. The grass will not be acceptable unless it is planted and watered within 24 hours after being dug out from its original growing position.

3. Seed for hydro mulching, unless otherwise specified, shall be Bermuda (Cynodon Dactylon) except giant varieties, certified, meeting the following requirements:

Pure Seed	95% minimum
Crop Seed	1% maximum
Weed	0.5% maximum
Inert Material	5% maximum
Germination	85% minimum

4. The seeds shall be applied at the rate of 100 pounds per acre (minimum) and within twelve (12) months of the date of the certified germination test.

D. Fertilizer

1. Fertilizer and soil conditioners shall be a standard commercial grade acceptable to the University.

2. Contractor shall be responsible to determine the proper fertilizer required in the hydro mulch mix for the existing soil condition and be responsible to decide the quantity and the analysis and ratio to ensure sufficient nutrients for the sustained growth of the grass.

PART 3 – EXECUTION

3.01 GENERAL

A. Earth material shall not be exposed until the BMPs are installed and accepted by the University. The maximum surface area of earth material exposed by clearing, grubbing, borrow and fill operations at any time is 300,000 square feet. The University has the authority to limit the surface area exposed by clearing and grubbing and to limit the surface area exposed by excavation and fill operations. The University may also direct the Contractor to provide immediate, permanent, or temporary pollution control measures to prevent contamination of drainage channels and pipes, roads, neighboring lands, and other areas.

B. Except for specified measures as indicated, the Contractor shall determine the appropriate erosion control measures to use. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, and slope drains, and the use of temporary mulches, mats, and grassing, or the construction and use of other control devices or methods as necessary to control erosion.

C. The Contractor shall incorporate all erosion control measures indicated. The Drawings may be modified as necessary to adjust to conditions that develop during construction.

3.02 CLEARING AND GRUBBING

A. The Contractor shall limit the surface area exposed by grubbing, stripping of topsoil, and trenching to that which is necessary to perform the next operation, and which is within his capability and progress in keeping the finish grading, mulching, grassing, and other such pollution control measures current.

B. The grubbing of the vegetative root mat and stumps and the stripping of topsoil shall be confined within the limits of clearing which can be actively and continuously prosecuted within fifteen (15) calendar days. The area to be cleared shall be limited to the minimum area necessary to accommodate the Contractor's equipment and work force and shall not at any time extend beyond the limits of work indicated without prior approval of the University.

C. Any area remaining bared or cleared for more than thirty (30) calendar days and which is not within the limits of active construction shall be remedied as directed by the University.

3.03 BEST MANAGEMENT PRACTICES

A. The temporary erosion and siltation control measures outlined in these Specifications are minimum requirements and shall not preclude the provision of any additional measures which the Contractor may deem necessary. Damages caused by the erosion of soils and the pollution of downstream areas shall be the responsibility of the Contractor and all costs for repairing, correcting, replacing, and cleaning such damaged or polluted facilities shall be borne by the Contractor.

B. Grassing for erosion control can be undertaken by sprigging, matting or hydro-mulch seeding.

1. Sprigging or Matting

a. Ground Preparation: Prior to planting, the areas to be grassed shall be cleared of all unwanted plants (including their root systems), stones over three (3) inches in diameter, papers, trash and debris.

b. If the existing soil in the areas to be grassed is suitable for use as topsoil, the soil shall be scarified to a depth of six (6) inches from the finished surface, and worked until it is of a uniform and loose texture.

c. Areas unsuitable for planting shall be finished with a 4-inch layer of topsoil, spread and graded to conform to the finish grade shown on the Plans.

d. Planting: Planting shall be by sprigging, matting, or other methods at the option of the Contractor. If planting is by sprigging or matting, the surface shall be rolled with a suitable lawn roller after planting has been completed.

2. Water shall be applied within the same day of planting in such quantities as to moisten the soil to the depth of the planted grass. Additional application shall be made so that the planted areas are continually kept damp to the grass depth and until the commencement of plant establishment work.

e. Fertilizer shall be applied at not less than the rate of 300 pounds per acre, 23 to 30 days after the grass has been planted.

C. Hydro-Mulch Seeding

1. The Contractor shall begin hydro-mulch seeding operations after the areas prepared or designated for seeding have been approved by the University. Approval shall include inspection of slopes to ensure provision has been made for the collection and disposal of surface water to protect planted areas from erosion. Approval shall not relieve the Contractor of his responsibility to restore any damage to the slope or planted areas not yet accepted by the University.

2. The hydro-mulch equipment shall be capable of mixing all the necessary ingredients to a uniform mixture and of applying the slurry to provide uniform coverage. Seed, fertilizer, and mulch mix shall be applied in one operation by approved hydraulic equipment.

3. Areas inaccessible to hydro-mulching application shall be seeded, fertilized and mulched by hand methods.

4. Water shall be applied immediately following mulching in such quantities as to moisten the soil and mulch. Watering shall be continued in such manner, quantity, and frequency to insure proper germination and growth and shall be done in a way that will prevent erosion and will not cause damage to the planted areas.

END OF SECTION

SECTION 01575 – ENVIRONMENTAL CONTROLS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in Section 01001.

1.02 SUMMARY

A. 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 degrade the utilization of the environment for aesthetic and recreational purposes.

B. All costs incurred in complying with the provisions of this Section shall be borne by the Contractor. No separate payment will be made to the Contractor for measures required for environmental control during construction.

1.03 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, Title 11, Chapter 55, WATER POLLUTION CONTROL; Title 11, Chapter 54, WATER QUALITY STANDARDS.

B. State of Hawaii, Department of Health, Hawaii Administrative Rules, Title 11, Chapter 59, AMBIENT AIR QUALITY, Title 11, Chapter 60, AIR POLLUTION CONTROL LAW.

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

D. State of Hawaii, Occupational Safety and Health Standards, Title 12, Department of Labor and Industrial Relations, Subtitle 8, Division of Occupational Safety and Health, subparagraph 12-202-13, ASBESTOS; Environmental Protection Agency, Code of Federal Regulations Title 40,

Part 61, NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS, and Subpart M, NATIONAL EMISSION STANDARDS FOR ASBESTOS; and U.S. Department of Labor Occupational Safety and Health Administration (OSHA) Asbestos Regulations, Code of Federal Regulations Title 29, Part 1910, Subpart Z, Section 1910.1001.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 AIR POLLUTION CONTROL

A. Emission: The Contractor shall not be allowed to operate equipment and vehicles that show excessive emissions of exhaust gases until corrective repairs or adjustments are made, as determined by the University.

B. Dust: The Contractor, for the duration of the Contract, shall maintain all excavations, embankments, haul roads, permanent access roads, plant sites, waste disposal areas, borrow areas, and all other work areas within or without the project limits free from dust which would cause a hazard to the work, or the operations of other contractors, or to persons or property. Industry accepted methods of stabilization suitable for the area involved, such as sprinkling or similar methods, will be permitted. Chemicals or oil treating shall not be used.

C. Burning shall not be permitted.

3.02 WATER POLLUTION CONTROL

A. Wastes: The Contractor shall not deposit at the site or in its vicinity, solid waste or discharge liquid waste, such as fuels, lubricants, bituminous waste, untreated sewage and other pollutants, which may contaminate the existing streams or groundwater.

B. Spills: Care shall be taken to ensure that no petroleum products, bituminous materials, or other deleterious substances, including debris, are allowed to fall, flow, leach, or otherwise enter existing streams or groundwater.

C. Erosion: Contractor shall provide any necessary temporary drainage, dikes, and similar facilities to prevent erosion damage to the site. Run-off shall be controlled to prevent damage to surrounding area. Additional requirements provided in Section 01570 – SOIL EROSION CONTROL.

3.03 NOISE CONTROL

Construction equipment shall be equipped with suitable mufflers to maintain noise within levels complying with applicable regulations.

3.04 DISPOSAL

A. Construction waste, such as crates, boxes, building materials, pipes and other rubbish shall be disposed of at State licensed facilities. Other areas or methods proposed by the Contractor will be approved only if the University determines that their effect on the environment is equal to or less than those described herein.

B. Removal of wastes shall be a continuous ongoing operation. Wastes and debris shall not be allowed to accumulate in large open piles.

C. Windblown wastes and debris and wastes left by workers shall be collected by the Contractor and disposed as described above. No rubbish shall be deposited in the gullies located on the property.

END OF SECTION

SECTION 01700 – CONTRACT CLOSE OUT

PART 1 – GENERAL

1.01 GENERAL CONDITIONS

As specified in SECTION 01001 GENERAL REQUIREMENTS.

1.02 CLOSEOUT PROCEDURES

A. When work has reached final completion, submit written notification that the contract documents have been reviewed, the work has been examined, and that the work is complete in accordance with contract documents and ready for University's inspection.

B. A final inspection to determine acceptance of the project will be performed by the Contractor, Architect/Engineer and University representative.

C. From the information gathered from this inspection, the University will prepare a "punch list" of work to be performed before the project will be accepted. All work on the punch list shall be completed by the Contractor prior to acceptance of the project by the University.

D. In addition to submittals required by the conditions of the contract, provide submittals required by governing authorities, and submit a final statement of accounting, on forms provided by the University.

E. Execute final cleaning prior to final inspection.

1.03 PROJECT RECORD DOCUMENTS

Store documents separate from those used for construction. Keep documents (As-Built) current and do not permanently conceal any work until required information has been recorded. At contract closeout, submit documents with transmittal letter.

1.04 WARRANTIES

Provide duplicate notarized copies. Execute submittals and assemble documents executed by subcontractors, suppliers, and manufacturers. Submit materials prior to final application for payment. Warranties shall begin from the date of project acceptance. The Contractor shall be advised that the University shall have the right for beneficial use of all new equipment prior to project acceptance. It shall be the Contractor's responsibility to obtain extended warranties for use of all new equipment provided by this contract prior to project acceptance at no additional cost to the University.

1.05 MANUALS

Contractor(s) shall furnish the University with two (2) complete sets of written service instructions and manufacturer operation catalogs and data, together with warranties and guarantees and such field instructions to University personnel as is necessary to fully instruct correct operating and maintenance procedures for equipment installed under this contract. Data and instructions shall be furnished for equipment requiring periodic adjustment, maintenance or other operating procedure, include also the hardware, accessories, heating, ventilating, air conditioning, plumbing, and electrical work.

1.06 RELEASE OF CLAIMS

Contractor(s) shall furnish document for release of all claims against the University arising by virtue of this contract other than claims in stated amounts as may be specifically excluded by the Contractor from the operation of the release. Document must be notarized and provided in duplicate.

1.07 FINAL CLEANING

A. At the completion of the project, prior to acceptance and prior to the final inspection, thoroughly clean the job site, buildings and work areas. Vacuum clean where appropriate and remove grease, adhesive, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces. Use commercial cleaning compounds where necessary. Wash and shine glazing and mirrors. Polish glossy surfaces to a clean shine. Wash and wax all resilient floors, clean all tile flooring and similar surfaces. Clean all painted surfaces where soiled. Clean all toilets including fixtures and partitions. Clean and leave in like- new condition all surfaces not specifically mentioned above.

B. If applicable, clean permanent filters of ventilating systems and replace disposable filters if units were operated during construction. Clean ducts, blowers, and coils if units were operated without filters during construction.

C. Follow the recommendations of the manufacturers of the materials and items to be cleaned for all cleaning.

D. Prior to final inspection, clean the site and put it into a neat, acceptable condition. Hose down and scrub where necessary all new pavement and walks, and all existing pavement and walks dirtied as a result of the work. Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify that the entire work is clean and ready for final inspection.

1.08 RESTORATION OF SITE

Contractor shall be held responsible for restoration of all lawn and grass areas and/or shrubs, landscaping, lawn sprinkler heads etc. damaged as a result of construction vehicles and Contractor's vehicular parking.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01715 - EXISTING CONDITIONS - HAZARDOUS MATERIAL SURVEY

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the results of the State's survey for *Asbestos, Lead and other Hazardous* materials and is provided for the Contractor's information.

B. Related Sections include the following:

1. SECTION 13281 - REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING MATERIALS (ACM) for requirements of all work which disturbs asbestos-containing material (ACM). Also, refer to the drawings.

2. SECTION 13282 - LEAD-PAINT CONTROL MEASURES for requirements of all work which disturbs lead-containing paint (LCP). Also, refer to the drawings.

3. SECTION 13288 – ASBESTOS TESTING AND MONITORING for all testing and air monitoring of asbestos-containing material (ACM). Also, refer to the drawings.

4. SECTION 13289 – LEAD TESTING AND MONITORING for all testing and air monitoring of lead-containing paint (LCP). Also, refer to the drawings.

5. SECTION 13285 - PCB BALLASTS for requirements of all work which disturbs PCB ballasts. Also, refer to the drawings.

6. SECTION 13286 – MERCURY CONTAINING COMPONENTS for requirements of all work which disturbs mercury containing components. Also, refer to the drawings.

1.02 ASBESTOS

A. The structure or structures to be renovated or demolished under this contract were surveyed for the presence of asbestos-containing materials (ACM), using AHERA and NESHAP requirements. A copy of the initial survey report, as well as any subsequent supplemental survey report(s) if performed, are included in this Section.

1. The report(s) are included, even when no ACM was found, for the Contractor's information. Review the attached report(s) for the basis on which the negative ACM finding was made. Contractor may perform further surveys at its own expense, if ACM not shown in the report(s) is suspected in the areas of the building(s) in which work will be performed. If ACM is found, notify the Contracting Officer immediately. The State will reimburse the Contractor for the testing cost if ACM is found.
2. If there is ACM outside of the areas in which work will be performed, this ACM shall not be disturbed in any way.

B. If applicable, notify employees, Subcontractors and all other persons engaged on the project of the presence of asbestos in the existing buildings in accordance with the requirements of State of Hawaii: Occupational Safety and Health Administration 29 CFR 1926.1101, Asbestos.

C. In the event work is required in any building or buildings on the site other than the one(s) designated within this project scope, request copies of the asbestos survey report(s) for such building(s) from the Contracting Officer assuming they are available. Based on the information contained in the additional survey(s), notify affected personnel per paragraph 1.02 B. If not available, Contracting Officer and/or DAGS Project Coordinator must decide to perform additional hazardous materials survey as soon as practicable.

1.03 LEAD CONTAINING PAINT

A. Inform employees, Subcontractors and all other persons engaged in the project that lead containing paints (LCP) is present in the existing building(s) and at the job site. Conduct work in accordance with the requirements of Occupational Safety and Health Administration 29 CFR 1926.62 Lead.

B. Review the attached lead testing data which identifies locations where LCP was found and ensure that all workers that need to be involved understand the contents of the report(s) referring to areas in which work is to be performed. Contractor must understand that lead testing was for design purposes only, and the results do not satisfy any of the requirements of Occupational Safety and Health Administration 29 CFR 1926.62 Lead.

1.04 POLYCHLORINATED BIPHENYLS (PCB's), MERCURY

A. Inform employees, Subcontractors and all other persons engaged in the project that PCB and mercury containing components are present in the existing building(s) and at the job site, and Chlordane, Dieldrin, and may have contaminated the soil under and around the buildings.

1.05 CHLORDANE/DIELDRIN AND OTHER TERMITICIDES

A. The structure to be renovated or modified under this contract was not surveyed for the presence of chlordane/dieldrin and other termiticides, and due to the age of the existing structure and the building type it is assumed that banned termiticides are not present. Contractor may perform surveys at its own expense, if banned termiticides are suspected in areas of the building in which work will be performed. If banned termiticides are found, notify the University immediately. The University will reimburse the Contractor for the testing cost if banned termiticides are found. If there is banned termiticides outside of the areas in which work will be performed, these termiticides shall not be disturbed in any way. If applicable, notify employees, subcontractors and all other personnel engaged in the project of the presence of banned termiticides in the existing building in accordance with the requirements of Chapter 110, Article 12-110-2(f)(1)(B) of the Occupational Safety and Health Standards, State of Hawaii.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 Limited Hazardous Materials Survey Report – 5988 Imiloa Room 123, 5986A and 5986B Uluwehi (Project No. CCR-17-6251) attached, 59 pages, dated June 3, 2019, prepared by TRC.

END OF SECTION

LIMITED HAZARDOUS MATERIALS SURVEY REPORT

5988 Imiloa Room 123 & 5986A and 5986B Uluwehi (Project No. CCR-17-6251) Windward Community College

45-720 Kea'ahala Rd
Kaneohe, Hawaii 96744

Prepared for:

Benjamin Woo Architects

1240 Ala Moana Blvd., Suite 540
Honolulu, Hawaii 96814

Report Date: June 3, 2019

Prepared By:

1600 Kapiolani Blvd., Suite 717, Honolulu, HI 96814

TRC Project: 342957

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Appendices

EXECUTIVE SUMMARY

Ben Woo Architects contracted TRC Environmental Corporation (TRC) to conduct a limited scope hazardous materials survey for the Windward Community College located at 45-720 Kea'ahala Road in Kaneohe, Hawaii. TRC understands renovation activities are planned for the following areas:

- Conversion of existing classroom into a laboratory (5988 Imiloa Room 123).
- Adding classrooms and other renovation activities in the Greenhouse and potential renovations to Building S restrooms (5986A & 5986B Uluwehi).

The survey activities were conducted on May 15 and 16, 2019, by Ms. Kacey Swindle (HIASB-3378), an Asbestos Hazard Emergency Response Act (AHERA) accredited Asbestos Building Inspector.

Asbestos Containing Materials

Results of analysis confirmed asbestos was identified within some of the bulk samples collected. Asbestos-containing materials (ACM) are defined by the Occupational Safety and Health Administration (OSHA), the Environmental Protection Agency (EPA) and the State of Hawaii Department of Health (DOH) as any material containing more than one percent (>1.0%) asbestos when analyzed using Polarized Light Microscopy (PLM) methods.

Material	Location	Percentage/ Type	Approx. Quantity	Condition	Material Type	NESHAP Category
Sink Undercoat, Black	Greenhouse Sink/Counter	6% Chrysotile	15 SF	Good	Misc.	Cat II

Any materials uncovered during renovation or demolition activities that are not addressed in this inspection report, or presumed asbestos containing materials (PACM), must be sampled by an accredited asbestos inspector prior to any disturbance, or they must be treated as asbestos containing (ACM).

Lead Containing Paint Sampling Results

Results of laboratory analysis of the paint chip samples that were collected and analyzed is included in the table below. Lead-based paint (LBP) is defined as paint containing greater than or equal to 0.5 percent lead by weight (≥0.5%) or greater than or equal to 5,000 parts per million (ppm). Lead-containing paint is paint with lead in any concentration above the laboratory detection limit.

Sample Number	Location	Description	% Lead (by weight)	Lead-Based Paint
WCC-Pb-01	Greenhouse – I-Beams and Vertical Cylindrical Supports	Off-White Over Gray Paint on Metal	0.050%	No
WCC-Pb-02	Greenhouse – Exterior	Light Beige over Light Green Paint on Metal	<0.12%	No

Sample Number	Location	Description	% Lead (by weight)	Lead-Based Paint
WCC-Pb-03	Greenhouse – Interior	White over Light Green Paint on Metal	<0.093%	No
WCC-Pb-04	Uluwehi – Building S – Interior	Cream Paint on Drywall, Metal and CMU	0.031%	No
WCC-Pb-05	Uluwehi – Building S – Exterior	White Paint on Metal, Wood and CMU	0.025%	No
WCC-Pb-06	Imiloa – Room 123 – Structural Steel	Red Paint on Metal	<0.024%	No
WCC-Pb-07	Imiloa – Room 123 – Walls and Door Frames	White Paint on Drywall, Metal and CMU	<0.015%	No

Hazardous Materials Inventory

Based on the limited visual inspection, the following materials were identified at the property.

Location	Material Type	Description	Quantity
Greenhouse	Heavy Metal Containing Devices	Fluorescent Lights (Silver Tip)	24
	Polychlorinated Biphenyls (PCB) Containing Devices	PCB Ballast	24
	Heavy Metal Containing Devices	Halogen Bulbs	7
Uluwehi – Building S – Restrooms	Heavy Metal Containing Devices	Fluorescent Lights	6
	PCB Containing Devices	PCB Ballast	6
Imiloa – Room 123	PCB Containing Devices	PCB Ballast	32

INTRODUCTION

Ben Woo Architects contracted TRC Environmental Corporation (TRC) to conduct a limited scope hazardous materials survey for the Windward Community College located at 45-720 Kea'ahala Road in Kaneohe, Hawaii. TRC understands renovation activities are planned for the following areas:

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BACKGROUND

Asbestos Containing Materials

Occupational Safety and Health Administration (OSHA) defines asbestos-containing material (ACM), as any material containing more than one percent asbestos.

The Environmental Protection Agency (EPA) defines ACM as follows:

1. Friable asbestos-containing material (ACM), is defined by the Asbestos NESHAP, as any material containing more than one percent (1%) asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy (PLM), that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure.

2. Nonfriable ACM is any material containing more than one percent (1%) asbestos as determined using the PLM method that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. The EPA further defines two categories of nonfriable ACM:

    a. Category I (Cat I) - Category I nonfriable ACM is any asbestos-containing packing, gasket, resilient floor covering or asphalt roofing product which contains more than one percent (1%) asbestos as determined using PLM according to the method specified in Appendix A, Subpart F, 40 CFR Part 763, and

    b. Category II (Cat II) - Category II nonfriable ACM is any material, excluding Category I nonfriable ACM, containing more than one percent (1%) asbestos as determined using PLM according to the methods specified in Appendix A, Subpart F, 40 CFR Part 763 that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

3. Regulated Asbestos-Containing Material (RACM) is (a) friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting or abrading, or (d) Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

Asbestos Sampling Procedures

The survey was conducted in accordance with the sample collection protocols established in 40 CFR 763 (AHERA), 40 CFR 61 Subpart M (NESHAP). A summary of survey activities is provided below.

Survey activities began with visual observation of the project area to identify homogeneous areas of suspect ACM. A homogeneous area consists of building materials that appear similar throughout in terms of color and texture that does not extend to other buildings or floors. Visual assessments were conducted in accessible areas of the building. Building materials identified as glass, wood or metal were not considered suspect ACM.

A physical assessment of each homogeneous area of suspect ACM was conducted to assess the friability and condition of the materials. Friability was assessed by physically touching suspect materials.

Based on results of the visual observation, bulk samples of suspect ACM were collected in accordance with State of Hawaii Department of Health (DOH) sampling protocols. Samples of suspect materials were collected in each homogeneous area. Bulk samples were collected using wet methods as applicable to reduce the potential for fiber release. Samples were placed in sealable containers and labeled with unique sample numbers using an indelible marker.

All asbestos bulk samples were submitted under proper COC documentation to the laboratory. Bulk samples were analyzed by PLM utilizing the EPA's, Method for the Determination of Asbestos in Bulk Building Materials, EPA 600/M4-82-020. Analysis by PLM was performed by visual observation of the bulk sample and slides prepared of the bulk sample for microscopic examination and identification. The samples were analyzed for asbestos (Chrysotile, Amosite, Crocidolite, Anthophyllite, and Actinolite/Tremolite), fibrous non-asbestos constituents (mineral wool, cellulose, etc.) and non-fibrous constituents. Using a stereoscope, the microscopist visually estimated the relative amounts of each constituent by determining the estimated area of the asbestos compared with the area estimate of the total sample.

Paint Chip Sampling

Paint chip samples were collected from painted surfaces to determine total lead content and assist in determining Occupational Safety and Health Administration (OSHA) requirements with respect to construction activities which may disturb lead-containing paints.

All paint chip samples were submitted under proper COC documentation to the laboratory. Samples were analyzed by Flame AAS utilizing the Environmental Protection Agency's (EPA) Test Method for Evaluating Solid Waste, Physical / Chemical Methods, EPA SW-846 Method 7420.

Suspect Polychlorinated Biphenyl (PCB) Containing Equipment

TRC identified the approximate number of fluorescent light ballasts in the project areas as part of the hazardous materials survey. TRC's inspection did not include a determination as to whether the light ballasts are in fact PCB containing.

Suspect Mercury Containing Fluorescent Light Tubes and Halogen Bulbs

TRC identified the approximate number of fluorescent light tubes and halogen bulbs in the project areas as part of the hazardous materials survey. TRC's inspection did not include a determination as to whether the fluorescent light tubes and halogen bulbs are in fact mercury containing.

Laboratory Analysis

Laboratory services were provided by EMSL Analytical, Inc., a National Voluntary Laboratory Accreditation Program (NVLAP) certified laboratory (NVLAP code #101048-3) and an American Association for Laboratory Accreditation (A2LA 2845.09) accredited laboratory located in San Leandro, California.

FINDINGS

Asbestos Containing Materials

Laboratory analytical results indicated the following materials were positive for asbestos in concentrations greater than 1%:

Material	Location	Percentage/ Type	Approx. Quantity	Condition	Material Type	NESHAP Category
Sink Undercoat, Black	Greenhouse Sink/Counter	6% Chrysotile	15 SF	Good	Misc.	Cat II

Negative Materials (No Asbestos Detected)

Results of the bulk sampling indicated none of the following sampled materials contained detectable levels of asbestos, based on the PLM method:

Material Description	Material Location(s)
Concrete, Gray	Greenhouse
Caulking, Gray	Greenhouse – Concrete Floor Expansion Joint
Wall Penetration Sealant, White	Greenhouse – Exterior Wall Penetrations
CMU Block And Mortar, Gray	Uluwehi – Building S
Concrete, Gray	Uluwehi – Building S – Throughout Floor
Caulking, White	Uluwehi – Building S – Interior Doors, Exterior Doors And Windows
Caulking, Black	Uluwehi – Building S – Interior Windows

Material Description	Material Location(s)
Wallboard, Gypsum With Joint Compound, White	Uluwehi – Building S – Interior Walls And Ceiling
Caulking, White	Uluwehi – Building S – Toilets, Sinks And Mirrors
Ceiling Tile, 2' X 2', White, Wormhole	Imiloa – Room 123
CMU Block And Mortar	Imiloa – Room 123
Gray Concrete With Gray Skim Coat	Imiloa – Room 123 – Corner Columns And Soffits Concrete Throughout
Cove Base And Associated Adhesive, Green	Imiloa – Room 123 And Common Corridor
Wall Texture, White	Imiloa – Common Corridor Wall
Caulking, White	Imiloa – Room 123 – Doors
Caulking, White	Imiloa – Room 123 – Cabinets
Wallboard, Gypsum With Joint Compound, White	Imiloa – Room 123 And Common Corridor
Vinyl Floor Tile With Black Mastic, 12" X 12", Cream With Blue And Pink Specks	Imiloa – Room 123
Vinyl Floor Tile With Black Mastic, 3" X 3" Gray And Blue Accent	Imiloa – Room 123
Vinyl Floor Tile, 36" X 36", Blue	Imiloa – Common Corridor
Caulking, Cream	Imiloa – Room 123 Windows

Paint Chip Sampling Results

Sample Number	Location	Description	% Lead (by weight)	Lead-Based Paint
WCC-Pb-01	Greenhouse – I-Beams and Vertical Cylindrical Supports	Off-White Over Gray Paint on Metal	0.050%	No
WCC-Pb-02	Greenhouse – Exterior	Light Beige over Light Green Paint on Metal	<0.12%	No
WCC-Pb-03	Greenhouse – Interior	White over Light Green Paint on Metal	<0.093%	No
WCC-Pb-04	Uluwehi – Building S – Interior	Cream Paint on Drywall, Metal and CMU	0.031%	No
WCC-Pb-05	Uluwehi – Building S – Exterior	White Paint on Metal, Wood and CMU	0.025%	No
WCC-Pb-06	Imiloa – Room 123 – Structural Steel	Red Paint on Metal	<0.024%	No
WCC-Pb-07	Imiloa – Room 123 – Walls and Door Frames	White Paint on Drywall, Metal and CMU	<0.015%	No

Results of laboratory analysis indicate that lead was detected in some of the paint chip samples that were collected and analyzed.

Hazardous Materials Inventory

Location	Material Type	Description	Quantity
Greenhouse	Heavy Metal Containing Devices	Fluorescent Lights (Silver Tip)	24
	Polychlorinated Biphenyls (PCB) Containing Devices	PCB Ballast	24
	Heavy Metal Containing Devices	Halogen Bulbs	7
Uluwehi – Building S – Restrooms	Heavy Metal Containing Devices	Fluorescent Lights	6
	PCB Containing Devices	PCB Ballast	6
Imiloa – Room 123	PCB Containing Devices	PCB Ballast	32

Based on the limited visual inspection, suspect PCB containing equipment and heavy metal containing devices were identified at the property.

RECOMMENDATIONS

Asbestos Containing Materials

Results of laboratory analysis confirmed asbestos was identified within some of the bulk samples collected. The asbestos-containing materials were found to be in good condition at the time of the inspection. Removal of asbestos-containing materials should be performed by a State of Hawaii licensed asbestos abatement contractor, and should be handled, stored, and disposed of according to all local, state, and federal regulations.

Any materials uncovered during renovation or demolition activities that are not addressed in this inspection report, or presumed asbestos containing materials (PACM), must be sampled by an accredited asbestos inspector prior to any disturbance, or they must be treated as asbestos containing (ACM).

Asbestos Inaccessible Suspect Materials / Areas

The following materials and areas listed in the table below were not accessible at the time the asbestos survey was conducted.

Materials / Areas	Material Location	Reason
Ceramic, Tile, Grout, Mortar, 1" x 1" Tan	Uluwehi – Building S – Restroom Floors	Discreet Sampling Requested
Ceramic, Tile, Grout, Mortar, 4" x 4" Light Beige	Uluwehi – Building S – Restroom and Janitors Closet Walls	

Materials / Areas	Material Location	Reason
Ceramic, Tile, Grout, Mortar, 4" x 4" Light Tan	Uluwehi – Building S – Restroom and Janitors Closet Walls	

Lead Containing Paints

Results of laboratory analysis confirmed that lead was detected in some of the paint chip samples collected. TRC recommends that any demolition or renovation activities which may disturb painted surfaces be conducted according to the OSHA requirements regarding lead in construction (29 CFR 1926.62).

Suspect PCB Containing Equipment

Suspect PCB containing fluorescent light ballasts were identified in the project areas. Fluorescent ballasts manufactured prior to January 1, 1978 or ballasts that are not labeled "No PCBs" must be considered PCB containing unless testing proves otherwise.

Suspect Mercury Containing Fluorescent Light Tubes and Halogen Bulbs

Suspect mercury containing fluorescent light tubes and suspect halogen bulbs were identified in the project areas. Fluorescent light tubes and halogen bulbs that are scheduled for disposal must be managed according to applicable local, state and federal waste disposal regulations.

DISCLAIMER

The content presented in this report is based on data collected during the site inspection and survey, review of pertinent regulations, requirements, guidelines and commonly followed industry standards, and information provided by Client, their clients, agents, and representatives.

The work has been conducted in an objective and unbiased manner and in accordance with generally accepted professional practice for this type of work. TRC believes the data and analysis to be accurate and relevant, but cannot accept responsibility for the accuracy or completeness of available documentation or possible withholding of information of other parties.

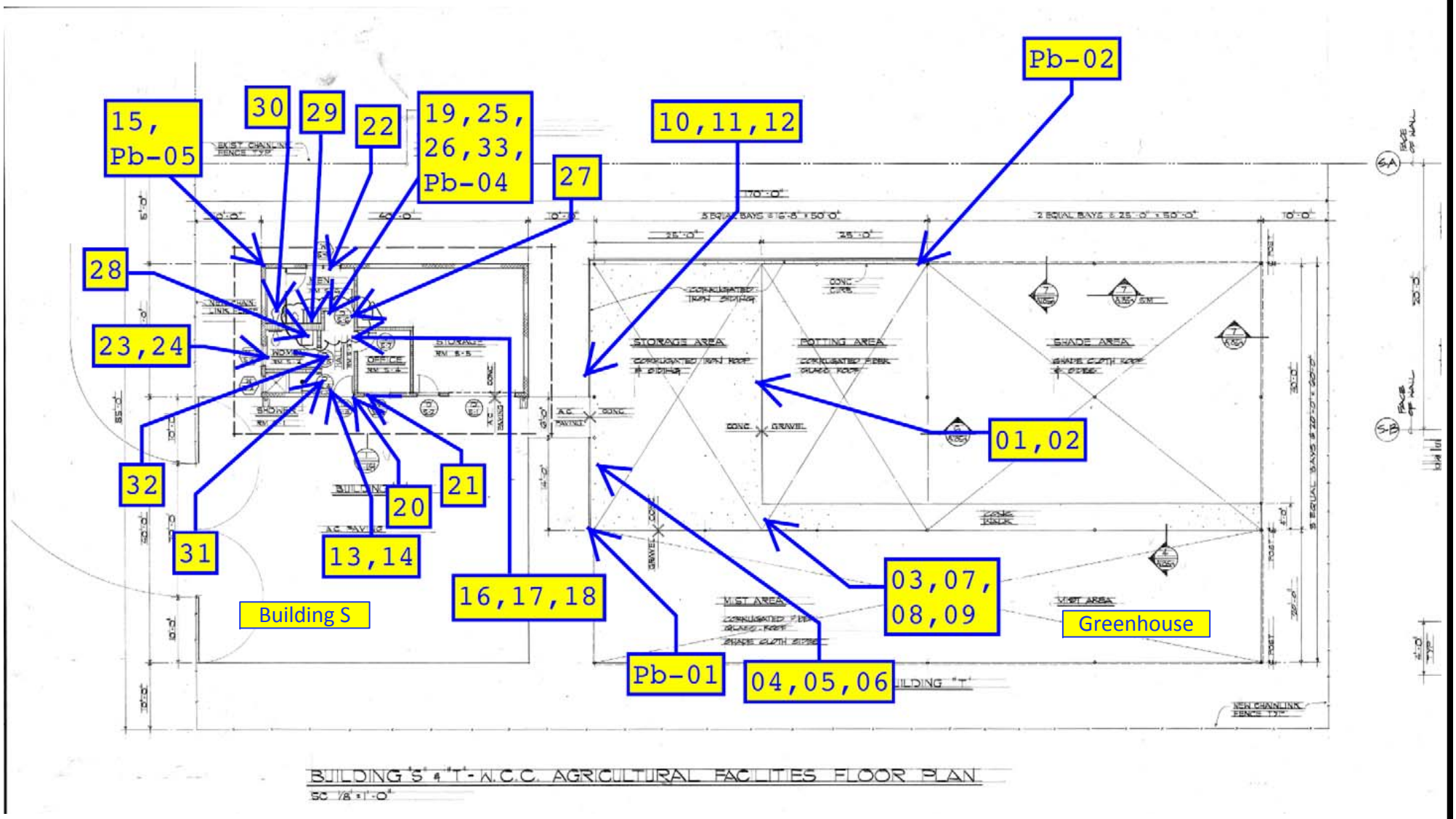
This limited hazardous materials survey report is designed to aid the property owner, architect, construction manager, general contractor, and asbestos abatement contractor in locating asbestos containing materials, lead containing paints, suspect PCB containing equipment and suspect mercury containing equipment.

Sincerely,
TRC Environmental Corporation

Kacey Swindle
Project Manager

Bart Ashley, CIH, CSP
Senior Project Manager

Appendix A – Sample Location Diagrams



LEGEND

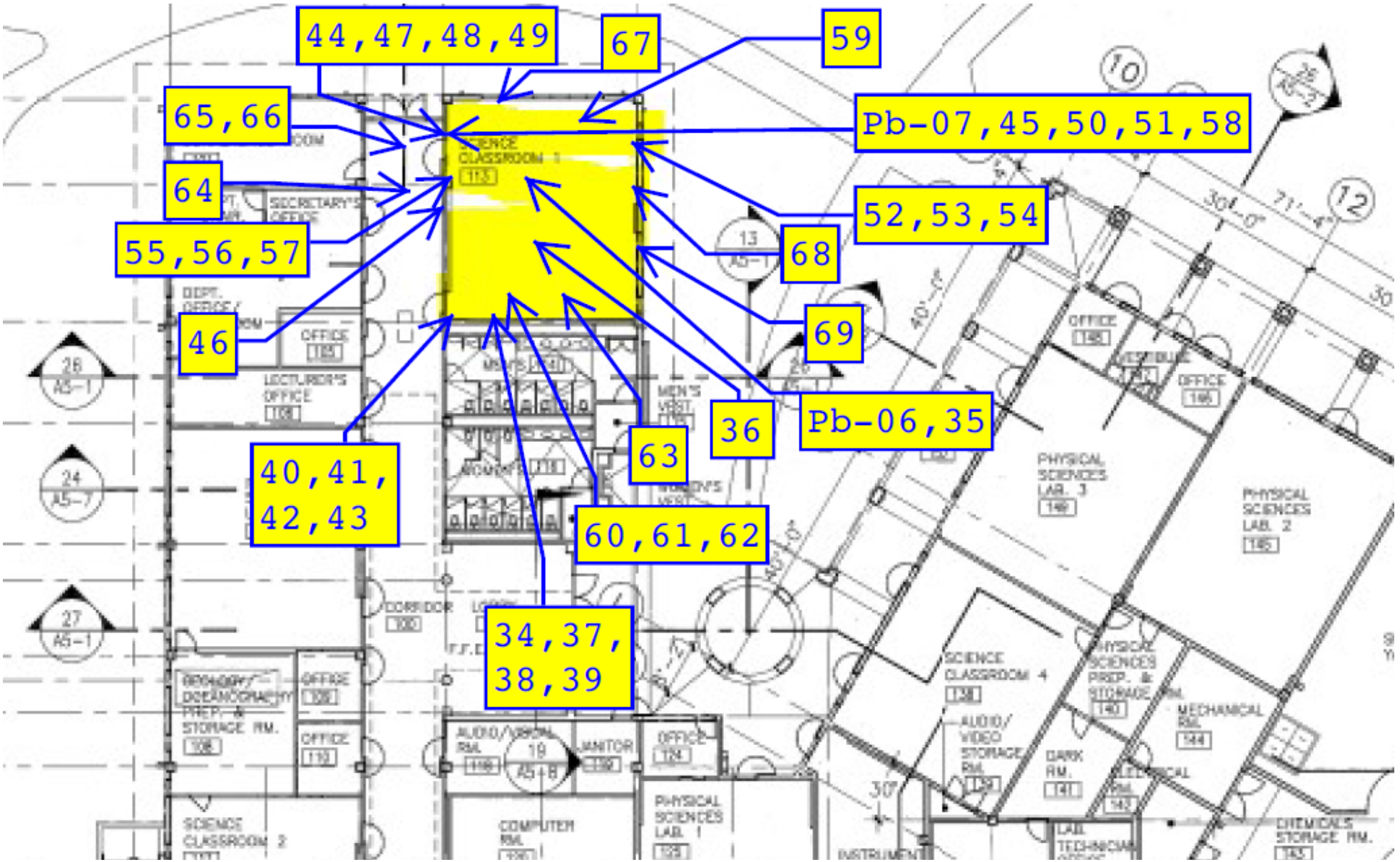
Sample Prefix – "WCC-"

SAMPLE LOCATION DIAGRAM

Windward Community College Project No. CCR-17-6251
45-720 Keaahala Road
Kaneohe, Hawaii 96744

TRC Project No.: 293935	5986A and 5986B Uluwehi Building S and Greenhouse
Drawn by: K. Swindle	

TRC
1600 Kapiolani Boulevard, Suite 717
Honolulu, Hawaii 96814
Phone: (808) 728-4111 Fax: (808) 638-5649



LEGEND

Sample Prefix – "WCC-"

SAMPLE LOCATION DIAGRAM

Windward Community College Project No. CCR-17-6251
45-720 Keaahala Road
Kaneohe, Hawaii 96744

TRC Project No.: 293935		5988 Imiloa Classroom 113
Drawn by: K. Swindle		

TRC
1600 Kapiolani Boulevard, Suite 717
Honolulu, Hawaii 96814
Phone: (808) 728-4111 Fax: (808) 638-5649

Appendix B – Laboratory Results and Chain of Custody

EMSL Analytical, Inc.

464 McCormick Street San Leandro, CA 94577

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http://www.EMSL.com / sanleandrolab@emsl.com

EMSL Order:	091911363
Customer ID:	32EVSW63
Customer PO:	342957
Project ID:	

Attention:	Bart Ashley	**Phone:**	(808) 728-4111
	TRC Environmental Corporation	**Fax:**	
	1600 Kapiolani Blvd	**Received Date:**	05/17/2019 8:30 AM
	Suite 717	**Analysis Date:**	05/20/2019 - 05/23/2019
	Honolulu, HI 96814	**Collected Date:**	

Project: 342957 / 5988 IMILOA ROOM 123 AND 5986A AND 5986B ULUWEHI - BUILDING S AND T / WINDWARD COMMUNITY COLLEGE

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**
WCC-01 *091911363-0001*	CONCRETE, GRAY - GREENHOUSE	Gray Non-Fibrous Homogeneous		35% Quartz 60% Ca Carbonate 5% Non-fibrous (Other)	None Detected
WCC-02 *091911363-0002*	CONCRETE, GRAY - GREENHOUSE	Gray Non-Fibrous Homogeneous		30% Quartz 60% Ca Carbonate 5% Gypsum 5% Non-fibrous (Other)	None Detected
WCC-03 *091911363-0003*	CONCRETE, GRAY - GREENHOUSE	Gray Non-Fibrous Homogeneous		40% Quartz 40% Ca Carbonate 20% Non-fibrous (Other)	None Detected
WCC-04 *091911363-0004*	SINK UNDERCOAT, BLACK - GREENHOUSE SINK/COUNTER	Black Non-Fibrous Homogeneous		9% Ca Carbonate 80% Matrix 5% Non-fibrous (Other)	6% Chrysotile
WCC-05 *091911363-0005*	SINK UNDERCOAT, BLACK - GREENHOUSE SINK/COUNTER	Black Non-Fibrous Homogeneous		10% Ca Carbonate 80% Matrix 5% Non-fibrous (Other)	5% Chrysotile
WCC-06 *091911363-0006*	SINK UNDERCOAT, BLACK - GREENHOUSE SINK/COUNTER	Black Non-Fibrous Homogeneous		70% Matrix 25% Non-fibrous (Other)	5% Chrysotile
WCC-07 *091911363-0007*	CAULKING, GRAY - GREENHOUSE CONCRETE FLOOR EXPANSION JOINT	Gray Non-Fibrous Homogeneous		5% Quartz 30% Ca Carbonate 30% Matrix 35% Non-fibrous (Other)	None Detected
WCC-08 *091911363-0008*	CAULKING, GRAY - GREENHOUSE CONCRETE FLOOR EXPANSION JOINT	Gray Non-Fibrous Homogeneous		5% Quartz 20% Ca Carbonate 40% Matrix 35% Non-fibrous (Other)	None Detected
WCC-09 *091911363-0009*	CAULKING, GRAY - GREENHOUSE CONCRETE FLOOR EXPANSION JOINT	Gray Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
WCC-10 *091911363-0010*	WALL PENETRATION SEALANT, WHITE - GREENHOUSE EXTERIOR WALL PENETRATIONS	White Non-Fibrous Homogeneous		15% Ca Carbonate 70% Matrix 15% Non-fibrous (Other)	None Detected
WCC-11 *091911363-0011*	WALL PENETRATION SEALANT, WHITE - GREENHOUSE EXTERIOR WALL PENETRATIONS	White Non-Fibrous Homogeneous		70% Quartz 15% Ca Carbonate 15% Non-fibrous (Other)	None Detected

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EMSL Order:	091911363
Customer ID:	32EVSW63
Customer PO:	342957
Project ID:	

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**
WCC-12 *091911363-0012*	WALL PENETRATION SEALANT, WHITE - GREENHOUSE EXTERIOR WALL PENETRATIONS	White Non-Fibrous Homogeneous		5% Ca Carbonate 70% Matrix 25% Non-fibrous (Other)	None Detected
WCC-13-CMU Block *091911363-0013*	CMU BLOCK AND MORTAR, GRAY - ULUWEHI - BUILDING S	Beige Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
WCC-13-Mortar *091911363-0013A*	CMU BLOCK AND MORTAR, GRAY - ULUWEHI - BUILDING S	Gray Non-Fibrous Homogeneous		15% Quartz 70% Ca Carbonate 15% Non-fibrous (Other)	None Detected
WCC-14-CMU Block *091911363-0014*	CMU BLOCK AND MORTAR, GRAY - ULUWEHI - BUILDING S	White/Beige Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
WCC-14-Mortar *091911363-0014A*	CMU BLOCK AND MORTAR, GRAY - ULUWEHI - BUILDING S	Gray Non-Fibrous Homogeneous		15% Quartz 70% Ca Carbonate 15% Non-fibrous (Other)	None Detected
WCC-15-CMU Block *091911363-0015*	CMU BLOCK AND MORTAR, GRAY - ULUWEHI - BUILDING S	Beige Non-Fibrous Homogeneous		60% Ca Carbonate 10% Gypsum 30% Non-fibrous (Other)	None Detected
WCC-15-Mortar *091911363-0015A*	CMU BLOCK AND MORTAR, GRAY - ULUWEHI - BUILDING S	Gray Non-Fibrous Homogeneous		25% Quartz 50% Ca Carbonate 10% Gypsum 15% Non-fibrous (Other)	None Detected
WCC-16 *091911363-0016*	CONCRETE, GRAY - ULUWEHI - BUILDING S - THROUGHOUT FLOOR	Gray/White Non-Fibrous Homogeneous		20% Quartz 70% Ca Carbonate 10% Non-fibrous (Other)	None Detected
WCC-17 *091911363-0017*	CONCRETE, GRAY - ULUWEHI - BUILDING S - THROUGHOUT FLOOR	Gray/White Non-Fibrous Homogeneous		20% Quartz 70% Ca Carbonate 10% Non-fibrous (Other)	None Detected
WCC-18 *091911363-0018*	CONCRETE, GRAY - ULUWEHI - BUILDING S - THROUGHOUT FLOOR	Gray Non-Fibrous Homogeneous		20% Quartz 60% Ca Carbonate 10% Gypsum 10% Non-fibrous (Other)	None Detected
WCC-19 *091911363-0019*	CAULKING WHITE - ULUWEHI - BUILDING S INTERIOR DOORS, EXTERIOR DOORS AND WINDOWS	White Non-Fibrous Homogeneous		10% Ca Carbonate 70% Matrix 20% Non-fibrous (Other)	None Detected
WCC-20 *091911363-0020*	CAULKING WHITE - ULUWEHI - BUILDING S INTERIOR DOORS, EXTERIOR DOORS AND WINDOWS	White Non-Fibrous Homogeneous		10% Ca Carbonate 70% Matrix 20% Non-fibrous (Other)	None Detected

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EMSL Order:	091911363
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Project ID:	

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**
WCC-21 *091911363-0021*	CAULKING WHITE - ULUWEHI - BUILDING S INTERIOR DOORS, EXTERIOR DOORS AND WINDOWS	White Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
WCC-22 *091911363-0022*	CAULKING BLACK - ULUWEHI - BUILDING S - INTERIOR WINDOWS	Black Non-Fibrous Homogeneous		10% Ca Carbonate 70% Matrix 20% Non-fibrous (Other)	None Detected
WCC-23 *091911363-0023*	CAULKING BLACK - ULUWEHI - BUILDING S - INTERIOR WINDOWS	Black Non-Fibrous Homogeneous		10% Ca Carbonate 70% Matrix 20% Non-fibrous (Other)	None Detected
WCC-24 *091911363-0024*	CAULKING BLACK - ULUWEHI - BUILDING S - INTERIOR WINDOWS	Black Non-Fibrous Homogeneous		10% Ca Carbonate 70% Matrix 20% Non-fibrous (Other)	None Detected
WCC-25-Wallboard *091911363-0025*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - ULUWEHI - BUILDING S - INTERIOR WALLS AND CEILING	White Non-Fibrous Homogeneous		5% Quartz 5% Ca Carbonate 80% Gypsum 10% Non-fibrous (Other)	None Detected
WCC-25-Joint Compound *091911363-0025A*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - ULUWEHI - BUILDING S - INTERIOR WALLS AND CEILING	White Non-Fibrous Homogeneous		95% Ca Carbonate 2% Mica 3% Non-fibrous (Other)	None Detected
WCC-25-Skim Coat *091911363-0025B*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - ULUWEHI - BUILDING S - INTERIOR WALLS AND CEILING	White Non-Fibrous Homogeneous		3% Quartz 90% Ca Carbonate 2% Mica 5% Non-fibrous (Other)	None Detected
WCC-26-Wallboard *091911363-0026*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - ULUWEHI - BUILDING S - INTERIOR WALLS AND CEILING	White Non-Fibrous Homogeneous	4% Cellulose	6% Ca Carbonate 80% Gypsum 10% Non-fibrous (Other)	None Detected
WCC-26-Joint Compound *091911363-0026A*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - ULUWEHI - BUILDING S - INTERIOR WALLS AND CEILING	White Non-Fibrous Homogeneous	2% Cellulose	94% Ca Carbonate 2% Mica 2% Non-fibrous (Other)	None Detected

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Customer PO: 342957
Project ID:

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**
WCC-26-Skim Coat *091911363-0026B*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - ULUWEHI - BUILDING S - INTERIOR WALLS AND CEILING	White Non-Fibrous Homogeneous		90% Ca Carbonate 3% Mica 7% Non-fibrous (Other)	None Detected
WCC-27-Wallboard *091911363-0027*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - ULUWEHI - BUILDING S - INTERIOR WALLS AND CEILING	White Non-Fibrous Homogeneous		5% Ca Carbonate 70% Gypsum 25% Non-fibrous (Other)	None Detected
WCC-27-Joint Compound *091911363-0027A*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - ULUWEHI - BUILDING S - INTERIOR WALLS AND CEILING	Gray/White Non-Fibrous Homogeneous		60% Ca Carbonate 20% Gypsum 20% Non-fibrous (Other)	None Detected
WCC-28 *091911363-0028*	CAULKING, WHITE - ULUWEHI - BUILDING S - TOILETS, SINKS AND MIRRORS	White Non-Fibrous Homogeneous		60% Ca Carbonate 40% Matrix	None Detected
WCC-29 *091911363-0029*	CAULKING, WHITE - ULUWEHI - BUILDING S - TOILETS, SINKS AND MIRRORS	Tan/White Non-Fibrous Homogeneous		60% Ca Carbonate 40% Matrix	None Detected
WCC-30 *091911363-0030*	CAULKING, WHITE - ULUWEHI - BUILDING S - TOILETS, SINKS AND MIRRORS	White Non-Fibrous Homogeneous		10% Ca Carbonate 70% Matrix 20% Non-fibrous (Other)	None Detected
WCC-31 *091911363-0031*	SEALANT, GRAY - ULUWEHI - BUILDING S - INTERIOR DOOR THRESHOLDS				Not Submitted
WCC-32-Sealent *091911363-0032*	SEALANT, GRAY - ULUWEHI - BUILDING S - INTERIOR DOOR THRESHOLDS	Gray Non-Fibrous Homogeneous		20% Ca Carbonate 80% Matrix	None Detected
WCC-32-Compound *091911363-0032A*	SEALANT, GRAY - ULUWEHI - BUILDING S - INTERIOR DOOR THRESHOLDS	Gray Non-Fibrous Homogeneous		70% Ca Carbonate 30% Non-fibrous (Other)	None Detected
WCC-33-Sealant *091911363-0033*	SEALANT, GRAY - ULUWEHI - BUILDING S - INTERIOR DOOR THRESHOLDS	Gray Non-Fibrous Homogeneous	5% Cellulose	10% Ca Carbonate 60% Matrix 25% Non-fibrous (Other)	None Detected

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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**
WCC-33-Compound *091911363-0033A*	SEALANT, GRAY - ULUWEHI - BUILDING S - INTERIOR DOOR THRESHOLDS	Gray Non-Fibrous Homogeneous		10% Quartz 60% Ca Carbonate 30% Non-fibrous (Other)	None Detected
WCC-34 *091911363-0034*	CEILING TILE, 2'X2', WHITE, WORMHOLE - IMILOA - ROOM 123	Tan/White Fibrous Homogeneous	80% Cellulose	20% Perlite	None Detected
WCC-35 *091911363-0035*	CEILING TILE, 2'X2', WHITE, WORMHOLE - IMILOA - ROOM 123	Tan/White Fibrous Homogeneous	80% Cellulose	20% Perlite	None Detected
WCC-36 *091911363-0036*	CEILING TILE, 2'X2', WHITE, WORMHOLE - IMILOA - ROOM 123	Tan/White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
WCC-37-CMU Block *091911363-0037*	CMU BLOCK AND MORTAR - IMILOA - ROOM 123	Beige Non-Fibrous Homogeneous		70% Ca Carbonate 30% Non-fibrous (Other)	None Detected
WCC-37-Mortar *091911363-0037A*	CMU BLOCK AND MORTAR - IMILOA - ROOM 123	Gray Non-Fibrous Homogeneous		5% Quartz 40% Gypsum 55% Non-fibrous (Other)	None Detected
WCC-38-CMU Block *091911363-0038*	CMU BLOCK AND MORTAR - IMILOA - ROOM 123	Beige Non-Fibrous Homogeneous		70% Ca Carbonate 30% Non-fibrous (Other)	None Detected
WCC-38-Mortar *091911363-0038A*	CMU BLOCK AND MORTAR - IMILOA - ROOM 123	Gray Non-Fibrous Homogeneous		5% Quartz 40% Gypsum 55% Non-fibrous (Other)	None Detected
WCC-39-CMU Block *091911363-0039*	CMU BLOCK AND MORTAR - IMILOA - ROOM 123	Beige Non-Fibrous Homogeneous		70% Ca Carbonate 10% Gypsum 20% Non-fibrous (Other)	None Detected
WCC-39-Mortar *091911363-0039A*	CMU BLOCK AND MORTAR - IMILOA - ROOM 123	Gray Non-Fibrous Homogeneous		10% Quartz 40% Gypsum 50% Non-fibrous (Other)	None Detected
WCC-40-Concrete *091911363-0040*	GRAY CONCRETE WITH GRAY SKIM COAT - IMILOA - ROOM 123 - CORNER COLUMNS AND SOFFITS CONCRETE THROUGHOUT	Gray Non-Fibrous Homogeneous		10% Quartz 20% Gypsum 70% Non-fibrous (Other)	None Detected
WCC-40-Skim Coat *091911363-0040A*	GRAY CONCRETE WITH GRAY SKIM COAT - IMILOA - ROOM 123 - CORNER COLUMNS AND SOFFITS CONCRETE THROUGHOUT	Gray Non-Fibrous Homogeneous		15% Quartz 20% Gypsum 65% Non-fibrous (Other)	None Detected
WCC-41-Concrete *091911363-0041*	GRAY CONCRETE WITH GRAY SKIM COAT - IMILOA - ROOM 123 - CORNER COLUMNS AND SOFFITS CONCRETE THROUGHOUT	Gray Non-Fibrous Homogeneous		10% Quartz 20% Gypsum 70% Non-fibrous (Other)	None Detected

Initial report from: 05/23/2019 15:18:59

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464 McCormick Street San Leandro, CA 94577
Tel/Fax: (510) 895-3675 / (510) 895-3680
http://www.EMSL.com / sanleandrolab@emsl.com

EMSL Order:	091911363
Customer ID:	32EVSW63
Customer PO:	342957
Project ID:	

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**
WCC-41-Skim Coat *091911363-0041A*	GRAY CONCRETE WITH GRAY SKIM COAT - IMILOA - ROOM 123 - CORNER COLUMNS AND SOFFITS CONCRETE THROUGHOUT	Gray Non-Fibrous Homogeneous		15% Quartz 20% Gypsum 65% Non-fibrous (Other)	None Detected
WCC-42-Mastic *091911363-0042*	GRAY CONCRETE WITH GRAY SKIM COAT - IMILOA - ROOM 123 - CORNER COLUMNS AND SOFFITS CONCRETE THROUGHOUT	Yellow Non-Fibrous Homogeneous		10% Ca Carbonate 70% Matrix 20% Non-fibrous (Other)	None Detected
WCC-42-Skim Coat *091911363-0042A*	GRAY CONCRETE WITH GRAY SKIM COAT - IMILOA - ROOM 123 - CORNER COLUMNS AND SOFFITS CONCRETE THROUGHOUT	Gray Non-Fibrous Homogeneous		15% Quartz 60% Ca Carbonate 25% Non-fibrous (Other)	None Detected
WCC-42-Concrete *091911363-0042B*	GRAY CONCRETE WITH GRAY SKIM COAT - IMILOA - ROOM 123 - CORNER COLUMNS AND SOFFITS CONCRETE THROUGHOUT	Gray/White Non-Fibrous Homogeneous		20% Quartz 70% Ca Carbonate 10% Non-fibrous (Other)	None Detected
WCC-43-Cove Base *091911363-0043*	COVE BASE AND ASSOCIATED ADHESIVE, GREEN - IMILOA - ROOM 123 AND COMMON CORRIDOR	Green Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
WCC-43-Adhesive *091911363-0043A*	COVE BASE AND ASSOCIATED ADHESIVE, GREEN - IMILOA - ROOM 123 AND COMMON CORRIDOR	Tan Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
WCC-44-Cove Base *091911363-0044*	COVE BASE AND ASSOCIATED ADHESIVE, GREEN - IMILOA - ROOM 123 AND COMMON CORRIDOR	Green Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
WCC-44-Adhesive *091911363-0044A*	COVE BASE AND ASSOCIATED ADHESIVE, GREEN - IMILOA - ROOM 123 AND COMMON CORRIDOR	Tan Non-Fibrous Homogeneous		40% Ca Carbonate 60% Matrix	None Detected

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
WCC-45-Drywall *091911363-0045*	COVE BASE AND ASSOCIATED ADHESIVE, GREEN - IMILOA - ROOM 123 AND COMMON CORRIDOR	White Non-Fibrous Homogeneous		10% Ca Carbonate 60% Gypsum 30% Non-fibrous (Other)	None Detected
WCC-45-Adhesive *091911363-0045A* *Inseparable paint / coating layer included in analysis*	COVE BASE AND ASSOCIATED ADHESIVE, GREEN - IMILOA - ROOM 123 AND COMMON CORRIDOR	Beige Non-Fibrous Homogeneous		15% Ca Carbonate 70% Matrix 15% Non-fibrous (Other)	None Detected
WCC-45-Cove Base *091911363-0045B*	COVE BASE AND ASSOCIATED ADHESIVE, GREEN - IMILOA - ROOM 123 AND COMMON CORRIDOR	Green Non-Fibrous Homogeneous		10% Quartz 70% Matrix 20% Non-fibrous (Other)	None Detected
WCC-46 *091911363-0046*	WALL TEXTURE, WHITE - IMILOA - COMMON CORRIDOR WALL	White Non-Fibrous Homogeneous		25% Quartz 75% Non-fibrous (Other)	None Detected
WCC-47 *091911363-0047*	WALL TEXTURE, WHITE - IMILOA - COMMON CORRIDOR WALL	White Non-Fibrous Homogeneous		5% Quartz 60% Ca Carbonate 30% Gypsum 5% Non-fibrous (Other)	None Detected
WCC-48 *091911363-0048*	WALL TEXTURE, WHITE - IMILOA - COMMON CORRIDOR WALL	White Non-Fibrous Homogeneous		10% Quartz 70% Ca Carbonate 5% Mica 15% Non-fibrous (Other)	None Detected
WCC-49 *091911363-0049*	CAULKING, WHITE - IMILOA - ROOM 123 - DOORS	White Non-Fibrous Homogeneous		25% Quartz 60% Matrix 15% Non-fibrous (Other)	None Detected
WCC-50 *091911363-0050*	CAULKING, WHITE - IMILOA - ROOM 123 - DOORS	White Non-Fibrous Homogeneous		30% Ca Carbonate 70% Matrix	None Detected
WCC-51 *091911363-0051*	CAULKING, WHITE - IMILOA - ROOM 123 - DOORS	White Non-Fibrous Homogeneous		30% Ca Carbonate 45% Matrix 25% Non-fibrous (Other)	None Detected
WCC-52 *091911363-0052*	CAULKING, WHITE - IMILOA - ROOM 123 - CABINETS	White Non-Fibrous Homogeneous		25% Ca Carbonate 75% Matrix	None Detected
WCC-53 *091911363-0053*	CAULKING, WHITE - IMILOA - ROOM 123 - CABINETS	White Non-Fibrous Homogeneous		25% Ca Carbonate 75% Matrix	None Detected
WCC-54 *091911363-0054*	CAULKING, WHITE - IMILOA - ROOM 123 - CABINETS	White Non-Fibrous Homogeneous		15% Ca Carbonate 70% Matrix 15% Non-fibrous (Other)	None Detected
WCC-55-Wallboard *091911363-0055*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - IMILOA - ROOM 123 AND COMMON CORRIDOR	White Non-Fibrous Homogeneous	1% Glass	80% Gypsum 19% Non-fibrous (Other)	None Detected

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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**
WCC-55-Joint Compound *091911363-0055A*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - IMILOA - ROOM 123 AND COMMON CORRIDOR	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
WCC-56-Wallboard *091911363-0056*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - IMILOA - ROOM 123 AND COMMON CORRIDOR	White Fibrous Homogeneous	1% Glass	80% Gypsum 19% Non-fibrous (Other)	None Detected
WCC-56-Joint Compound *091911363-0056A*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - IMILOA - ROOM 123 AND COMMON CORRIDOR	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
WCC-57-Wallboard *091911363-0057*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - IMILOA - ROOM 123 AND COMMON CORRIDOR	White Non-Fibrous Homogeneous		80% Gypsum 20% Non-fibrous (Other)	None Detected
WCC-57-Joint Compound *091911363-0057A*	WALLBOARD, GYPSUM WITH JOINT COMPOUND, WHITE - IMILOA - ROOM 123 AND COMMON CORRIDOR	White Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
WCC-58-Vinyl Floor Tile *091911363-0058*	VINYL FLOOR TILE WITH BLACK MASTIC, 12"X12", CREAM WITH BLUE AND PINK SPECKS - IMILOA - ROOM 123	White/Blue/Pink Non-Fibrous Homogeneous		70% Ca Carbonate 30% Non-fibrous (Other)	None Detected
WCC-58-Mastic *091911363-0058A*	VINYL FLOOR TILE WITH BLACK MASTIC, 12"X12", CREAM WITH BLUE AND PINK SPECKS - IMILOA - ROOM 123	Black Non-Fibrous Homogeneous		20% Ca Carbonate 80% Matrix	None Detected
WCC-59-Vinyl Floor Tile *091911363-0059*	VINYL FLOOR TILE WITH BLACK MASTIC, 12"X12", CREAM WITH BLUE AND PINK SPECKS - IMILOA - ROOM 123	White/Blue/Pink Non-Fibrous Homogeneous		70% Ca Carbonate 30% Non-fibrous (Other)	None Detected
WCC-59-Mastic *091911363-0059A*	VINYL FLOOR TILE WITH BLACK MASTIC, 12"X12", CREAM WITH BLUE AND PINK SPECKS - IMILOA - ROOM 123	Black Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected

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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**
WCC-60-Vinyl Floor Tile *091911363-0060*	VINYL FLOOR TILE WITH BLACK MASTIC, 12"X12", CREAM WITH BLUE AND PINK SPECKS - IMILOA - ROOM 123	White Non-Fibrous Homogeneous		50% Ca Carbonate 10% Gypsum 10% Matrix 30% Non-fibrous (Other)	None Detected
WCC-60-Mastic *091911363-0060A*	VINYL FLOOR TILE WITH BLACK MASTIC, 12"X12", CREAM WITH BLUE AND PINK SPECKS - IMILOA - ROOM 123	Black Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
WCC-60-Leveler *091911363-0060B*	VINYL FLOOR TILE WITH BLACK MASTIC, 12"X12", CREAM WITH BLUE AND PINK SPECKS - IMILOA - ROOM 123	Brown Non-Fibrous Homogeneous		50% Ca Carbonate 20% Matrix 30% Non-fibrous (Other)	None Detected
Result includes a small amount of inseparable attached material					
WCC-61-Vinyl Floor Tile *091911363-0061*	VINYL FLOOR TILE WITH BLACK MASTIC, 3"X3" GRAY AND BLUE ACCENT - IMILOA - ROOM 123	Gray/Blue Non-Fibrous Homogeneous		70% Ca Carbonate 30% Non-fibrous (Other)	None Detected
WCC-61-Mastic *091911363-0061A*	VINYL FLOOR TILE WITH BLACK MASTIC, 3"X3" GRAY AND BLUE ACCENT - IMILOA - ROOM 123	Black Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
WCC-62-Vinyl Floor Tile *091911363-0062*	VINYL FLOOR TILE WITH BLACK MASTIC, 3"X3" GRAY AND BLUE ACCENT - IMILOA - ROOM 123	Blue/Green Non-Fibrous Homogeneous		70% Ca Carbonate 30% Non-fibrous (Other)	None Detected
WCC-62-Mastic *091911363-0062A*	VINYL FLOOR TILE WITH BLACK MASTIC, 3"X3" GRAY AND BLUE ACCENT - IMILOA - ROOM 123	Black Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
WCC-63-Vinyl Floor Tile *091911363-0063*	VINYL FLOOR TILE WITH BLACK MASTIC, 3"X3" GRAY AND BLUE ACCENT - IMILOA - ROOM 123	Gray/Blue Non-Fibrous Homogeneous		40% Ca Carbonate 40% Matrix 20% Non-fibrous (Other)	None Detected
WCC-63-Mastic *091911363-0063A*	VINYL FLOOR TILE WITH BLACK MASTIC, 3"X3" GRAY AND BLUE ACCENT - IMILOA - ROOM 123	Black Non-Fibrous Homogeneous		50% Matrix 50% Non-fibrous (Other)	None Detected
WCC-64-Vinyl Floor Tile *091911363-0064*	VINYL FLOOR TILE WITH YELLOW ADHESIVE, 36"X36" BLUE - IMILOA - COMMON CORRIDOR	Blue Non-Fibrous Homogeneous		20% Ca Carbonate 70% Matrix 10% Non-fibrous (Other)	None Detected

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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**
WCC-64-Adhesive *091911363-0064A*	VINYL FLOOR TILE WITH YELLOW ADHESIVE, 36"X36" BLUE - IMILOA - COMMON CORRIDOR				Insufficient Material
WCC-65-Vinyl Floor Tile *091911363-0065*	VINYL FLOOR TILE WITH YELLOW ADHESIVE, 36"X36" BLUE - IMILOA - COMMON CORRIDOR	Black Non-Fibrous Homogeneous		20% Ca Carbonate 70% Matrix 10% Non-fibrous (Other)	None Detected
WCC-65-Adhesive *091911363-0065A*	VINYL FLOOR TILE WITH YELLOW ADHESIVE, 36"X36" BLUE - IMILOA - COMMON CORRIDOR	Yellow Non-Fibrous Homogeneous		5% Mica 70% Matrix 25% Non-fibrous (Other)	None Detected
WCC-66-Vinyl Floor Tile *091911363-0066*	VINYL FLOOR TILE WITH YELLOW ADHESIVE, 36"X36" BLUE - IMILOA - COMMON CORRIDOR	Gray/Black Non-Fibrous Homogeneous		80% Ca Carbonate 20% Non-fibrous (Other)	None Detected
WCC-66-Adhesive *091911363-0066A*	VINYL FLOOR TILE WITH YELLOW ADHESIVE, 36"X36" BLUE - IMILOA - COMMON CORRIDOR	Yellow Non-Fibrous Homogeneous		50% Matrix 50% Non-fibrous (Other)	None Detected
WCC-67 *091911363-0067*	CAULKING, CREAM - IMILOA - ROOM 123 WINDOWS	Tan Non-Fibrous Homogeneous		40% Ca Carbonate 40% Matrix 20% Non-fibrous (Other)	None Detected
WCC-68 *091911363-0068*	CAULKING, CREAM - IMILOA - ROOM 123 WINDOWS	Tan Non-Fibrous Homogeneous		40% Ca Carbonate 40% Matrix 20% Non-fibrous (Other)	None Detected
WCC-69 *091911363-0069*	CAULKING, CREAM - IMILOA - ROOM 123 WINDOWS	White Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected

Analyst(s)

Coralie Rodriguez (9)
Jose Madrid (26)
Jared Martin (39)
Mary Morris (14)
Van (Rebecca) Huynh (13)

Matthew Batongbacal
or Other Approved Signatory

Initial report from: 05/23/2019 15:18:59

OrderID: 091911363

091911363

TRC
Results you can rely on

1600 Kapiolani Blvd., Suite 717, Honolulu, HI 96814

ASBESTOS BULK SAMPLE CHAIN OF CUSTODY FORM

Client:	Project Number:	Inspector(s):
Ben Woo Architects	342957	Kacey Swindle
Project Name: 5988 Imiloa Room 123 and 5986A and 5986B Uluwehi - Building S and T Windward Community College	**Tracking Number:** 795720501927	**Requested TAT:** 5 DAY
Email Results to: bashley@trccompanies.com, Kswindle@trccompanies.com	Analytical Method: PLM EPA 600/R-93/116	Lab Comments:

ASBESTOS BULK SAMPLE INFORMATION

Date Collected	Sample Identification	Material Description	Homogeneous Area	Sample Location	Lab Identification (Lab Use Only)
2019-05-15	WCC-01	Concrete, Gray	Greenhouse	See Diagram	
2019-05-15	WCC-02	Concrete, Gray	Greenhouse	See Diagram	
2019-05-15	WCC-03	Concrete, Gray	Greenhouse	See Diagram	
2019-05-15	WCC-04	Sink Undercoat, Black	Greenhouse Sink/Counter	See Diagram	
2019-05-15	WCC-05	Sink Undercoat, Black	Greenhouse Sink/Counter	See Diagram	
2019-05-15	WCC-06	Sink Undercoat, Black	Greenhouse Sink/Counter	See Diagram	
2019-05-15	WCC-07	Caulking, Gray	Greenhouse Concrete Floor Expansion Joint	See Diagram	

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OrderID: 091911363

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Date Collected	Sample Identification	Material Description	Homogeneous Area	Sample Location	Lab Identification (Lab Use Only)
2019-05-15	WCC-08	Caulking, Gray	Greenhouse Concrete Floor Expansion Joint	See Diagram	
2019-05-15	WCC-09	Caulking, Gray	Greenhouse Concrete Floor Expansion Joint	See Diagram	
2019-05-16	WCC-10	Wall Penetration Sealant, White	Greenhouse Exterior Wall Penetrations	See Diagram	
2019-05-16	WCC-11	Wall Penetration Sealant, White	Greenhouse Exterior Wall Penetrations	See Diagram	
2019-05-16	WCC-12	Wall Penetration Sealant, White	Greenhouse Exterior Wall Penetrations	See Diagram	
2019-05-16	WCC-13	CMU Block and Mortar, Gray	Uluwehi - Building S	See Diagram	
2019-05-16	WCC-14	CMU Block and Mortar, Gray	Uluwehi - Building S	See Diagram	
2019-05-16	WCC-15	CMU Block and Mortar, Gray	Uluwehi - Building S	See Diagram	
2019-05-16	WCC-16	Concrete, Gray	Uluwehi - Building S - Throughout Floor	See Diagram	
2019-05-16	WCC-17	Concrete, Gray	Uluwehi - Building S - Throughout Floor	See Diagram	
2019-05-16	WCC-18	Concrete, Gray	Uluwehi - Building S - Throughout Floor	See Diagram	
2019-05-16	WCC-19	Caulking, White	Uluwehi - Building S - Interior Doors, Exterior Doors and Windows	See Diagram	
2019-05-16	WCC-20	Caulking, White	Uluwehi - Building S - Interior Doors, Exterior Doors and Windows	See Diagram	
2019-05-16	WCC-21	Caulking, White	Uluwehi - Building S - Interior Doors, Exterior Doors and Windows	See Diagram	
2019-05-16	WCC-22	Caulking, Black	Uluwehi - Building S - Interior Windows	See Diagram	
2019-05-16	WCC-23	Caulking, Black	Uluwehi - Building S - Interior Windows	See Diagram	

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Date Collected	Sample Identification	Material Description	Homogeneous Area	Sample Location	Lab Identification (Lab Use Only)
2019-05-16	WCC-24	Caulking, Black	Uluwehi - Building S - Interior Windows	See Diagram	
2019-05-16	WCC-25	Wallboard, Gypsum with Joint Compound, White	Uluwehi - Building S - Interior Walls and Ceiling	See Diagram	
2019-05-16	WCC-26	Wallboard, Gypsum with Joint Compound, White	Uluwehi - Building S - Interior Walls and Ceiling	See Diagram	
2019-05-16	WCC-27	Wallboard, Gypsum with Joint Compound, White	Uluwehi - Building S - Interior Walls and Ceiling	See Diagram	
2019-05-16	WCC-28	Caulking, White	Uluwehi - Building S - Toilets, Sinks and Mirrors	See Diagram	
2019-05-16	WCC-29	Caulking, White	Uluwehi - Building S - Toilets, Sinks and Mirrors	See Diagram	
2019-05-16	WCC-30	Caulking, White	Uluwehi - Building S - Toilets, Sinks and Mirrors	See Diagram	
2019-05-16	WCC-31	Sealant, Gray	Uluwehi - Building S - Interior Door Thresholds	See Diagram	
2019-05-16	WCC-32	Sealant, Gray	Uluwehi - Building S - Interior Door Thresholds	See Diagram	
2019-05-16	WCC-33	Sealant, Gray	Uluwehi - Building S - Interior Door Thresholds	See Diagram	
2019-05-16	WCC-34	Ceiling Tile, 2' x 2', White, Wormhole	Imiloa - Room 123	See Diagram	
2019-05-16	WCC-35	Ceiling Tile, 2' x 2', White, Wormhole	Imiloa - Room 123	See Diagram	
2019-05-16	WCC-36	Ceiling Tile, 2' x 2', White, Wormhole	Imiloa - Room 123	See Diagram	
2019-05-16	WCC-37	CMU Block and Mortar	Imiloa - Room 123	See Diagram	
2019-05-16	WCC-38	CMU Block and Mortar	Imiloa - Room 123	See Diagram	
2019-05-16	WCC-39	CMU Block and Mortar	Imiloa - Room 123	See Diagram	

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Date Collected	Sample Identification	Material Description	Homogeneous Area	Sample Location	Lab Identification (Lab Use Only)
2019-05-16	WCC-40	Gray Concrete with Gray Skim Coat	Imiloa - Room 123 - Corner Columns and Soffits Concrete Throughout	See Diagram	
2019-05-16	WCC-41	Gray Concrete with Gray Skim Coat	Imiloa - Room 123 - Corner Columns and Soffits Concrete Throughout	See Diagram	
2019-05-16	WCC-42	Gray Concrete with Gray Skim Coat	Imiloa - Room 123 - Corner Columns and Soffits Concrete Throughout	See Diagram	
2019-05-16	WCC-43	Cove Base and Associated Adhesive, Green	Imiloa - Room 123 and Common Corridor	See Diagram	
2019-05-16	WCC-44	Cove Base and Associated Adhesive, Green	Imiloa - Room 123 and Common Corridor	See Diagram	
2019-05-16	WCC-45	Cove Base and Associated Adhesive, Green	Imiloa - Room 123 and Common Corridor	See Diagram	
2019-05-16	WCC-46	Wall Texture, White	Imiloa - Common Corridor Wall	See Diagram	
2019-05-16	WCC-47	Wall Texture, White	Imiloa - Common Corridor Wall	See Diagram	
2019-05-16	WCC-48	Wall Texture, White	Imiloa - Common Corridor Wall	See Diagram	
2019-05-16	WCC-49	Caulking, White	Imiloa - Room 123 - Doors	See Diagram	
2019-05-16	WCC-50	Caulking, White	Imiloa - Room 123 - Doors	See Diagram	
2019-05-16	WCC-51	Caulking, White	Imiloa - Room 123 - Doors	See Diagram	
2019-05-16	WCC-52	Caulking, White	Imiloa - Room 123 - Cabinets	See Diagram	
2019-05-16	WCC-53	Caulking, White	Imiloa - Room 123 - Cabinets	See Diagram	
2019-05-16	WCC-54	Caulking, White	Imiloa - Room 123 - Cabinets	See Diagram	
2019-05-16	WCC-55	Wallboard, Gypsum with Joint Compound, White	Imiloa - Room 123 and Common corridor	See Diagram	

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Date Collected	Sample Identification	Material Description	Homogeneous Area	Sample Location	Lab Identification (Lab Use Only)
2019-05-16	WCC-56	Wallboard, Gypsum with Joint Compound, White	Imiloa - Room 123 and Common corridor	See Diagram	
2019-05-16	WCC-57	Wallboard, Gypsum with Joint Compound, White	Imiloa - Room 123 and Common corridor	See Diagram	
2019-05-16	WCC-58	Vinyl Floor Tile with Black Mastic, 12" x 12", Cream with Blue and Pink Specks	Imiloa - Room 123	See Diagram	
2019-05-16	WCC-59	Vinyl Floor Tile with Black Mastic, 12" x 12", Cream with Blue and Pink Specks	Imiloa - Room 123	See Diagram	
2019-05-16	WCC-60	Vinyl Floor Tile with Black Mastic, 12" x 12", Cream with Blue and Pink Specks	Imiloa - Room 123	See Diagram	
2019-05-16	WCC-61	Vinyl Floor Tile with Black Mastic, 3" x 3" Gray and Blue Accent	Imiloa - Room 123	See Diagram	
2019-05-16	WCC-62	Vinyl Floor Tile with Black Mastic, 3" x 3" Gray and Blue Accent	Imiloa - Room 123	See Diagram	
2019-05-16	WCC-63	Vinyl Floor Tile with Black Mastic, 3" x 3" Gray and Blue Accent	Imiloa - Room 123	See Diagram	
2019-05-16	WCC-64	Vinyl Floor Tile with Yellow Adhesive, 36" x 36" Blue	Imiloa - Common Corridor	See Diagram	
2019-05-16	WCC-65	Vinyl Floor Tile with Yellow Adhesive, 36" x 36" Blue	Imiloa - Common Corridor	See Diagram	
2019-05-16	WCC-66	Vinyl Floor Tile with Yellow Adhesive, 36" x 36" Blue	Imiloa - Common Corridor	See Diagram	
2019-05-16	WCC-67	Caulking, Cream	Imiloa - Room 123 windows	See Diagram	
2019-05-16	WCC-68	Caulking, Cream	Imiloa - Room 123 windows	See Diagram	
2019-05-16	WCC-69	Caulking, Cream	Imiloa - Room 123 windows	See Diagram	

Special Instruction to Laboratory:

N/A

JR 05/17/19 8:30am E-Fax

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CHAIN OF CUSTODY INFORMATION					
Relinquished By:	Date	Time	Received By:	Date	Time
I. (Print): Kacey Swindle	2019-05-16	14:02:48 HST	I. (Print): JR	05/17/19	8:30am
(Sign):			(Sign): E-Fedex		
II. (Print):			II. (Print):		
(Sign):			(Sign):		

EMSL Analytical, Inc
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ProjectID:	

Attn: **Kacey Swindle**
TRC Environmental Corporation
1600 Kapiolani Blvd
Suite 717
Honolulu, HI 96814

Phone: (808) 728-4111
Fax:
Received: 05/17/19 9:00 AM
Collected: 05/16/2019

Project: **BEN WOO ARCHITECTS; 342957**

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

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Weight*	*Lead Concentration*
WCC-PB-01	*091911196-0001*	05/16/2019	05/18/2019	0.2654 g	0.050 % wt
	Site: OFF WHITE OVER GRAY PAINT				
WCC-PB-02	*091911196-0002*	05/16/2019	05/18/2019	0.0169 g	<0.12 % wt
	Site: LIGHT BEIGE OVER LIGHT GREEN PAINT				
WCC-PB-03	*091911196-0003*	05/16/2019	05/18/2019	0.0214 g	<0.093 % wt
	Site: WHITE OVER LIGHT GREEN PAINT				
WCC-PB-04	*091911196-0004*	05/16/2019	05/18/2019	0.2298 g	0.031 % wt
	Site: CREAM PAINT				
WCC-PB-05	*091911196-0005*	05/16/2019	05/18/2019	0.2631 g	0.025 % wt
	Site: WHITE PAINT				
WCC-PB-06	*091911196-0006*	05/16/2019	05/18/2019	0.0851 g	<0.024 % wt
	Site: RED PAINT				
WCC-PB-07	*091911196-0007*	05/16/2019	05/18/2019	0.1339 g	<0.015 % wt
	Site: WHITE PAINT				

Julian Neagu, Lead Laboratory Manager
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. 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. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc San Leandro, CA A2LA Accredited Environmental Testing Cert #2845.09

Initial report from 05/18/2019 16:51:16

OrderID: 091911196

091911196

1600 Kapiolani Blvd., Suite 717, Honolulu, HI 96814

LEAD CONTAINING PAINT BULK SAMPLE CHAIN OF CUSTODY FORM

Client:	Project Number:	Inspector(s):
Ben Woo Architects	342957	Kacey Swindle
Project Name: 5988 Imiloa Room 123 and 5986A and 5986B Uluwehi - Building S and T Windward Community College	Tracking Number: 795720501927	Requested TAT: 5 DAY
Email Results to: bashley@trccompanies.com, Kswindle@trccompanies.com	Analytical Method: Lead Chips SW846-7000B	Lab Comments:

LEAD BULK SAMPLE INFORMATION

Date Collected	Sample Identification	Sample Description	Substrate	Lab Identification (Lab Use Only)
2019-05-15	WCC-Pb-01	Off-White Over Gray Paint	Metal	
2019-05-16	WCC-Pb-02	Light Beige over Light Green Paint	Metal	
2019-05-16	WCC-Pb-03	White over Light Green Paint	Metal	
2019-05-16	WCC-Pb-04	Cream Paint	Drywall, Metal, CMU	
2019-05-16	WCC-Pb-05	White Paint	Metal, Wood, CMU	
2019-05-16	WCC-Pb-06	Red Paint	Metal	
2019-05-16	WCC-Pb-07	White Paint	Drywall, CMU, Concrete, Metal	

Special Instruction to Laboratory:

N/A

JR 05/17/19 8:30am E-Fedex

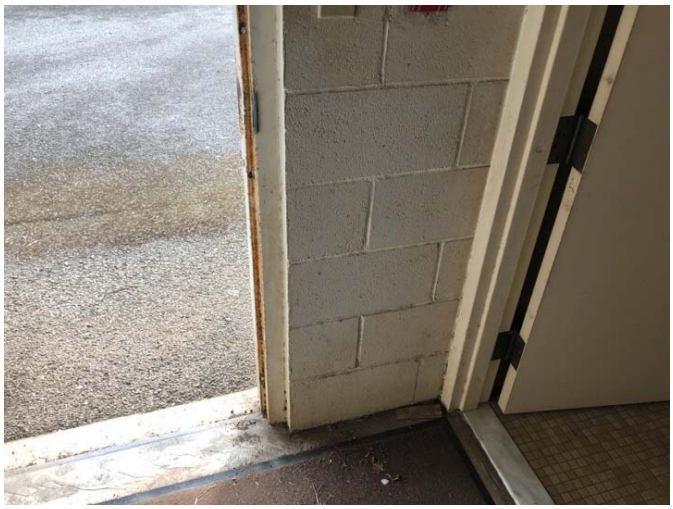
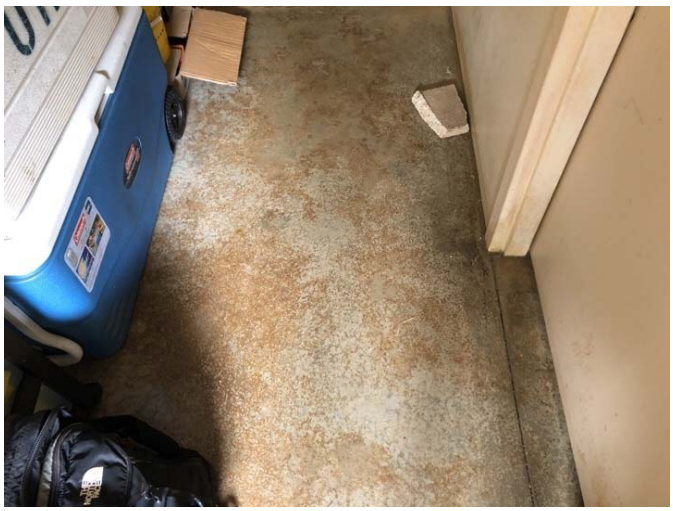
OrderID: 091911196

Relinquished By:	Date	Time	Received By:	Date	Time
I. (Print): Kacey Swindle	2019-05-16	14:02:48 HST	I. (Print): JR	05/17/19	8:30am
(Sign):			(Sign):	E-Fedex	
II. (Print):			II. (Print):		
(Sign):			(Sign):		

Appendix C – Representative Photographs

PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-01, WCC-02, WCC-03	
Material Description	Concrete Gray	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Greenhouse	
Total Approximate Quantity	NaN SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-04, WCC-05, WCC-06	
Material Description	Sink Undercoat Black	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Positive	
Asbestos Type	6% Chrysotile	
Homogeneous Area	Greenhouse Sink/Counter	
Total Approximate Quantity	15 SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	

PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-07, WCC-08, WCC-09	
Material Description	Caulking Gray	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Greenhouse Concrete Floor Expansion Joint	
Total Approximate Quantity	8 LF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-10, WCC-11, WCC-12	
Material Description	Wall Penetration Sealant, White	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Greenhouse Exterior Wall Penetrations	
Total Approximate Quantity	3 SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	

PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-13, WCC-14, WCC-15	
Material Description	CMU Block and Mortar, Gray	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Uluwehi - Building S	
Total Approximate Quantity	1000 SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-16, WCC-17, WCC-18	
Material Description	Concrete Gray	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Uluwehi - Building S - Throughout Floor	
Total Approximate Quantity	800 SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	

PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-19, WCC-20, WCC-21	
Material Description	Caulking White	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Uluwehi - Building S - Interior Doors, Exterior Doors And Windows	
Total Approximate Quantity	225 LF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-22, WCC-23, WCC-24	
Material Description	Caulking Black	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Uluwehi - Building S - Interior Windows	
Total Approximate Quantity	30 LF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	

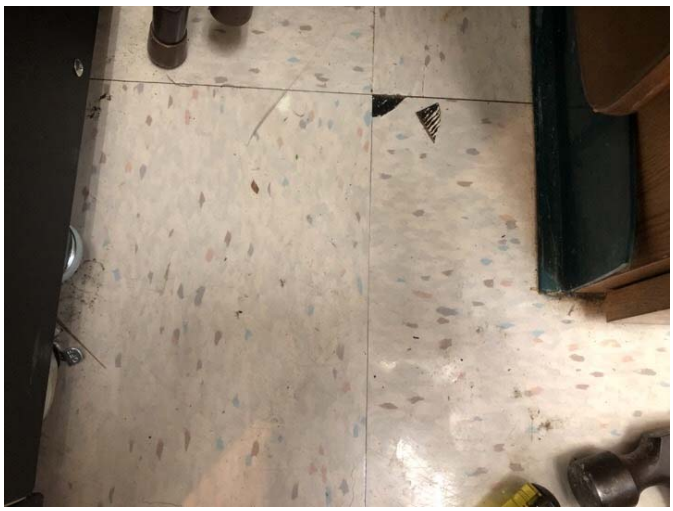
PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-25, WCC-26, WCC-27	
Material Description	Wallboard Gypsum with Joint Compound White	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Uluwehi - Building S - Interior Walls And Ceiling	
Total Approximate Quantity	1600 SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	RACM	
Notes	Not Applicable	
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-28, WCC-29, WCC-30	
Material Description	Caulking White	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Uluwehi - Building S - Toilets, Sinks And Mirrors	
Total Approximate Quantity	30 LF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	

PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-34, WCC-35, WCC-36	
Material Description	Ceiling Tile 2' x 2' White, Wormhole	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Imiloa - Room 123	
Total Approximate Quantity	1050 SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	RACM	
Notes	Not Applicable	
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-37, WCC-38, WCC-39	
Material Description	CMU Block and Mortar	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Imiloa - Room 123	
Total Approximate Quantity	1200 SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	

PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-40, WCC-41, WCC-42	
Material Description	Gray Concrete with Gray Skim Coat	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Imiloa - Room 123 - Corner Columns And Soffits Concrete Throughout	
Total Approximate Quantity	280 SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-43, WCC-44, WCC-45	
Material Description	Cove Base and Associated Adhesive Green	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Imiloa - Room 123 And Common Corridor	
Total Approximate Quantity	175 LF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Quantity limited to project area.	

PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-46, WCC-47, WCC-48	
Material Description	Wall Texture, White	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Imiloa - Common Corridor Wall	
Total Approximate Quantity	375 SF	
Condition	Good	
Material Type	Surfacing	
NESHAP Category	RACM	
Notes	Quantity limited to wall outside of Imiloa Room 123.	
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-49, WCC-50, WCC-51	
Material Description	Caulking White	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Imiloa - Room 123 - Doors	
Total Approximate Quantity	80 LF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	

PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-52, WCC-53, WCC-54	
Material Description	Caulking White	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Imiloa - Room 123 - Cabinets	
Total Approximate Quantity	50 LF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-55, WCC-56, WCC-57	
Material Description	Wallboard Gypsum with Joint Compound White	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Imiloa - Room 123 And Common Corridor	
Total Approximate Quantity	800 SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	RACM	
Notes	Quantity limited to project area.	

PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-58, WCC-59, WCC-60	
Material Description	Vinyl Floor Tile with Black Mastic 12" x 12" Cream with Blue and Pink Specks	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Imiloa - Room 123	
Total Approximate Quantity	1025 SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat I	
Notes	Not Applicable	
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-61, WCC-62, WCC-63	
Material Description	Vinyl Floor Tile with Black Mastic 3" x 3" Gray and Blue Accent	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Imiloa - Room 123	
Total Approximate Quantity	25 SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat I	
Notes	Not Applicable	

PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-64, WCC-65, WCC-66	
Material Description	Vinyl Floor Tile 36" x 36", Blue	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Imiloa - Common Corridor	
Total Approximate Quantity	NaN SF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat I	
Notes	Not Applicable	
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	WCC-67, WCC-68, WCC-69	
Material Description	Caulking Cream	
Accessible Material	Accessible	
Reason Inaccessible	N/A	
Asbestos Detected	Negative	
Asbestos Type	No Asbestos Detected	
Homogeneous Area	Imiloa - Room 123 Windows	
Total Approximate Quantity	120 LF	
Condition	Good	
Material Type	Misc.	
NESHAP Category	Cat II	
Notes	Not Applicable	

PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	N/A	
Material Description	Ceramic Tile, Grout, Mortar 1" x 1" Tan	
Accessible Material	Inaccessible	
Reason Inaccessible	Discreet Sampling Requested	
Asbestos Detected	N/A	
Asbestos Type	N/A	
Homogeneous Area	Uluwehi - Building S - Restroom Floors	
Total Approximate Quantity	215 SF	
Condition	N/A	
Material Type	N/A	
NESHAP Category	N/A	
Notes	Not Applicable	
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	N/A	
Material Description	Ceramic Tile, Grout, Mortar 4" x 4" Light Beige	
Accessible Material	Inaccessible	
Reason Inaccessible	Discreet Sampling Requested	
Asbestos Detected	N/A	
Asbestos Type	N/A	
Homogeneous Area	Uluwehi - Building S - Restroom And Janitors Closet Walls	
Total Approximate Quantity	400 SF	
Condition	N/A	
Material Type	N/A	
NESHAP Category	N/A	
Notes	Not Applicable	

PHOTOGRAPHIC LOG		
SUSPECT ASBESTOS CONTAINING MATERIAL		
Sample Numbers	N/A	
Material Description	Ceramic Tile, Grout, Mortar 4" x 4" Light Tan	
Accessible Material	Inaccessible	
Reason Inaccessible	Discreet Sampling Requested	
Asbestos Detected	N/A	
Asbestos Type	N/A	
Homogeneous Area	Uluwehi - Building S - Restroom And Janitors Closet Walls	
Total Approximate Quantity	70 SF	
Condition	N/A	
Material Type	N/A	
NESHAP Category	N/A	
Notes	Not Applicable	

LEAD CONTAINING PAINT PHOTOGRAPHIC LOG

SUSPECT PAINT

Sample Numbers	WCC-Pb-01
Sample Location	Greenhouse
Description	Off-White Over Gray Paint
Laboratory Result	0.050%
Substrate	Metal
Paint Locations	Greenhouse I-Beams And Vertical Cylindrical Supports
Quantity of Deteriorated Paint	150

SUSPECT PAINT

Sample Numbers	WCC-Pb-02
Sample Location	Greenhouse Exterior Walls And Roof
Description	Light Beige Over Light Green Paint
Laboratory Result	<0.12%
Substrate	Metal
Paint Locations	Greenhouse Exterior
Quantity of Deteriorated Paint	N/A

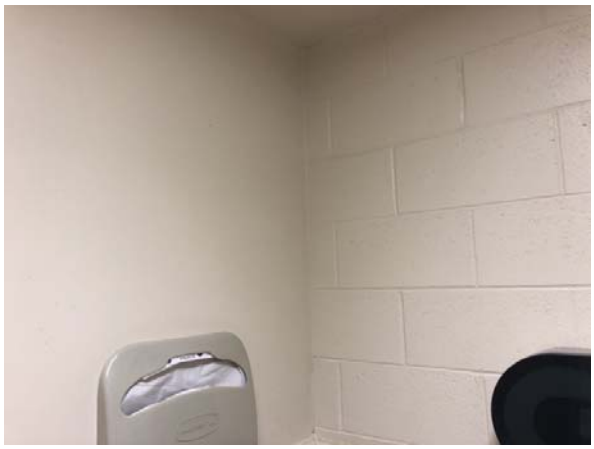
SUSPECT PAINT

Sample Numbers	WCC-Pb-03
Sample Location	Greenhouse Interior Walls And Ceiling
Description	White Over Light Green Paint
Laboratory Result	<0.093%
Substrate	Metal
Paint Locations	Greenhouse Interior
Quantity of Deteriorated Paint	N/A

LEAD CONTAINING PAINT PHOTOGRAPHIC LOG

SUSPECT PAINT

Sample Numbers	WCC-Pb-04
Sample Location	Uluwehi - Building S
Description	Cream Paint
Laboratory Result	0.031%
Substrate	Drywall, Metal, CMU
Paint Locations	Uluwehi - Building S - Interior
Quantity of Deteriorated Paint	N/A

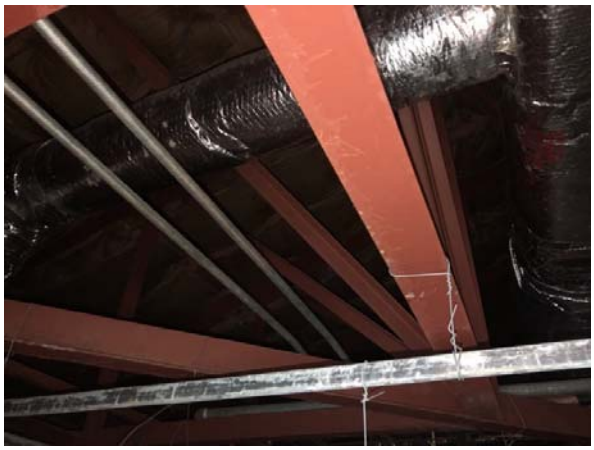


SUSPECT PAINT

Sample Numbers	WCC-Pb-05
Sample Location	Uluwehi - Building S
Description	White Paint
Laboratory Result	0.025%
Substrate	Metal, Wood, CMU
Paint Locations	Uluwehi - Building S - Exterior
Quantity of Deteriorated Paint	20

SUSPECT PAINT

Sample Numbers	WCC-Pb-06
Sample Location	Imiloa - Room 123
Description	Red Paint
Laboratory Result	<0.024%
Substrate	Metal
Paint Locations	Imiloa - Room 123 - Structural Steel
Quantity of Deteriorated Paint	N/A



LEAD CONTAINING PAINT PHOTOGRAPHIC LOG

SUSPECT PAINT

Sample Numbers	WCC-Pb-07
Sample Location	Imiloa - Room 123 And Common Corridor
Description	White Paint
Laboratory Result	<0.015%
Substrate	Drywall, CMU, Concrete, Metal
Paint Locations	Imiloa - Room 123 – Walls and Door Frames
Quantity of Deteriorated Paint	N/A

HAZARDOUS MATERIALS INVENTORY PHOTOGRAPHIC LOG

ITEM		
Area	Greenhouse	
Description	Heavy Metal Containing Devices, Fluorescent (Silver Tip)	
Quantity	24	
Notes	N/A	

ITEM		
Area	Greenhouse	
Description	PCB Containing Devices, PCB Ballast	
Quantity	24	
Notes	N/A	

ITEM		
Area	Greenhouse	
Description	Heavy Metal Containing Devices, Halogen Bulbs	
Quantity	7	
Notes	N/A	

HAZARDOUS MATERIALS INVENTORY PHOTOGRAPHIC LOG

ITEM		
Area	Uluwehi - Building S - Restrooms	
Description	Heavy Metal Containing Devices, Fluorescent Tubes	
Quantity	6	
Notes	Tip color unknown.	

ITEM		
Area	Uluwehi - Building S - Restrooms	
Description	PCB Containing Devices, PCB Ballast	
Quantity	6	
Notes	N/A	

ITEM		
Area	Imiloa - Room 123	
Description	PCB Containing Devices, PCB Ballast	
Quantity	32	
Notes	Per Site personnel, the bulbs in this room have been replaced with LEDs.	

Appendix D – Certifications

State of Hawai'i
Asbestos Certification

Training Course Exp. Dates

W	n/a	**MP**	n/a
CS	01/22/19	**PD**	n/a
INS	10/02/19	**PM**	11/05/19

W= Worker
CS= Cont./Sup.
INS= Inspector
PD= Project Designer
MP= Mgmt. Planner
PM= Project Monitor

Swindle
Kacey N.
TRC Environmental Corporation
HIASB-3378
State Exp. Date 06/22/2019

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101048-3

EMSL Analytical, Inc.

San Leandro, CA

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2018-07-01 through 2019-06-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

EMSL Analytical, Inc.
464 McCormick St.
San Leandro, CA 94577
Mr. Matthew Batongbacal
Phone: (510) 895-3675 Fax: (510) 895-3680
Email: mbatongbacal@emsl.com
http://www.emsl.com

ASBESTOS FIBER ANALYSIS — NVLAP LAB CODE 101048-3

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

DAVID Y. IGE
GOVERNOR OF HAWAII

BRUCE S ANDERSON, Ph.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
File: EHSD/IRH

June 7, 2018

To: Lori Dennis, Quality Assurance Administrator
EMSL Analytical, Inc.
Corporate Office & Lab

From: Department of Health, Indoor and Radiological Health Branch
Asbestos Section

Subject: Annual Asbestos Laboratory Registration for *EMSL Analytical, Inc. – San Leandro, CA*

Your asbestos laboratory registration packet has been received and processed. Your registration number is **L-01-035** and is valid until **July 10, 2019.**

Your laboratory is now registered to perform the duties specified in Chapter 11-504-19 for regulated facilities and will abide by the rules set forth in the Hawaii Administrative Rules, Chapter 11-501 through 11-504.

Enclosed is the receipt for the **$100.00** registration fee.

Thank you for your cooperation. Should you have any questions or require additional information, please contact Ms. Kristie Kasaoka Kimura at (808) 586-5800.

Enc: As stated

kkk

Accredited Laboratory

A2LA has accredited

EMSL ANALYTICAL, INC.

San Leandro, CA

for technical competence in the field of

Environmental Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of A2LA R206 - *Specific Requirements - Environmental Testing Laboratory Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION
CORPORATE SEAL 1978
DISTRICT OF COLUMBIA
A2LA

Presented this 18th day of December 2017.

President and CEO
For the Accreditation Council
Certificate Number 2845.09
Valid to January 31, 2020

For the tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

EMSL ANALYTICAL, INC.
464 McCormick St.
San Leandro, CA 94577
Julian Neagu Phone: (510) 895-3675

ENVIRONMENTAL

Valid To: January 31, 2020 Certificate Number: 2845.09

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below; for the test methods applicable to the National Environmental Lead Laboratory Accreditation Program (NLLAP) and tests on children's products:

ENVIRONMENTAL LEAD	
Test	**Test Method(s)**
Total Lead (Pb) in Paint Chips	Chips, EPA 7000B - (FLAA), EMSL Analytical, Inc. LMBL - SOP 200 3050 Modified Hotblock Digestion
Total Lead (Pb) in Dust Wipes	Wipes, EPA 7000B - (FLAA), EMSL Analytcial, Inc. LMBL - SOP 200 3050, Modified Hotblock Digestion
Total Lead (Pb) in Soil	Soil, EPA 7000B - (FLAA), EMSL Analytical, Inc. LMBL - SOP 200 3050 Modified Hotblock Digestion
AIR MATRIX*	
Test	**Test Method(s)**
Total Lead (Pb) in Air	Air Cassettes, NIOSH 7082 – EMSL Analytical LMBL - SOP 200

*Not under NLLAP program

5202 Presidents Court, Suite 220 I Frederick, MD 21703-8398 I Phone: 301 644 3248 I Fax: 240 454 9449 I www.A2LA.org

DIVISION 2 – SITE CONSTRUCTION

SECTION 02070 – SELECTIVE DEMOLITION

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENT

1.02 SUMMARY

A. Extent of selective demolition work is indicated on drawings. Selective demolition work includes, but is not limited to, removal and subsequent disposal of all non-hazardous materials indicated or required to be removed.

B. It shall be the responsibility of the Contractor to examine the project site and determine the existing conditions.

C. Executive all work in an orderly and careful manner with due consideration for all items of work to remain.

D. Obvious conditions which exist at the site shall be accepted as part of the work, even though they may not be clearly indicated on the Drawings and/or described herein, or may vary therefrom.

E. All debris of any kind accumulated from the work of this section shall be disposed off the site in a State Department of Health (DOH) approved waste, recycle, or asbestos-containing material landfill as applicable.

F. Burning of any debris on-site will not be permitted.

G. Sandblasting is not permitted.

H. Permits, Notice, etc.:

1. The Contractor shall procure and pay for all necessary permits, certificates, or approvals that may be required in connection with this work.

2. The Contractor shall serve proper notice and consult with the University regarding any temporary barricades and disconnections of electrical or other utility lines in the area which may interfere with the removal work, and all such lines where necessary shall be properly disconnected or relocated before commencing with the work.

I. Carefully remove and store all materials indicated for relocation or reinstallation. Record all deficiencies prior to removal and recorded with

the University. All damage caused by the Contractor's operations shall be repaired as accepted by the University at no additional cost to the University.

J. Related Work Described Elsewhere: Contractor shall review SECTION 01715- EXISTING CONDITIONS – HAZARDOUS MATERIAL SURVEY.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

B. Schedule: Submit two copies of schedule indicating proposed methods and sequence of operations for selective demolition work to the University for review prior to commencement or work. Include coordination for temporary shut-off and continuation of utility services as required, together with details for weather protection, dust and noise control protection.

C. Permits and Notices: Submit a State Department of Health, Asbestos Notification of Demolition and Renovation form (a facsimile is attached).

D. Solid Waste Demolition Report: Submit 2 copies of the disposal transport and manifest reports to the University.

1.04 JOB CONDITIONS

A. Conditions of Structure: The University assumes no responsibility for actual condition of items or portions of structure to be demolished.

B. Conditions existing at time of commencement of contract will be maintained by the University insofar as practicable.

C. Do not interfere with use of adjacent occupied spaces or buildings. Maintain free and safe passage to and from occupied spaces or other occupied buildings.

D. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor, may be removed as work progresses. Transport salvaged items from site as they are removed. Storage or sale of removed items on site will not be permitted.

E. Protections: Provide temporary barricades and other forms of protection as required to protect the general public, school, staff, and students from injury due to selective demolition work.

1. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of elements to be demolished, and adjacent facilities or work to remain.

2. Protect from damage existing finish work that is to remain in place and become exposed during demolition operations.

3. Life safety procedures and provisions shall be in conformance with all applicable Federal, State and City and County regulations, including HIOSH. Cease operations and notify the University immediately if safety of structure appears to be endangered. Take precautions to properly support structure. Do not resume until safety is restored.

4. Provide accessibility around temporary structures conforming to ADAAG section 201.3 & 206.1.

5. Remove protections, obstructions, and barricades at completion of work.

F. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to the University.

G. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from the University. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations, as directed by the University.

H. Explosives: Use of explosives will not be permitted.

I. Utility Services: The existence of above and below ground utility lines other than those shown on the drawings is not definitely known and is based on available data but are not guaranteed as to accuracy nor are there implied guarantees that other obstacles will not be encountered during the course of the work. Should any other utility lines that affect the work be encountered, the Contractor shall immediately notify the University and follow his direction as to procedure. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations. Do not interrupt existing utilities serving occupied buildings or facilities, except when authorized in writing by the University. Submit written notice of outages and interruptions not less than fourteen days in advance of intended outage. Report damage, however slight, immediately. Do not repair or reconstruct any pipe, conduit or installation without authorization, except perform emergency repairs immediately. The Contractor shall tone the area to be excavated to ascertain the location of uncharted utilities and structures and verify the locations of these improvements shown. The cost of toning shall be incidental to the cost of the Contract.

J. Dust Control:

1. Keep dust within acceptable levels at all times, including non-working hours, weekends, and holidays, as specified in SECTION 01567 – POLLUTION CONTROLS in conformance with State Department of Health, Title 11, Administrative Rules, Chapter 60.1 – Air Pollution Control latest edition.

2. Only wet grinding of concrete will be allowed on exterior surfaces.

3. Mechanical dry sweeping not permitted. Vacuuming, wet mopping, approved limited dry hand, wet or damp sweeping is acceptable.

4. During loading operations, water down debris and waste materials to avoid dust.

5. The method of dust control and all costs incurred thereof shall be the responsibility of the Contractor.

6. Enclosed chutes shall be used for removing debris from above the ground floor level.

K. Noise Control: As specified in SECTION 01567 – POLLUTION CONTROL.

L. Fire Safety: Fire safety during demolition shall comply with NFPA 241, "Standard for Safeguarding Construction, Alteration, and Demolition Operations", and NFPA 1 "Fire Code", as amended.

M. Demolition Work: Conform to State of Hawaii, Occupational Safety and Health Standards; Subtitle 8, Division of Occupational Safety and Health; Part 3, Construction Standards; Chapter 131.1, Demolition.

N. Other Controls:

1. Wherever trucks and/or vehicles leave the site and enter surrounding paved streets, the Contractor shall prevent any material from being spilled onto the pavement. Waste water shall not be discharged into existing streams, waterways, or drainage systems such as gutter and catch basins unless treated to comply with Department of Health pollution regulations.

2. Trucks hauling materials shall be covered as required by PUC regulation. Trucks hauling fine materials shall be covered.

PART 2 – PRODUCTS

(Not Applicable)

PART 3 – EXECUTION

3.01 INSPECTION

A. Prior to commencement of selective demolition work, inspect areas in which work will be performed. Inventory existing conditions of structure surfaces, equipment or surrounding properties which could be misconstrued as damage resulting from selective demolition work; photograph, video or otherwise document and file with the University prior to starting work.

B. Test all equipment that is to be relocated prior to disconnection. File a list of discrepancies with the University prior to disconnection and relocation. Allow the University 5 working days to verify discrepancies prior to removal.

3.02 PREPARATION:

Provide temporary security type weatherproof enclosures covering for exterior openings and exposed roof deck resulting from demolition work.

3.03 BARRICADES AND ENCLOSURES:

As specified in SECTION 01500 – CONSTRUCTION FACILITIES.

3.04 SELECTIVE DEMOLITION

A. Perform selective demolition work, including all exterior improvements indicated on the drawings, in a systematic manner. Use such methods as required to complete work indicated on drawings in accordance with demolition schedule and governing regulations.

1. Demolish concrete in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.

2. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction. All dust shall be suppressed by a fog spray or other approved method.

3. Extent of demolition and removal as shown are minimum requirements. Contractor shall be responsible for the extent of work required to properly accommodate the methods of construction required for the new work. Additional work required to accommodate construction shall be considered incidental to the new work and shall be done at no additional cost to the University.

B. Trenches, holes, depressions, and pits left by the removal of miscellaneous improvements shall be backfilled to the satisfaction of the University. Backfill with suitable material and compact to 95% maximum dry density as determined by ASTM D 1557, “Laboratory Compaction Characteristics of Soil Using Modified Effort”.

C. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to the University in written, accurate detail. Pending receipt of directive from the University rearrange selective demolition schedule as necessary to continue overall job progress without delay.

3.05 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove debris, rubbish, and other materials resulting from demolition operations from building site daily. Transport and legally dispose of materials off site.

1. If additional hazardous materials are encountered during demolition operations, comply with applicable regulations, laws and ordinances concerning removal, handling and protection against exposure or environmental pollution.

2. Burning of removed materials is not permitted on project site.

B. Locksets on Swing Doors: The Contractor shall remove all locksets from all swinging doors indicated to be removed and disposed of. Contractor shall give the locksets to the University after their removal.

3.06 CLEAN UP AND REPAIR

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave areas broom clean.

B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

C. All existing grass areas disturbed or damaged due to construction or ingress or egress to the site shall be repaired to original conditions. Grass areas shall be recultivated, topsoiled and the grassed with the same type and kind of material as existing, in a manner accepted by and to the satisfaction of the University.

Asbestos Notification of Demolition & Renovation
(Ref. HAR Chapter 11-501)

SEND TO: **STATE DEPARTMENT OF HEALTH**
INDOOR AND RADIOLOGICAL HEALTH BRANCH
99-945 HALAWA VALLEY STREET
AIEA, HAWAII 96701
Phone (808) 586-5800 Fax (808) 586-5811

I. **Type of notification:** O=original R=revised C=cancelled		
II. **Type of operation:** D=Demolition R=Renovation OD=Ordered Demolition ER=Emergency Renovation		
III. Facility information		
Owner name:		
Address:		
City:	State:	Zip code:
Contact person:		Telephone #:
Removal contractor:		License #:
Address:		
City:	State:	Zip code:
Contact person:		Telephone #:
Other operator:		
Address:		
City:	State:	Zip code:
Contact person:		Telephone #:
IV. Is asbestos present (y/n): Inspector's name:	Certification #:	State of certification:
V. Facility description (Include building number, floor and room number)		
Building name:		
Address:		
City:	State:	Zip code:
Location(s) on site:		
Building size (sq. ft.):	# Floors:	Age:
Present use:	Prior use:	
Official Use Only		
Postmark Date:	**Received by:**	**State Record Number:**

VI. Procedure used to detect the presence of asbestos Laboratory name: Analytical method:			
VII. Specify the nature of the asbestos material (TSI, surfacing, VAT, miscellaneous):			
Amount of asbestos, including: 1. RACM to be removed 2. CAT I left in place, and 3. CAT II left in place	RACM to be removed	Nonfriable ACM (not) to be removed	
		Category I	Category II
Pipes (linear ft.)			
Surfacing (square ft.)			
Facility components (cu. ft.)			
Scheduled asbestos abatement dates Start (mm/dd/yy): Finish (mm/dd/yy) Circle workdays and times: weekdays: daytime nighttime weekends: daytime nighttime			
Scheduled renovation/demolition dates Start (mm/dd/yy): Finish (mm/dd/yy) Circle workdays and times: weekdays: daytime nighttime weekends: daytime nighttime			
Description of the planned renovation/demolition work and methods to be used:			
Description of the work practices and engineering controls to be used to prevent emissions of asbestos from the work-site: Project designer name: Certification #: State:			
VIII. Waste transporter #1			
Name:			
Address:			
City:	State:	Zip code:	
Contact Person:	Telephone:		
Waste transporter #2			
Name:			
Address:			
City:	State:	Zip code:	
Contact Person:	Telephone:		
IX. Waste disposal site			
Facility Name:	Telephone:		
Address:			
City:	State:	Zip code:	

XIV. For demolition ordered by a government agency, please identify	
Name:	Title:
Authority (Agency):	
Date of order (mm/dd/yy):	Date ordered to begin (mm/dd/yy):

XV. For emergency renovations (Please call 808-586-5800 for additional instructions)

Date and time of emergency
Date (mm/dd/yy): Time: (a.m./p.m.)

Description of sudden, unexpected event and the damage caused:

Explanation of how the event caused an unsafe condition or would cause equipment damage or an unreasonable financial burden:

Person contacted for approval at the Indoor and Radiological Health Branch:

Name: Date (mm/dd/yy): Time: (a.m./p.m.)

XVI. Description of procedures to be followed in the event that unexpected asbestos is found or previously nonfriable asbestos material becomes crumbled, pulverized or reduced to powder:

XVII. I certify that an individual trained in the provisions of Hawaii administrative rules chapter 11-501, and certified as a contractor/supervisor, will be on-site during the entire renovation and/or demolition and evidence that the required training has been accomplished for this and all workers will be available at the work-site.

Signature of owner/operator Date (mm/dd/yy):

XVIII. I certify that the information on this notification is correct.

Signature of owner/operator Date (mm/dd/yy):

XIX. Additional Comments:

END OF SECTION

SECTION 02220 – SITE DEMOLITION

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in Section 01001.

1.02 SUMMARY

Work under this section includes, but is not limited to demolition of site elements as indicated and specified.

1.03 JOB CONDITIONS

Contractor shall field verify location of new utility construction to confirm the limits of demolition and removal prior to the start of demolition work.

1.04 SUBMITTALS

A. Submit in accordance with Section 01300 - SUBMITTALS.

B. Submit a demolition work plan to coordinate the work with the University.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 GENERAL

A. Existing Conditions:

1. The Drawings show general information only. Examine the site to determine the exact existing conditions and character and extent of the work to be performed and demolition operations required to complete the new work.

2. The failure or omission of the Contractor to visit the site and acquaint himself with the existing conditions shall in no way relieve him from obligations with respect to his bid or to his Contract.

B. Existing Utilities:

1. Existing underground lines indicated are from the best possible information available. Verify all utility line locations prior to the start of any work.

2. It is understood and agreed that certain lines cannot be or have not been located and no indication is contained on any of the Drawings or referred to in the specifications (i.e. storm drainage, electrical, plumbing, sewer, water, or telephone); therefore, exercise extreme caution during demolition and like work. Should any such lines be encountered, written notice shall be given to the University, and no further work in the area shall proceed until adequate investigation has been made, the line identified, and instructions are issued as to how to proceed.

3. The Contractor shall be liable for any and all damages associated with his activities which may disrupt services as a result of any utility line damage.

C. Barricades: Provide barricades, warning (signs and lighting), and maintenance and supervision thereof, in accordance with applicable Federal, State and local codes, or as may be directed from time to time.

D. Equipment: The use of proper equipment is the responsibility of the Contractor.

E. Protection of Property: Existing appurtenances and improvements, which are to remain or be temporarily removed and restored, shall be protected from damage due to work under this section.

F. Protection of Utilities: Preserve in operating condition all active utilities traversing or within and about the site; protect all such property and items, including but not limited to piping, mains, laterals, valve boxes, meters, and other appurtenances and structures. Promptly repair and notify the affected utility company of any damage to such utility or work caused by work under this Contract.

G. Protection of Plant Materials to Remain:

1. Carefully protect existing shrubs, plants and trees within the areas of work and site access during the course of the construction period.

2. Contractor shall be responsible for maintaining all landscaping, including shrubs and trees within the limits of work for the duration of construction. Maintaining landscape includes watering as well as protection.

3.02 DEMOLITION

A. Pavement Demolition:

1. Remove from site all pavement as indicated.

2. Provide a breakline for removal of paving by machine saw-cutting the existing pavement. The depth of the saw cut shall be as required to produce a uniform breakline both vertically and horizontally.

3. Remove paving so as to prevent spalling, cracking or other damage to adjacent paving which is to remain. The Contractor shall at his expense remove and replace damaged pavement outside the limits of removal.

4. Reuse of demolished concrete or asphalt paving as rubble fill shall not be permitted, unless otherwise accepted by the University.

B. Utilities:

1. All existing work and items which are required to be removed shall be removed in such manner that minimum damage and disturbance is caused to adjacent and connecting work. The Contractor shall be responsible for repairing and/or replacing all work which is damaged by these operations to the satisfaction of the University.

2. Plug or cap all existing utilities to be abandoned and not interfering with the work. Remove and dispose of existing piping within the limits of new work.

C. Tree Trimming:

Pruning and root removal shall be done under the direct supervision of an on-site arborist certified by the International Society of Arboriculture.

3.03 CLEANUP

A. Removal of Demolished Material: Remove all waste material from the project site and comply with all applicable government regulations in disposing of said waste material.

1. All materials and equipment to be removed, except that indicated to be reused or delivered as directed by the University, shall become the property of the Contractor and shall be removed from the site.

2. Remove debris resulting from this work from the site as promptly as it accumulates.

B. Cleanup: Remove all evidence of demolition work and leave areas impacted by demolition work in clean and debris-free condition.

END OF SECTION

SECTION 02230 – SITE CLEARING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in Section 01001.

1.02 SUMMARY

A. The Work under this Section is specified in Section 10 – CLEARING AND GRUBBING of the City Standard Specifications. All references to measurement and payment shall be deleted.

B. Related Work Described Elsewhere: Section 02315 – UTILITY SYSTEM EXCAVATION AND BACKFILL.

C. Clearing: This item includes but is not limited to clearing and disposing of all materials, vegetation, debris, rubbish, and other unsuitable material; removing of trash piles and other obstructions interfering with the proposed work to the limits indicated.

D. Grubbing: This item includes but is not limited to the removal of tree stumps, large roots, buried logs, junk, and other objectionable materials at or below the ground surface not prescribed under the item of “Clearing” to the limits indicated.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 SITE CLEARING

A. General: Remove vegetation, debris, rubbish and trees, shrubs, grass and other vegetation, or obstruction interfering with the limits indicated.

B. Clearing and Grubbing:

1. Clear site of vegetation as indicated.

2. Strip and remove the organically contaminated near-surface soils to a minimum depth of two (2) to six (6) inches. Save for reuse in surface restoration at the Contractor’s option.

3. Remove trees and roots to a minimum of (three) 3 feet below existing ground level. Remove all large roots in excess of (two) 2 inches in diameter.

4. Except in excavation areas, backfill all trenches, holes, depressions or pits resulting from clearing and grubbing operations with structural fill according to the requirements of Section 02315 – UTILITY SYSTEM EXCAVATION AND BACKFILL or as directed by the University.

3.02 DISPOSAL OF WASTE MATERIALS

A. Burning of Debris: Burning of debris is not permitted.

B. Removal of Waste Material: Remove all waste material from the project site and comply with all applicable government regulations in disposing of said waste material.

C. Remove all evidence of demolition and clearing work, and restore areas impacted as indicated and in accordance requirements specified herein, the City Standard Specifications or as directed by the University. Leave the areas in a clean and debris-free condition.

END OF SECTION

SECTION 02281 – SOIL TREATMENT FOR TERMITE CONTROL

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENT

1.02 SUMMARY

Soil treatment for termite control consists of application of termiticide chemicals to exposed soil and to voids in construction where insects may gain entry to the building.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300 – SUBMITTALS.

B. Manufacturer's Data: Submit to the University for acceptance copies of the label for the chemical proposed for use.

C. Safety Data Sheet (SDS): Submit SDS for all products and keep one posted at the project site.

1.04 QUALITY ASSURANCE

A. Soil at new slab shall be treated against subterranean termites by a pest control operator licensed by the Hawaii State Pest Control Board in Branch #3 and certified as a commercial applicator under the Hawaii Pesticide Law by the Hawaii State Department of Agriculture in category 7b.

B. The Contractor shall notify the University at least one day before application of chemicals.

C. A totalizing meter shall be provided to determine application rates and to indicate the total volume of pesticide applied in U.S. gallons. The meter shall be no more than five-feet from the applicator at all times.

D. Pumping equipment shall be a type normally used and be capable of pumping the working solution in a manner accepted and practiced by the pest control industry.

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

1.05 DELIVERY, STORAGE, AND HANDLING

Deliver pesticides to the project site in sealed and labeled containers in good condition as supplied by the manufacturer or formulator. Store, handle, and use pesticides in accordance with manufacturer's labels. Labels shall bear evidence of registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended.

PART 2 – PRODUCTS

2.01 MATERIALS

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

B. Chemicals shall be aqueous solutions of Type I repellent termiticides such as Prelude, Dragnet SFR, Demon Max, or Prevail FT or the Type II non-repellant termiticide Premise 75. The chemicals shall be used in accordance with all local laws, ICC IBC as amended, and the labels and provisions related to the use of those pesticides as adopted by the Hawaii Pesticide Law, Chapter 149A, HRS, and the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended. Organophosphate termiticides such as Dursban TC (chlorphyrifos) shall not be used.

PART 3 – EXECUTION

3.01 APPLICATION

A. The solution shall be applied uniformly and at the maximum rates permitted on the label for the chemical being used.

B. Treatment shall include the provision of vertical barriers as stated on the product label, including the creation of a vertical barrier around the slab's outer perimeter. Treatment shall extend down to the top of the footing.

C. Whenever possible, the solution shall be applied not more than 24 hours before the pouring of concrete over the affected area.

D. The solution under slabs shall be applied after backfill has been completed and rough plumbing and other utility lines have been installed and just prior to the placement of the moisture barrier. The treatment shall be applied to dry compacted material whenever possible, but in any

case, shall not be applied under conditions during which the soil does not readily absorb the solution.

E. Treat voids in masonry and similar construction.

F. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

G. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

H. Post warnings signs in areas of application.

I. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.02 CLEAN UP

Do not allow chemicals to remain at the project site whenever the Contractor is not present at the site. Remove chemical spills and other applications exceeding label requirements as recommended by the manufacturer and as directed by the University at no additional cost to the University.

END OF SECTION

SECTION 02315 – UTILITY TRENCH EXCAVATION AND BACKFILL

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in Section 01001.

1.02 SUMMARY

A. Work under this section consists of excavating and backfilling for water, sanitary sewer and electrical lines to the lines and grades indicated. The work includes sheeting and bracing, dewatering, hauling and stockpiling of surplus excavated materials declared as suitable, and hauling and disposing of excavated materials declared as unsuitable

B. Work includes engaging firms to provide quality assurance for the work.

C. Related Work Described Elsewhere:

1. Requirements for the water system improvements are specified in Section 02713 - WATER SYSTEM.

2. Requirements for utility layout and toning for existing utility crossings are specified in Section 02702 - CONSTRUCTION SURVEYS

3. Requirements for the sanitary sewer system are specified in Section 02722 SANITARY SEWER SYSTEM.

4. Requirements for pavement subgrade are specified in Section 02740 ASPHALT CONCRETE PAVING.

5. Requirements for the electrical and communications systems are specified in Division 16 ELECTRICAL.

6. The work under this Section is also specified in the following sections of the Standard Specifications of the City and County of Honolulu, et al., September 1986, herein referred to as the City Standard Specifications:

a. Section 11 – TRENCH EXCAVATION AND BACKFILL of the City Standard Specifications.

b. Section 51 – PLANTING TREES, SHRUBS, GROUND COVER AND GRASS

7. Earthwork for water system improvements shall comply with Section 302.02 – TRENCH BACKFILL of the “Water System Standards,” Board of Water Supply, City and County of Honolulu, et al., State of Hawaii, dated 2002, referred to as the BWS Water System Standards.

1.03 QUALITY ASSURANCE

A. The services of a Quality Control (QC) Geotechnical Engineer or Technician shall be engaged by the Contractor. The Contractor's QC Geotechnical Engineer or Technician shall be present at the site to observe trenching, bedding and backfill operations and progress, and take density or make visual tests as appropriate. Where low density test results are noted, the area shall be reworked by the Contractor and retested. If the field observations and test results, in the opinion of the Contractor's QC Geotechnical Engineer or Technician, indicate that the backfill and earthwork are not in general conformance to the intent of the Drawings and Specifications, the discrepancy shall be reported to the Contractor for corrective action with the University notified when the area is ready for re-testing.

B. An independent third-party Inspector shall be engaged by the Contractor to monitor installation of the utility systems to be accepted by the University.

1.04 SUBMITTALS

A. Submit in accordance with Section 01300 - SUBMITTALS.

B. Submit the name and qualifications of the QC Geotechnical Engineer and the Inspector to be engaged for the utility installation work for acceptance by the University prior to undertaking any earthwork for utilities.

C. Submit inspection soil tests, field logs and certification statements from the QC Geotechnical Engineer and Inspector for the utility line installation work and testing monitored on behalf of the Contractor.

1.05 SPECIAL CONDITIONS

An NPDES permit for dewatering was not obtained for this project. Consequently, the Contractor shall conduct the work to preclude discharge from dewatering operations from entering State Water, including ponds, wetlands, and the ocean.

PART 2 – PRODUCTS

2.01 MATERIALS

A. All materials excavated shall be considered to be unclassified and shall be paid for as such, whether earth, boulders, solid rock, concrete, steel, rubbish, wood, or other materials.

B. Materials excavated within the project boundary may be used in trench restoration, unless otherwise indicated or directed by the University during construction. Control of gradation and maximum size of individual fragments will be required. If excavated materials do not contain sufficient fines to produce well-graded material, off-site borrow or on-site, rock crushing shall be undertaken to provide suitable materials as herein specified. Roots, tree branches, and other organic matter missed during clearing and grubbing

shall be removed from the backfill material. Material that is expansive, spongy, subject to decay, or otherwise considered unsuitable shall not be used in the backfill.

C. Bedding and backfill materials for water lines shall be in accordance with the BWS Standard Specifications.

D. Bedding and backfill materials for drain lines shall be in accordance with Section 11 of the City Standard Specifications.

E. Backfill for areas to be repaved shall be as indicated and specified in Section 02740 ASPHALT CONCRETE PAVING.

F. Buried Warning and Identification Tape:

1. General: Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, three (3) inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

Warning Tape Color Codes

Blue: Water Systems

Yellow: Electric/Communications

Green: Sewer

2. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1,500 psi lengthwise, and 1,250 psi crosswise, with a maximum 350 percent elongation.

3. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1,500 psi lengthwise and 1,250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to three (3) feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

G. Detection Wire for Non-Metallic Piping: Detection wire shall be insulated single strand, solid copper with a minimum diameter of 12 AWG.

PART 3 – EXECUTION

3.01 GENERAL

A. No trenching shall be undertaken until the area has been cleared and grubbed or the paving has been demolished and removed.

B. All excavations shall be protected and guarded against danger to life, limb and property. Shoring, cribbing and lagging, as required to safely preserve the excavations and trench walls from damages resulting from the work, shall be provided and installed by the Contractor.

C. Contractor shall at all times prevent any water from flowing into off-site areas and open trench excavations. All excavations shall be kept free from standing water. The Contractor shall perform all efforts that may be necessary to remove the water from the excavation to the extent required for completion of the work. Such dewatering shall be considered incidental to the work.

D. Laying Out:

1. The laying out of base lines, establishment of grades and staking out the entire work shall be done by a surveyor licensed in the State of Hawaii and paid for by the Contractor. The Contractor shall erect and maintain slope stakes showing existing and/or required elevations.

2. Contractor shall be responsible for property corners and grade stakes which are destroyed by his operations and for which retaking is requested.

3.02 TRENCH EXCAVATION

A. Excavation shall be done so as to obtain the elevations indicated.

B. Usable materials as approved by the University may be stockpiled for later use as backfill material. Non-usable material such as mud, soft material, and expansive soils shall become the property of the Contractor and shall be properly disposed of outside the project boundary limits. Unsuitable subgrade soil, as determined by the University, shall be excavated and removed by the Contractor.

C. Perform excavation, placement and compaction of bedding and backfill material for water lines and appurtenances in accordance with the BWS Standard Specifications.

D. Perform excavation, and placement and compaction of bedding and backfill materials for drain lines and structures as indicated and specified in Section 11 of the City Standard Specifications.

E. Perform excavation, and placement and compaction of bedding and backfill materials for electrical and communication lines as indicated and in accordance with the requirements of Division 16 ELECTRICAL.

F. Backfill material shall be moisture-conditioned to at least 2 percent above the optimum moisture content, placed in level lifts not exceeding 8 inches in loose thickness, and compacted.

G. Compaction: The exposed and prepared subgrade shall be scarified, moisture-conditioned to at least two percent above optimum moisture content, and uniformly compacted to at least the specified percent relative compaction as determined by Laboratory Compaction Test, ASTM D1557 test procedures.

1. Mechanical compaction equipment shall be used to compact the materials. Water tamping, jetting, or ponding shall not be used to compact backfill material.

2. The compacted surface shall be kept moist and not allowed to dry excessively prior to placement of fill or backfill.

3. For pavements and walkway areas, the top three feet of the fill below the pavement finish grades, including base course and subbase, shall be compacted to at least 95 percent compaction. Comply with the requirements of Section 02740 ASPHALT CONCRETE PAVING.

4. Landscape areas shall be compacted to 80 percent of the maximum dry density.

3.03 BURIED WARNING AND IDENTIFICATION TAPE

Install tape in accordance with manufacturer's recommendations except as modified herein. Unless otherwise indicated, bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

3.04 BURIED DETECTION WIRE

Bury detection wire directly above non-metallic piping at a distance not to exceed 12 inches above the top of pipe. The wire shall extend continuously and unbroken, from manhole to manhole. The ends of the wire shall terminate inside the manholes at each end of the pipe, with a minimum of 3 feet of wire, coiled, remaining accessible in each manhole. The wire shall remain insulated over its entire length. The wire shall enter manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal.

3.05 TESTING AND INSPECTION

A. The QC Geotechnical Engineer shall perform testing of all trench bedding and materials and perform in-place density testing during the backfill operations.

B. The Inspector shall review test as appropriate and accept the utility line being installed prior to completion of backfill.

3.06 PROTECTION

A. Protect above and below grade utilities that are to remain.

B. Protect newly backfilled surfaces from traffic and erosion, keep areas free of trash and debris. Repair and re-establish grades in settled, rutted, and eroded areas.

C. Repair all damages caused by and resulting from construction activities in accordance with the requirements of the City Standard Specifications and as directed by the University.

1. Restore paved areas as indicated and in accordance with the requirements of Section 02740 ASPHALT CONCRETE PAVING.

2. Restore grass areas in accordance with Section 51 of the City Standard Specifications.

END OF SECTION

SECTION 02702 - CONSTRUCTION SURVEYS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

A. This section includes requirements for survey to document conditions prior to construction. The Contractor shall be solely responsible for anticipating, planning, and providing any additional provisions that may be required to prevent damage to existing buildings, structures, pavements, above ground and below ground utilities, and new improvements within and adjacent to the work site due to his construction activities.

B. The work specified in this section includes furnishing all labor, materials, and equipment to perform all work necessary for pre-construction survey.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS

B. Qualifications: Submit firm and personnel qualifications for the surveyor and toning service for review demonstrating compliance with the requirements herein.

C. Provide two copies of the pre-construction survey drawing, including locations of all underground utilities within the work area.

D. The University shall be provided with copies of the photographs, videos, and a plan showing the locations of the photographs and videos, as applicable.

1.04 QUALITY ASSURANCE

A. Surveyor Qualifications: Surveying shall be performed by a land surveyor licensed in the State of Hawaii.

B. The firm engaged to conducting toning shall be a Hawaii licensed firm routinely engaged in using metal detectors, electromagnetic detectors, radio frequencies and electromagnetic signals, and ground-penetrating radar to sense underground pipes, utility wires, subsurface structure, voids and other potential encumbrances on conflicts with the work indicated

1.05 NOTIFICATION

The Contractor shall notify the University at least three (3) weeks prior to conducting the pre-construction survey. The University may accompany the Contractor on the pre-construction survey. Work shall not commence until the pre-construction survey has been completed and accepted by the University.

1.06 PRE-CONSTRUCTION SURVEY

A. Prior to the start of any Work, the Contractor shall perform a pre-construction survey of all adjacent and nearby existing structures, buildings, pavements, and walls that lie within the construction site.

The survey shall include identifying, locating and toning existing underground utilities. The survey may also include recording field observations and measurements in the field notebook, taking photographs, making sketches, and videotaping the buildings, existing structures, and other improvements to document pre-construction conditions.

The photographs shall be color prints (digital, 35mm, or Polaroid format) and each photograph shall be marked to indicate the date, name of project, direction of photograph and location and description of the photograph. Two sets of prints shall be submitted in separate three-ring photo albums with clear plastic protective sheets or on separate CD's (for digital format).

Videos may be made of the exteriors of existing buildings and, if possible, interiors, and other improvements within the Project showing their general appearance. Videos shall be narrated to verbally describe the features being shown. Videos may be submitted in digital format (on DVD or flash drive).

B. Two copies of a pre-construction survey drawing shall be submitted to the University Surveying shall include, but not be limited to, scaled drawings on 22" x 34" sheets showing locations of all existing utilities, buildings, and structures within the construction site.

Copies of the pre-construction survey drawing, field notebooks, videos, and photographs shall be provided to the University for review and information at least 2 weeks prior to beginning any demolition or construction work at the site.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

SECTION 02713 – WATER SYSTEM

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

Provide water system, as indicated and herein specified, including but limited to:

Pipes
Service Connections
Valves, including air relief valve
Valve Boxes
Testing and Chlorination

1.03 RELATED DOCUMENTS:

A. Water system trenching, bedding and backfilling requirements are specified in Section 02315 – UTILITY TRENCH EXCAVATION AND BACKFILL.

B. Requirements for water system layout and toning for existing utility crossings are specified in Section 02702 - CONSTRUCTION SURVEYS.

C. Standard Specifications: Wherever reference is made in this Section to BWS Standards, it shall mean the "Water System Standards," Board of Water Supply, City and County of Honolulu, et al., State of Hawaii, dated 2002.

1.04 SUBMITTALS

Submit manufacturer's data on pipe and valves.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Pipe: Install copper service laterals of soft tempered Type "K" tubing in accordance with the BWS Standards for pipe 3 inches and smaller.

B. Fittings: All fittings shall be compatible with the pipe joints and conform to the requirements of the BWS Standards and be on the BWS approved material list. Ductile iron pipe fittings shall be cement lined.

C. Service Connections: Materials for service connections shall be as indicated.

D. Valves: Valves shall conform to the requirements of the BWS Standards.

E. Valve Boxes: Valve boxes shall be per the BWS Standards.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Pipes and Fittings:

1. Excavation and bedding shall be as specified in Section 02315 – UTILITY TRENCH EXCAVATION AND BACKFILL.

2. Expose existing utility lines at connections and crossings prior to installation of new lines. Record pipe inverts on Record Drawings. Comply with the BWS Standards for making connections between new work and existing pipes.

3. Pipe to be laid in a trench shall be laid on the prepared trench bedding so that the barrel of the pipe shall have a firm, uniform bearing along its entire laying length with the invert properly set to grade and alignment. The pipe shall not be laid on wood blocks. “Springing” or “buckling” of pipe lengths into place between installed pipes or special casting will not be allowed.

4. Pipe shall be laid up-grade.

5. The installation procedure for pipe shall be as recommended in the manufacturer’s installation instructions and in accordance with the BWS Standards.

6. When pipe laying is interrupted or delayed, all openings shall be tightly closed with removable plugs or caps held securely in place.

7. The maximum allowable deflections at pipe joints and fitting connection shall be as stated in the BWS Standards. Should the deflections in excess of the Standards be indicated, successive joints and connections shall be deflected such that no one joint or connection exceeds the maximum allowable recommended.

8. Pipe and appurtenances shall be thoroughly inspected and tested prior to installation. Contractor shall assume full responsibility for the soundness of the pipe and appurtenances installed.

9. Pipes and appurtenances shall be thoroughly cleaned and scraped of all foreign matter and protuberances and shall be kept clean until the assembling of the joint has been completed.

10. Pipe, fittings, valves, and accessories shall be carefully lowered into the trench using suitable equipment in such manner as to prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

11. Copper Tubing and Fittings: Installation shall be in accordance with the BWS Standards, as modified to comply with the Safe Drinking Water Act.

12. Service connections shall be made in accordance with the BWS Standards and as indicated.

B. Valves:

Valves shall be inspected to insure proper working order before installation. All rust-preventing grease, dirt, grit, rust and foreign matter shall be removed from valve ends. Valves shall be tested and all leaks stopped.

C. Valve Boxes:

1. Valve boxes shall be constructed as indicated and in accordance with the BWS Standards. Valves shall be properly connected to the facilities of which they are a component part.

2. Excavation shall be made as closely as practicable to the neat lines of the structures. Use reasonable precaution to avoid over-excavation in all cases.

3. Cast iron frames and covers shall be set firmly to grade in concrete, and when applicable, centered over the standpipe. All cast iron covers shall be close fitting to avoid rattling due to passing traffic. Upon completion of installation, the frame and cover shall be given one coat of approved epoxy paint.

3.02 TESTING AND CHLORINATING

A. Chlorinate and flush all water mains and appurtenances, in accordance with the latest methods as approved by the BWS and the Department of Health, State of Hawaii.

1. In the process of chlorinating the pipeline, all valves and appurtenances shall be operated while the pipelines are being filled. After the necessary retention period, the pipeline shall be completely flushed and drained of the highly chlorinated water. Should the initial disinfection treatment fail to produce the desired results, the chlorination procedure shall be repeated until satisfactory results are obtained.

2. Temporary drain lines required to properly drain the newly installed facilities shall be installed and shall be removed after the completion of all chlorination.

3. Contractor shall be responsible for permits to dispose of hydrotest water.

B. Backfilling: Upon completion of the test, the trench shall be backfilled as specified under Section 02315 – UTILITY TRENCH EXCAVATION AND BACKFILL.

C. Restoration and Cleanup:

1. Restore existing pavements, walkway and grassed areas as indicated and specified in Section 02315 – UTILITY TRENCH EXCAVATION AND BACKFILL. Provide a smoothing riding connection between the restored and existing paved area. Restoration shall be in accordance with the BWS Standards and as indicated and specified.

2. Upon completion of each section of pipeline, remove all excess pipe and appurtenances and thoroughly clean the area.

3. Surplus material resulting from trench excavation shall be used to the extent required.

4. Keep all roadways and walkways free from debris. Control dust.

END OF SECTION

SECTION 02722 – SANITARY SEWER SYSTEM

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001

1.02 SUMMARY

A. Provide sanitary sewer system as indicated.

B. Obtain and pay for all inspections and testing necessary for acceptance of the sanitary sewer system.

C. Related Work Specified Elsewhere

1. Section 02315 – UTILITY TRENCH EXCAVATION AND BACKFILL. Sanitary sewer system trenching, bedding and backfilling requirements.

2. Section 02702 - CONSTRUCTION SURVEYS Requirements for sewer system layout and toning for existing utility crossings.

3. Section 03300 - CAST-IN-PLACE CONCRETE. Concrete work for manhole bases and cleanout collars.

4. The work under this Section is also specified in the following sections of the Standard Specifications of the City and County of Honolulu, et al., September 1986, herein referred to as the City Standard Specifications:

a. Section 20 - Cast Iron and Ductile Iron Sewer Pipe and Appurtenances

b. Section 21 - PVC Sewer Pipe and Appurtenances

c. Section 23 - Sewer Manholes

All references to measurement and payment shall be deleted.

1.03 SUBMITTALS

A. Submit manufacturer's data for pipe, fittings, couplings, and metal items.

B. Submit pipeline testing results.

C. Submit manufacturer’s literature for epoxy coating.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Sewer Pipe and Appurtenances:

1. Gravity pipe, all sizes, shall be polyvinyl chloride (PVC) sewer pipe.

2. Pipe 4 inches in diameter and larger shall be SDR 35, gasketed, conforming to the requirements of ASTM D3034.

3. Piping for the clean-outs-to-grade shall be cast iron soil piping conforming to the Standard Specifications, Section 20.

4. Fittings and couplings for sewer pipe shall be PVC or flex seal couplings. PVC fitting shall be Schedule 40, as specified for PVC pipe. Flex couplings shall be of rubberized material suitable for exposure to substances likely to be found in domestic wastewater, including soaps, fats, diluted acids, and cleaning solutions. Couplings shall provide leak proof seal on the pipe material installed. Flex coupling shall have stainless steel clamping bands to secure the pipes being joined.

5. Materials for the sanitary manholes and other concrete items shall conform to Section 23 of the Standard Specifications and Section 03300 CAST-IN-PLACE CONCRETE.

B. Soil Materials:

1. Bedding shall be crushed rock as specified in Section 18 of the Standard Specifications. Placement shall be in accordance with the requirements of Section 02315 – UTILITY TRENCH EXCAVATION AND BACKFILL.

2. Backfill shall conform to the requirements of Section 02315 – UTILITY TRENCH EXCAVATION AND BACKFILL.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Sewer Lines and Appurtenances:

1. Install the pipelines and manholes as indicated and in accordance with the Standard Specifications. Install clean-outs-to-grade as indicated.

2. Join pipes with couplings or fittings in accordance with the manufacturer's recommended procedures. All joints shall be leak proof and water tight.

3. Cast iron frames, covers and rungs shall be coated with an epoxy paint, color black, acceptable to the City and County of Honolulu, Department of Environmental Services.

B. Testing: All tests specified in the City Standard Specifications shall be performed on the lines installed with copies of the test results furnished to the Architect.

3.02 CLEANUP

A. Perform cleanup of the sanitary sewer system in accordance with Section 23 of the City Standard Specifications.

B. Restore pavements as specified in Section 02740 ASPHALT CONCRETE PAVING.

C. Restore grassed areas in accordance with Section 02315 – UTILITY TRENCH EXCAVATION AND BACKFILL.

END OF SECTION

SECTION 02740 – ASPHALT CONCRETE PAVING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in Section 01001.

1.02 SUMMARY

A. Work under this section consists of furnishing all labor, materials and equipment required to complete restoration of asphalt concrete pavements as indicated and specified herein.

B. Related Work Described Elsewhere:

1. Earthwork for utility trenching and requirements for Quality Control (QC) Geotechnical Engineer or Technician are specified in Section 02315 - UTILITY TRENCH EXCAVATION AND BACKFILL.

2. Pavement stripping is specified in Section 02760 - PAVEMENT Marking AND SIGNAGE.

3. The work in this Section is specified in the following sections of the City Standard Specifications:

a. Section 29 - SUBGRADE

b. Section 31 - AGGREGATE BASE COURSE

c. Section 33 - ASPHALT SURFACE TREATMENT

d. Section 34 - ASPHALT CONCRETE PAVEMENT

All references to measurement and payment shall be deleted.

1.03 SOILS TESTING AND ANALYSES

A. The Contractor's QC Geotechnical Engineer or technician shall be present at the site to observe and direct paving operations and to take density or make visual tests as appropriate. Where low density test results are noted, the area shall be reworked by the Contractor and retested.

B. If the field observations and test results, in the opinion of the QC Geotechnical Engineer or testing personnel or indicate that the paving is not in general conformance to the intent of the drawings and specifications, the discrepancy shall be reported to the Contractor for corrective action with the University notified.

1.04 SUBMITTALS

A. Submit in accordance with Section 01300 - SUBMITTALS.

B. Product Certificates: Certificates from manufacturers or suppliers to verify that types of materials being supplied meet the requirements of these specifications.

C. Submit job mix formula.

PART 2 – PRODUCTS

2.01 ASPHALT CONCRETE PAVEMENT MATERIALS

Materials for asphalt concrete pavements shall be in accordance with the below-listed sections of the City Standard Specifications, except as amended in the plans and/or specifications herewith.

A. Base Course, 1-1/2 inch Maximum Section 31

B. Prime Coat for Pavement, MC30 or SS-1H Section 33

C. Tack Coat for Pavement, SS-1 or SS-1H Section 33

D. Asphalt Concrete Pavement, Mix 4 Section 34

PART 3 – EXECUTION

3.01 SURFACE PREPARATION

A. The subgrade shall be prepared and compacted in accordance with the requirements of the City Standard Specifications. Soil tests shall be made at the subgrade level and the final pavement structure verified or modified as necessary. At least two tests per utility line trench and structure shall be made by Contractor's QC Geotechnical Engineer or technician .

B. Installation shall be in accordance with the applicable sections noted hereinabove and details indicated. Pavement shall be sloped to prevent ponding and match existing grades.

3.02 AGGREGATE BASE COURSE

A. The base course shall be constructed in accordance with Section 31 of the City Standard Specifications. Following scarification, the base course shall be constructed in accordance with Section 31 as above referenced. Base course shall be compacted to not less than 95% of its maximum density. The compacted base course shall be finished to allow for 2 inches of asphalt concrete pavement to meet the existing finish grades.

B. Field density tests on the constructed base course shall be made by the Contractor's QC Geotechnical Engineer or technician to verify that the compaction obtained meets the specified requirements.

3.03 ASPHALT CONCRETE PAVEMENT

A. Asphalt concrete pavement shall be constructed in accordance with Section 34 as referenced above.

B. The asphalt concrete pavement finish surface grade and drainage patterns shall match existing.

C. Finish surfaces free from irregular surface changes, within the following tolerances above or below required finish grade: Line, grade and cross-section, plus zero to minus 1/10 foot.

3.04 PAVEMENT STRIPING

Restoration of pavement striping shall be as specified in Section 02760 - PAVEMENT MARKING AND SIGNAGE.

3.05 REPAIR OF EXISTING ASPHALT CONCRETE PAVEMENT

Any existing asphaltic concrete pavements including road or parking areas that have been damaged by construction activities shall be repaired to the original condition and to the satisfaction of the University.

END OF SECTION

SECTION 02760 – PAVEMENT MARKING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in Section 01001.

1.02 SUMMARY

A. Work under this section consists of furnishing all labor, materials and equipment required to complete restriping of the asphalt concrete paving as indicated and specified herein.

B. Related Work Described Elsewhere:

1. These specifications shall amend Section 629 - PAVEMENT MARKERS, STRIPING AND MARKINGS of the State of Hawaii (State), Standard Specifications for Road, Bridge and Public Works Construction, 1994.

2. Related Work Not Included in This Section: Roadway paving is specified in Section 02740 - ASPHALT CONCRETE PAVING.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300 - SUBMITTALS.

B. Submit manufacturer's certificates of compliance for all materials herein specified.

PART 2 – PRODUCTS

2.01 TRAFFIC PAINTS

A. The State of Hawaii, Department of Transportation, Highways Division "Hawaii Standard Specifications for Road and Bridge Construction", 2005, including all revisions, shall govern all work except for subsections on Measurement and Payment which shall not be applicable. This publication shall be referred to as State DOT Standard Specifications hereinafter.

B. Paint shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's formulation number and directions, and name of the manufacturer, all of which shall be plainly legible at the time of use. The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics.

C. Paint shall conform to the State DOT Standard Specifications, latest edition, Sections 708 and 755.

2.02 EQUIPMENT:

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

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

PART 3 – EXECUTION

3.01 SURFACE PREPARATION:

Bituminous Pavements: New asphalt concrete pavement shall be allowed to cure for a period of not less than seven days before the application of marking materials unless directed otherwise. Dust, clay, silt and sand shall be removed from the pavement to be marked before application of paint by sweeping, blow with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface laitance and other substances adhering to the pavement shall be removed with stiff brooms, scrapers, wire brushes, sandblasting or mechanical abrasion. Marker adhesives and paints shall not be applied when moisture or foreign matter is present on the pavement surface or when wind conditions are such as to cause dust to be deposited on the prepared areas or to prevent satisfactory application of the paint.

3.02 CONTROL POINTS:

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

3.03 TRAFFIC CONTROL:

The Contractor shall furnish, install and maintain suitable barricades and other traffic control devices around the work site. Place traffic control devices along the newly painted lines to control traffic and prevent damage to the painted surface.

3.04 APPLICATION:

Paint shall not be applied to damp or wet pavement surfaces or when inclement weather threatens to interrupt the work. Traffic paints shall be applied when air and pavement temperatures exceed 95 degrees F. Paint shall be applied with equipment specified herein and at the rate of coverage specified below. The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters and symbols. All edges of markings shall be sharply outlined. The width of the lines supplied shall be within a tolerance of 1/2-inch. The centerline of marking will not deviate more than one-inch laterally from a straight line at any point. Workmanship will conform to the best commercial practices consistent with these specifications. Areas not properly painted shall be repainted. Any spilled paints will be cleaned from the paved areas to the satisfaction of the University. The Contractor will keep the premises clean at all times. Paint, empty containers and other material or equipment will not be stored or allowed to accumulate on or near the paved areas. Paint shall be applied evenly to the pavement at a rate between 100 and 110 square feet per gallon. Apply two coats of paint.

3.05 INSPECTION AND ACCEPTANCE:

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

3.06 PROTECTION OF WORK:

Protect newly painted surfaces from damage by vehicles as required for paint to harden sufficiently to withstand traffic. Discootinue painting during periods of

high winds. Any damage to newly painted markings due to Contractor's failure to provide adequate protection shall be repaired by the Contractor.

END OF SECTION

SECTION 02820 - CHAIN-LINK FENCE AND GATES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

A. Provide all labor, materials and equipment required to construct and test all fences and gates as indicated and as specified herein, but not limited to:

1. Miscellaneous fasteners and hardware

2. Miscellaneous framing and supports

3. Miscellaneous metal fabrications

4. Grout for stationary fence footings

B. Related Work Described Elsewhere:

1. The below listed sections of the Standard Specifications for Public Works Construction, City and County of Honolulu, et al., September 1986, hereinafter referred to as “City Standard Specifications,” apply to the work. All references to measurement and payment shall be deleted.

a. SECTION 39 - PORTLAND CEMENT CONCRETE

b. SECTION 54 - CHAIN LINK FENCE

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01330 – SUBMITTALS.

1. Shop Drawings:

a. Submit shop drawings showing scale elevations and sections in as large a scale as practical. Show full-scale sections only when needed for clarity.

b. Submit manufacturer's certificates of compliance for fencing materials.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fence: Chain link fence, height as indicated. Materials shall be as specified in the Section 54 of the City Standard Specifications. Rail, braces and frames shall be Schedule 40 galvanized steel conforming to ASTM A53.

1. Fence fabric shall be woven mesh of No. 9 gauge galvanized steel core wire with a minimum breaking strength of 1,290 pounds conforming to ASTM F668, Class 2B. Minimum coating thickness shall be 0.006 inch. Other fencing items shall be galvanized in accordance with ASTM A123, A153, or A385, as applicable. Fabric shall be furnished with salvages knuckled on both the top and bottom edges.

2. Fence stretcher bars shall be full height of the fabric with which they are being used. Ends shall not protrude beyond the top of the fence fabric. All sharp edges shall be ground smooth.

3. Tension bar bands and clips shall be heavy pressed steel or malleable iron. Tension bars shall be the full height of the fabric with which they are being used. Ends shall not protrude beyond the top of the fence fabric and shall be trimmed with all sharp edges shall be ground smooth.

4. All materials and fittings shall be new, and all ferrous materials shall be hot-dip galvanized per Section 54 of the requirements of the City Standard Specifications.

B. Related Components and Materials:

1. Epoxy Grout: ASTM C881, Types I - III, Grade 2, Class B/C, concrete gray color, The Burke Company “Thorogrip MV” or acceptable substitutes.

2. Fittings: Weld type fittings of the same metal as primary component of fitting types necessary for configuration.

a. Malleable iron castings shall be hot-dipped galvanized in accordance with ASTM A153.

b. Wrought iron forgings or pressed steel fitting and appurtenances shall be hot-dipped galvanized in accordance

3. Posts shall have dome caps, which shall be designed to exclude water from post. Line posts shall be equipped with eye caps suitable for the through passage of the top rail, with a round opening only slightly larger than the outer diameter of the top rail.

Elongated eye caps will not be acceptable.

4. Hardware:

   a. Bolts which are installed 6 feet or less above grade shall not protrude more than 1/4 inch beyond the nut after tightening. Rough edges shall be filed smooth. All fittings and accessories shall be polyester coated with color to match the fence frame.

   b. Tie wire shall be 9 gauge outer diameter galvanized steel wire.

5. Concrete for fence posts shall be Class B, per the Standard Specifications.

PART 3 - EXECUTION

3.01 PREPARATION

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

B. Coordination: Coordinate and furnish anchorage, setting drawings, diagrams, instructions, and directions for installation of anchors, such as metal posts and anchoring grout and miscellaneous items which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.02 INSTALLATION

A. General:

1. Protection: Use wood blocks and padding to prevent damage to components.

2. Fastening to In-Place Construction: Provide anchorage devices where necessary for securing miscellaneous metal fabrications to in-place construction; including metal posts and anchoring grout.

3. Anchorage Devices: Conceal to the greatest extent possible.

B. Fencing shall be installed in accordance with the Standard Specifications. Ground along the fence shall be properly graded on a level grade. All obstructions shall be removed.

C. Layout fence in accordance as indicated:

1. Provide at each termination, end post, corner post, pull post, and change in horizontal direction of 30 degrees or more unless otherwise indicated.

2. pace line posts uniformly at the maximum spacing indicated.

D. Corner, End, and Pull Posts Set in Concrete: Excavate holes after final grading in firm, undisturbed or compacted soil. Holes shall have a diameter not less than 4 times the diameter of the fence post and depths approximately 6 inches deeper than the bottom of the post. Excavate deeper as required for adequate support in soft and loose soils and for posts with heavy lateral loads.

1. Set fence posts not less than the depth indicated below the surface when in firm, undisturbed soil.

2. Place concrete around posts in a continuous pour and tamp for consolidation. Trowel finish tops of footings and slope to divert water away from posts.

3. Check each post for vertical and top alignment and hold in position during placement and finishing operations.

E. Fence Frame:

1. Top/Bottom Rails:

a. Provide random lengths, avenging not less than 18 feet in length.

b. Provide and install pressed steel sleeves for rigid, continuous connections and to provide space for expansion contraction of the top rail.

2. Install mid rails as indicated.

F. Gates:

1. Install gates plumb, level, and secure in the opening for full operation without interference.

2. Gate dimensions shall be as indicated on the Owner accepted shop drawings. Gates shall be fabricated to correctly fit the area between the gateposts.

3. Gates shall work freely and shall have adequate clearance between the bottom of the gate and road surface. Adjust each gate for smooth operation.

G. Other Fabrication: Comply with successfully reviewed shop drawings and fabricator's project specific requirements. For manufactured products comply with manufacturer's project specific requirements.

3.03 CLEAN-UP

Touch-Up Painting and Galvanizing Repair: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with paint manufacturer's recommended touch-up paint. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils. Touch-up damaged galvanized surfaces after solvent cleaning with two coats of cold applied galvanizing, such as ZRC compound, or pre-approved equal.

END OF SECTION

DIVISION 03 - CONCRETE

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. As specified in SECTION 01001.

1.02 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

B. Related Sections include the following:

1. DIVISION 2 – EARTHWORK for drainage fill under slabs-on-grade.

2. DIVISION 02 – TERMITE CONTROL

3. DIVISION 02 – CEMENT CONCRETE PAVEMENT for concrete pavement and walks.

4. SECTION 09620 – POLYURETHANE FLOORING SYSTEM

5. SECTION 09900 – PAINTING for testing for moisture and alkalinity.

1.03 DEFINITIONS

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

1.04 SUBMITTALS

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

B. Steel Reinforcement Material Certificate: Certified mill test results or laboratory test results. Indicate bar size, yield strength, ultimate tensile strength, elongation and bend test. Provide chemical composition for rebars that are to be welded.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar

arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Design Mixtures: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mix water to be withheld for later addition at Project site.

E. Welding Certificates: Copies of certificates for welding procedures and personnel.

F. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance with the requirements indicated, based on comprehensive testing of current materials.

G. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Form materials and form-release agents.

2. Steel reinforcement and reinforcement accessories.

3. Fiber reinforcement.

4. Waterstops.

5. Curing materials.

6. Floor and slab treatments.

7. Bonding agents.

8. Adhesives.

9. Vapor retarders.

10. Epoxy joint filler.

11. Joint-filler strips.

12. Repair materials.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

D. Welding: Qualify procedures and personnel according to AWS D1.4, “Structural Welding Code--Reinforcing Steel.”

E. ACI Publications: Comply with the following, unless more stringent provisions are indicated and maintain a copy at the field office.

1. ACI 301, “Specification for Structural Concrete.”

2. ACI 117, “Specifications for Tolerances for Concrete Construction and Materials.”

3. ACI 347R “Guide to Formwork for Concrete”

1.06 DELIVERY, STORAGE, AND HANDLING

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

1. Avoid damaging coatings on steel reinforcement.

2. Repair damaged epoxy coatings on steel reinforcement according to ASTM D 3963/D 3963M.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

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

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

2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1, or better.

b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.

c. Structural 1, B-B, or better, mill oiled and edge sealed.

d. B-B (Concrete Form), Class 1, or better, mill oiled and edge sealed.

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

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

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

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

2.02 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed, unless otherwise noted on the drawings.

C. Plain-Steel Wire: ASTM A 82, galvanized.

D. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

E. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

F. Galvanized Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from galvanized steel wire into flat sheets.

2.03 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place that will not puncture the vapor retarder. Use plastic straps or brightly colored tie wires to secure reinforcing. Manufacture bar supports

according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports. Refer to paragraph 3.06 for chair support spacing.

B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

C. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

2.04 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I / II.

B. Pozzolans

1. Fly Ash: ASTM C 618, Class C or F.

2. Blended Hydraulic Cement: ASTM C595M.

3. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Blended Hydraulic Cement: ASTM C 595M; Type IS - portland blast-furnace slag cement, Type IP - portland/pozzolan cement, Type I (PM) - pozzolan-modified portland cement, or Type I (SM) - slag-modified portland cement.

D. Silica Fume: ASTM C 1240, amorphous silica.

E. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:

1. Class: Moderate weathering region, but not less than 3M.

2. Aggregate Size: 1-1/2 inches (38 mm).

3. Aggregate Size: No. 57 (1 inch to No. 4).

4. Aggregate Size: No. 67 (3/4 inch to No. 4).

F. Size of Coarse Aggregate: Except when otherwise specified or permitted, maximum size of coarse aggregate shall not exceed three-fourths of the minimum clear spacing between reinforcing bars (or bundled bars), one-

fifth of the narrowest dimension between the sides of forms, or one-third of the thickness of slabs or toppings.

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

2.05 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

G. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:

a. DCI or DCI-S; W. R. Grace & Co., Construction Products Div.

b. Rheocrete CNI or Rheocrete 222+; Master Builders, Inc.

c. FerroGard-901; Sika Corporatio.

d. Eucon-CIA; Euclid Chemical corporation.

2.06 FIBER REINFORCEMENT

A. Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.

2.07 VAPOR RETARDERS

A. Vapor Retarder: ASTM E 1745, Class A except as modified in Subparagraph 1. below, nylon or polyester-cord-reinforced three-ply high-density polyethylene sheet, or one ply extruded polyolefin sheet; 10 mil minimum thickness. Compliance to ASTM standards shall be confirmed by an independent testing agency.

1. Permeance Rating: ASTM E96, ASTM E154 not exceeding 0.035 grains/ft^2/hr

2.08 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of silicon carbide, or fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by moisture, and cleaning materials.

B. Unpigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, and plasticizing admixture.

C. Pigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, coloring pigments, and plasticizing admixture. Use coloring pigments that are finely ground, nonfading mineral oxides interground with cement.

1. Colors: Match Project's samples.

2. Colors: As indicated by referencing manufacturer's designations.

3. Colors: As selected by UH from manufacturer's full range for these characteristics.

D. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solutions of inorganic silicate or siliconate or polymerized polyester polymer or other materials and proprietary components; odorless; colorless; that penetrates, hardens, waterproofs or densifies concrete surfaces.

2.09 CURING MATERIALS AND EVAPORATION RETARDERS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 22 percent solids.

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

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

2.10 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.

2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Cementitious Coatings: Cement based polymer modified concrete finishing materials. Available Products subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. ProFinish by Bonded Materials

2. Polycoat by Tremcrete Systems Incorporated

3. Durus by Durus High Tech Cement

4. MBT RS-1150 by Master Builders Technologies.

E. Sleeves:

1. Schedule 40 pipe, galvanized per ASTM A53.

2. Schedule 40 PVC Pipe.

F. Reglets: Fabricate reglets of not less than (0.0217-inch) thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations. Products shall contain no added gypsum.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4000 psi (27.6 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch. Products shall contain no added gypsum.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.

4. Compressive Strength: Not less than 5500 psi (39 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.

B. Footings: Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 Days): 3000 psi if poured separate with slab-on-grade and 4000 psi if poured with slab-on-grade.

C. Slab-on-Grade: Proportion normal-weight concrete mix as follows:
1. Compressive Strength (28 Days): 4000 psi.

D. Electrical Handholes and Boxes; Drainage Sewer and Plumbing systems; Manholes, Catchbasins, Valve Boxes and other appurtenances:

1. Compressive Strength (28 Days): 3000 psi.

E. Electrical Ducts, Conduit Encasements; Sidewalks, Equipment pads on grade;

1. Thrust Blocks and Trench Encasements:
   a. Compressive Strength (28 Days): 2500 psi.

F. Slab Vapor Emissions Rates: At the time of finished flooring installation , vapor emissions shall not exceed a maximum of 5 lbs. per 1000 square feet per 24 hours or the maximum emission established by the flooring manufacturer whichever is less. If the vapor emission rate exceeds the limit specified, take measures specified in Paragraph 3.18 to reduce the emissions to an acceptable level without delaying the project.

G. Cementitious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.

H. Cementitious Materials: Use fly ash, pozzolan, ground granulated blst furnace slag and silica fume as needed to reduce the total amount of Portland cement which would otherwise be used by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

2. Combined Fly Ash and Pozzolan: 25 percent.

3. Ground Granulated Blast-Furnace Slag: 50 percent.

4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

5. Silica Fume: 10 percent.

6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent portland cement minimum, with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

I. Maximum Water-Cementitious Materials Ratio: 0.45 for concrete required to have low permeability, interior slabs with vapor sensitive floor coverings.

J. Maximum Water-Cementitious Materials Ratio: 0.50 for concrete subject to moderate sulfate exposure.

K. Maximum Water-Cementitious Materials Ratio: 0.45 for concrete subject to severe or very severe sulfate exposure.

L. Do not add air entrainment to concrete of trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

M. Limit water-soluble, chloride-ion content in hardened concrete per ACI 318 Chapter 4 for corrosion protection of reinforcing steel.

N. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate.

1. Use synthetic fiber reinforcement for exterior concrete sidewalks on grade and in other areas identified in the contract documents.

O. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

4. Use corrosion-inhibiting admixture in concrete mixes where indicated.

2.13 FABRICATING REINFORCEMENT

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

2.14 CONCRETE MIXING

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

B. Project-Site Mixing: Measure, batch, and mix concrete materials according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd.0.76 cu. m or less, continue mixing at least one and one-half minutes, but not more than five minutes after all ingredients are in mixer, before any part of batch is released.

2. For mixer capacity larger than 1 cu. yd.0.76 cu. m, increase mixing time by 15 seconds for each additional 1 cu. yd.0.76 cu. m.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of concrete placement in structure.

4. Hand mixed concrete will not be allowed, except to make up shortages for fence post footing, thresholds, curbs and gutters, thrust block and utility trench encasements.

PART 3 - EXECUTION

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch.

D. Construct forms to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds. Maintain the integrity of the vapor retarder membrane.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.

2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3. Install inserts, hangers, metal ties, nailing strips, blocking, grounds and other fastening devices needed for attachment of other work.

B. Locate electrical or mechanical conduits and fittings so that the strength of the concrete member is not impaired. “Conduits” include pipes, ducts, and electrical conduits. Unless required otherwise on the Drawings, conform to the following:

1. Concrete Slabs on Grade: Do not embedded conduits within the thickness of any concrete slab on grade. Place conduits in the subgrade below the concrete slabs, but not within the thickness of the basaltic termite barrier.

C. Obtain UH Representative’s approval to install conduit or pipe penetrations that may unduly impair the strength of the structural member (for example, multiple pipe penetrations near the face of a column).

3.03 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, slabs, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F(10 deg C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained. The 24 hour period may be reduced to 12 hours in compliance with ACI 347R with prior approval from the Contracting Officer.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Contracting Officer.

3.04 VAPOR RETARDERS

A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 “Standard Practice for Installation of Water Vapor Retarders” and manufacturer’s written instructions. The more stringent shall apply.

1. Use the greatest widths and lengths practical to minimize lap joints. Seal laps joints and edges with tape or materials compatible with the vapor retarder. Remove and replace torn, punctured, or damaged vapor barrier materials, except when minor repairs or patches are allowed by manufacturer’s instructions.

2. Do not cut or puncture vapor retarder. No penetrations of the vapor barrier allowed except for reinforcing steel and permanent utilities. Seal all penetrations including pipes and reinforcing. Repair damage and reseal vapor retarder before placing concrete.

3. Do not leave the vapor retarder exposed to ultraviolet radiation for more than a few days prior to the concrete pour. Remove standing water from the vapor retarder prior top concrete pour.

3.05 STEEL REINFORCEMENT

A. General: Comply with CRSI’s “Manual of Standard Practice” for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Shop or field-weld reinforcement according to AWS D1.4, where indicated.

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

BAR SIZE	MAXIMUM DISTANCE BETWEEN SUPPORTS
#3	2 feet
#4	3 feet
#5	4 feet
#3 at 15" E.W.	4'-6" o.c. each way
WIRE FABRIC SHEETS	MAXIMUM DISTANCE BETWEEN SUPPORTS
6 x 6 - W2.9/w2.9	2'-0" o.c. each way
6 x 6 - W6/W6	3’-0" o.c. each way

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

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.06 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

C. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.

1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.07 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Provide one day notification to UH Representative for each scheduled pour.

B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301. Up to two gallons of water per cubic yard of concrete may be added at the jobsite provided the approved design mix accommodates the additional water.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.

C. Convey concrete from mixer to the place of final deposit rapidly by methods that prevent segregation or loss of ingredients and will insure the required quality of concrete. Use conveying equipment, conveyors, hoppers, baffles, chutes, pumps that are sized and designed to prevent cold joints from occurring and prevent segregation in discharged concrete. Clean conveying equipment before each placement.

D. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

E. Deposit concrete in forms in horizontal layers with proper consolidation into previous layers and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints. For high wall pours (above 12 feet), Contractor must show its experience and demonstrate its proficiency before UH will permit pours in excess of 12 feet.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

3. Make construction joints only where located on Drawings unless otherwise approved by UH. Plan pours to continuously place concrete from one construction joint to another.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleed-water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.08 CONCRETE SLABS ON GRADE

A. For interior areas, unless specified elsewhere, place concrete floor slabs directly over vapor retarder overlain atop basaltic termite barrier (or granular fill-capillary barrier if BTB is not used in the Project) and reinforce slabs with grade 60, No. 10 (#3) steel bars at 15" O.C. each way.

1. Place floor slabs in alternate panels, long strip pattern, and following construction or contraction joints. “Keyed Kold Joint” may be used in lieu of placement in alternate panels in areas where floor covering is specified provided all shrinkage cracks are sealed prior to installation of floor covering.

2. Provide a bond-break filler strip, between concrete slab and abutting vertical surfaces and as detailed.

B. For exterior areas, unless specified elsewhere, place concrete floor slabs directly over granular fill or compacted fill and reinforce slabs with synthetic fibers. Provide isolation and contraction joints where detailed and, at intersections, corners and at abutments. Place contraction joints not more than 40 feet apart, unless detailed otherwise.

1. Finish concrete true to grade, section and cross slope for sloped or crowned walks at 1.5% (1% minimum and 2% maximum). Round edges to 1/8" radius except saw-cut joints. Finish steps in connection with walks with same finish as walks.

3.09 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.

1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.

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

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.

1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

2. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding 10-foot-long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:

a. 1/4 inch.

E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Contracting Officer before application.

G. Swirled Finish: Apply a swirl finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated. Immediately after second troweling, and when concrete is still plastic, work the surface with a float in semi-circular or fan-like motion.

H. Slip-Resistive Aggregate Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:

1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.

2. After broadcasting and tamping, apply float finish.

3. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose slip-resistive aggregate.

I. Shot Blast Finish: Apply in accordance with polyurethane flooring manufacturer instructions see SECTION 09620.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

D. Electrical Work: Use 3/4" maximum size of aggregates for duct encasement. Unless detailed otherwise, encase underground ducts or conduits as follows:

1. Provide 3 inches minimum concrete cover around ducts or conduits. Use spacers to place and hold ducts. Provide 18

inches minimum earth cover over top of concrete encasement unless otherwise detailed.

2. For future connections, provide a one foot section of ducts or conduits to extend beyond concrete encasement and terminate with a coupling or end cap.

E. Concrete for Drainage, Sewer and Plumbing Systems:

1. Do not use calcareous coarse aggregates in sewerage structures or components.

2. Unless specified elsewhere, construct sewer manholes in accordance with the latest adopted/amended edition of Section 23 SEWER MANHOLES of the "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION".

3.12 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the curing methods listed in paragraph 3.14.D.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water

b. Continuous water-fog spray

c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moist cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

   b. Moist cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.

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

3.13 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.

   2. Do not apply to concrete that is less than 28 days old.

   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; re-wet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions. Defer joint filling as long as possible. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

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

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas. Remove and replace concrete that cannot be repaired and patched to UH Representative's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16(1.2-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than [1 inch] in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by UH Representative.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of [1/4-inch] to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes [1-inch] or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least [3/4-inch] clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes [1-inch] or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to UH Representative's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to UH Representative's approval.

3.16 DRYING CONCRETE SLABS TO LIMIT MOISTURE VAPOR EMISSIONS AND ALKALINITY

A. For concrete slabs (on grade or suspended) receiving floor finish susceptible to vapor emissions, protect, dry or seal concrete slabs to meet the required vapor emission level(s) of the intended floor finish systems. If choosing to use a floor sealing system, furnish submittals for approval.

1. Once slab drying has started, protect it from getting wet prior to floor finish installation. Test floor for moisture and alkalinity in accordance with Section 01400, Quality Requirements.

2. Test floor for vapor emission at locations and quantities recommended by the test kit manufacturer. Test pH levels of Concrete.

3. If the concrete slab does not meet the vapor emission or alkalinity level(s), use other means such as mechanical drying or floor sealing system(s) (penetrants, coatings, or membranes) to achieve the required levels.

4. If the concrete floor slab does not meet the required alkalinity level, neutralize, cure, dry or seal concrete to bring the concrete to an acceptable alkalinity level.

5. Be aware that no additional time or costs will be granted to meet the required vapor emission levels or alkalinity levels of the concrete surfaces.

B. Floor Vapor Emission Control System:

1. Acceptable products: Subject to compliance with requirements, products that may be incorporated into the Work include the following. Other products must be specifically approved by UH for use in this project.

a. Floor Seal by Floor Seal Technology, Inc.

b. Vectr-R System by Sinak Corporation.

c. Cutdown by Dependable Floor Products

2. Install per manufacturer's requirements to achieve a guaranteed vapor emission rate that meets the finished flooring recommended rates. Treatment shall not provide detrimental conditions to the

concrete slab or floor covering materials. Make sure flooring adhesives are compatible with the treatment materials.

3. Installer shall provide proof of installer's certification by the treatment manufacturer.

4. Guarantee:

   a. Manufacturer's Guarantee: Warrant against bond failure with concrete and failure of the system due to vapor emission and alkalinity levels. Guarantee Period: Five (5) years.

   b. Project Guarantee: Replace original finished flooring materials and vapor emission control system due to failure of the vapor emission control system to control vapor emission and prevent unacceptable alkalinity levels. Provide extended warranty that is covered by a separate material and installation bond or by the manufacturer's product liability insurance policy specifically covering the work on this Project. UH shall have final approval of accepting the bond or manufacturer's insurance policy.

3.17 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

   a. When frequency of testing will provide fewer than five compressive strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural

lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F4.4 deg C and below and when 80 deg F (27 degC) and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.

    a. Cast and field cure one set of four standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.

    a. Test two field-cured specimens at 7 days and two at 28 days.

    b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi3.4 MPa.

D. Test results shall be reported in writing to UH Representative, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by UH Representative but will not be used as sole basis for approval or rejection of concrete.

F. Moisture Vapor Emission Test: Standard test method meeting ASTM F-1869.

G. Alkalinity (pH Level) Testing: Standard test required for floor slabs and all wall and ceiling surfaces to receive painted finishes. Testing of concrete to receive paint finish may be conducted under Painting Section.

H. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by UH Representative. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by UH Representative.

END OF SECTION

DIVISION 05 – METALS

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. As specified in SECTION 01001.

1.02 SUMMARY

A. Section Includes:

1. Structural steel.

2. Grout.

B. Related Sections:

1. DIVISION 9 – PAINTING for surface-preparation and priming requirements.

1.03 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.04 SUBMITTALS

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

B. Product Data: For each type of product indicated.

C. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.

2. Include embedment drawings.

3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.

D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).

2. Electrode manufacturer and trade name, for demand critical welds.

E. Qualification Data: For qualified Installer and fabricator.

F. Welding certificates.

G. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

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

I. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.

2. Direct-tension indicators.

3. Shop primers.

4. Nonshrink grout.

J. Source quality-control reports.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and

FCAW-G shall be considered separate processes for welding personnel qualification.

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.

2. AISC 341 and AISC 341s1.

3. AISC 360.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.

2. Clean and relubricate bolts and nuts that become dry or rusty before use.

3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.07 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.01 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 50 percent.

B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:

1. W-Shapes: 60 percent.

2. Channels and Angles: 60 percent.

3. Plate and Bar: 25 percent.

4. Cold-Formed Hollow Structural Sections: 25 percent.

5. Steel Pipe: 25 percent.

6. All Other Steel Materials: 25 percent.

C. W-Shapes: ASTM A 992/A 992M.

D. Channels and Angles: ASTM A 36/A 36M.

E. Plate and Bar: ASTM A 36/A 36M.

F. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

G. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

H. Welding Electrodes: Comply with AWS requirements.

2.02 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.

1. Nuts: ASTM A 563 heavy-hex carbon steel.

2. Plate Washers: ASTM A 36/A 36M carbon steel.

3. Washers: ASTM F 436, Type 1, hardened carbon steel.

4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

C. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 heavy-hex carbon steel.

2. Washers: ASTM F 436, Type 1, hardened carbon steel.

3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

2.03 PRIMER

A. Primer: Comply with Division 9 painting Sections

B. Primer: Compatible with topcoat and surface preparation.

C. Primer: SSPC-Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.

D. Primer: SSPC-Paint 25 BCS, Type II, zinc oxide, alkyd, linseed oil primer.

E. Primer: SSPC-Paint 23, latex primer.

F. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

G. Galvanizing Repair Paint: ASTM A 780.

2.04 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working.

2.05 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.

2. Fabricate beams with rolling camber up.

3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.

4. Mark and match-mark materials for field assembly.

5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

2.06 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.07 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.

2. Surfaces to be field welded.

3. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.08 GALVANIZING

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

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.

2. Galvanize all exposed steel.

2.09 SOURCE QUALITY CONTROL

A. Testing Agency: If fabrication is performed in a non-certified fabrication shop, the Contractor will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.

2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

3. Ultrasonic Inspection: ASTM E 164.

4. Radiographic Inspection: ASTM E 94

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.

2. Weld plate washers to top of baseplate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Contracting Officer. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: As indicated.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Contracting Oficer will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.

b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

c. Ultrasonic Inspection: ASTM E 164.

d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.06 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in DIVISION 9 – PAINTING.

END OF SECTION

DIVISION 5 – METALS

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. As specified in SECTION 01001.

1.02 RELATED DOCUMENTS

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

B. This Section includes the following:

1. Load-bearing wall framing.

2. Floor / Ceiling joist framing.

C. Related Sections include the following:

1. Division 9 Section "Gypsum Board Assemblies".

1.03 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.

2. Expansion anchors.

3. Power-actuated anchors.

4. Mechanical fasteners.

5. Vertical deflection clips.

6. Miscellaneous structural clips and accessories.

C. Research/Evaluation Reports: For cold-formed metal framing.

1.04 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

1. Dietrich Metal Framing; a Worthington Industries Company.
2. Pre-approved equal.

2.02 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: ST33H.

2. Coating: G60, A60, AZ50, or GF30.

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50, Class 1 or 2.

2. Coating: G90.

2.03 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum depth: As indicated

2. Minimum Base-Metal Thickness: As indicated (0.043 inch minimum thickness).

3. Flange Width: As indicated (1.625 inch minimum width).

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated (0.043 inch minimum thickness).

2. Flange Width: As indicated (1.25” minimum width).

C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Dietrich Metal Framing; a Worthington Industries Company.

2. Minimum Base-Metal Thickness: As indicated (0.054 inch minimum thickness).

2.04 FLOOR / CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched stud shapes or floor joists with enlarged service holes, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated.

2. Flange Width: 1-5/8 inches, minimum.

2.05 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.

2. Bracing, bridging, and solid blocking.

3. Web stiffeners.

4. Anchor clips.

5. End clips.

6. Gusset plates.

7. Joist hangers and end closures.

8. Hole reinforcing plates.

9. Backer plates.

2.06 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.07 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sealer gaskets to isolate the underside of wall bottom track and the top of slab at stud locations.

3.03 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.

2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

I. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 INTERIOR LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated (16” maximum spacing).

2. Studs at wall ends and adjacent to windows: As indicated or at minimum: Two studs back to back (2) #10 screws at 16” spacing. Cap double stud with track of same gage on the window side. Screw to double studs with #10 screws at 16” typical.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Install horizontal bridging in wall studs, spaced in rows indicated but not more than 48 inches apart. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

E. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.05 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 06160 – SHEATHING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. As specified in SECTION 01001.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. Section Includes:

1. Wall sheathing

2. Roof sheathing

3. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Division 6 Section "Finish Carpentry" for plywood backing panels and weather barriers.

1.04 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTAL PROCEDURES.

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.

2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.

3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

C. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.06 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.01 WOOD PANEL PRODUCTS

A. Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1. Plywood.

2. Oriented strand board.

3. Fiberboard wall sheathing.

4. Particleboard underlayment.

5. Hardboard underlayment.

C. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.

D. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

E. Factory mark panels to indicate compliance with applicable standard.

2.02 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat all plywood unless otherwise indicated.

2.03 WALL SHEATHING

A. Plywood Wall Sheathing: As indicated.

2.04 ROOF SHEATHING

A. Plywood Roof Sheathing: As indicated.

2.05 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.

2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.02 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: As indicated.

END OF SECTION

DIVISION 6 – WOOD AND PLASTICS

SECTION 06200 – FINISH CARPENTRY

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Provide all finish carpentry work, complete, including, but not limited to, the following items.

1. All finish carpentry, work, blocking, etc.

2. Wood trim.

3. Solid Phenolic Cabinets.

4. Solid Polymer Surfacing.

5. Rough hardware.

6. Install wood doors, finish hardware, built-in equipment, and any other items specified to be installed under this section but furnished under other sections of these specifications.

B. Related Work Specified Elsewhere:

1. Sheathing is provided under Section 06160 – SHEATHING.

2. Preservative treatment is specified under Section 06311 – PRESERVATIVE TREATED WOOD.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's product data for all manufactured items such as the following:

1. Solid Polymer Surfacing

2. Solid Phenolic

3. Plywood Siding

C. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, materials, large scale details,

attachment devices, and other components. Submit shop drawings for the following:

1. Solid Phenolic Cabinets

D. Samples: Submit 4 each sample of the following:

1. Solid Phenolic

2. Solid Polymer Surfacing

E. Certificates: Provide a certificate of treatment showing compliance with the specifications.

F. Safety Data Sheet (SDS): Submit SDS for each material.

1.04 QUALITY ASSURANCE

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

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

C. Qualifications of Installers: Use adequate number of skilled workmen who are thoroughly trained and experienced in necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work of this section.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration

B. Store material away from threat of termite or other insect infestation.

C. Handle manufactured materials as recommended by the manufacturer.

PART 2 – PRODUCTS

2.01 WOOD PRODUCT QUALITY STANDARDS

A. Softwood Lumber Standards: Comply with American Lumber Standards Committee (ALSC) PS 20 and with applicable grading rules of the respective grading and inspection agency for the species and product indicated.

B. Hardwood Lumber Standard: Comply with National Hardwood Lumber Association (NHLA) rules.

C. Plywood Standards: Comply with American Plywood Association (APA) PS 1 for softwood plywood and PS 51 for hardwood plywood.

2.02 MATERIALS

A. General: Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes are required by PS 20 or to actual sizes and pattern as shown, unless otherwise indicated.

B. Finish Carpentry

1. Plywood Siding: APA 303, T-1-11 siding, ship lapped edges, parallel grooves 1/4-inch deep, 3/8-inch wide, grooves at 8-inches on center, 5/8-inch thickness unless indicated otherwise. Provide with scratch sanded surface of Douglas Fir.

2. Wood Trim: Douglas Fir/Larch or Hem/Fir, B and Better, Vertical grain for paint finish.

C. Miscellaneous Materials

1. Solid Phenolic Cabinet Surfacing:

a. Non-porous thermosetting resins, homogeneously reinforced with cellulosic fiber and manufactured under high pressure and temperature. Material shall not support microorganic growth and shall provide minimum performance when tested for chemical resistance in accordance with Scientific Equipment and Furniture Association (SEFA) 8. Material shall not be coated or laminated to substrates. Material shall be thickness indicated. Provide Tresa Athlon or equivalent by Thermo Fisher Scientific, PerMar Ltd., or pre-approved equal.

b. Joint Adhesive: Manufacturer's standard adhesive kit to created color matched inconspicuous, non-porous joints with a chemical bond.

c. Panel Adhesive: Manufacturer's standard epoxy adhesive.

2. Solid Polymer Surfacing: Non-porous homogeneous filled acrylic. Material shall not be coated or laminated to substrates. Material shall be thickness indicated but not less than ½-inch. Superficial damage to a depth of 0.01-inch shall be repairable by sanding and polishing. Provide Corian, Gibralter, Hi-Macs, Staron, or pre-approved equal. Material shall conform to the following minimum requirements:

a. Tensile Strength: ASTM D 638, 5,800 psi.

b. Hardness: ASTM D 2583, Barcol Impressor, 55 minimum.

c. Flammability: ASTM E 84, Class 1/A, flame spread of 25 maximum and smoke development of 30 maximum.

d. Thermal Expansion: ASTM D 696, 0.00002 inch/inch./degree F.

e. Boiling Water Resistance: NEMA LD3, no effect.

f. High Temperature Resistance: NEMA LD3, no effect.

g. Liquid Absorption: ASTM D 570, 24 hours, 0.10 percent maximum.

h. Mold and Mildew Growth: ASTM F 21, no growth, no effect.

i. Bacteria Growth: No growth, no effect.

j. Sanitation: NSF/ANSI 51, "Food Contact", approval for food area applications.

k. Impact Resistance: NEMA LD3, ½ pound ball drop; ¼-inch material, 36-inch drop, no failure; and ½-inch material, 120-inch drop, no failure.

3. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create color matched inconspicuous, non-porous joints with a chemical bond.

4. Panel Adhesive: Manufacturer's standard neoprene based panel adhesive, UL listed.

5. Panel Sealant: Manufacturer's standard mildew resistant, FDA compliant and UL listed silicone sealant in color matched finish.

6. Weather Barrier: Weather barrier and secondary weather resistive membrane, when applied on exterior walls, "Tyvek Commercial Wrap" as manufactured by DuPont Co., "MetroWrap" by Typar, RufcoWrap by Raven Industries, Type-65 Standard Grade by Griffonlyn Reinforced Vapor Barrier, Jumbo Tex by Fortifiber Corp., MOLD Blocker Housewrap by PRO Installer, or pre-approved equal. Provide with DuPont Blocker Housewrap by StraightFlash, and Tyvek Tape as required. Material shall be Class A tested in accordance with the procedures of ASTM E84.

7. Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the proper type, size, material and finish for application indicated to provide secure attachment, concealed where possible, and complying with ASTM F 547 and applicable ANSI standards. Provide all fasteners and anchorages with a hot-dipped zinc coating ASTM A 153/A 153M, Class C or D as applicable except that fasteners used with ACQ-C and ACQ-D, CBA-A, CA-B, and borate non-DOT type treated wood shall be G185 or stainless steel. Fasteners at wet areas shall be stainless steel.

2.03 FABRICATION

A. Custom Solid Phenolic casework shall be fabricated at the casework shop in accordance with detailed drawings, in as large units as practicable for shipment and introduction into permanent position in an orderly arrangement for neat and rigid field assembly. All units when erected in place shall be straight, square, plumb, level and free from damage and tool marks. All joints shall be made up with waterproof glue. Nails and screws shall be placed in concealed surfaces to the maximum extent possible.

B. Plastic Phenolic Cabinets: Provide shop fabricated casework as follows:

1. Quality Standard: AWS Section 10, Premium.

2. Cabinet Construction, including Countertops: Solid Phenolic throughout unless indicated otherwise. Flush overlay type casework construction, unless detailed otherwise.

C. Countertops: Countertops shall be as detailed.

1. Solid Surfacing: AWS Section 11

PART 3 – EXECUTION

3.01 INSTALLATION

A. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.

B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8-inch in 8-feet for plumb and level countertops; and with 1/16-inch maximum offset in flush adjoining 1/8-inch maximum offsets in revealed adjoining surfaces.

C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

D. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum lengths of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fittings joints with full surface contact throughout length of joint. Use scarf joints for end-to-end joints. Sand smooth for imperceptible joints. Make exterior joints water-resistant by careful fitting.

E. Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and where prefinished matching fasteners heads are required, use fine finishing nail for exposed nailings, countersunk and filled flush with finished surfaces.

F. Casework:

1. Fasten each individual cabinet to floor with fasteners spaced a maximum of 24-inches on center. Fasten to walls at framing or blocking. Where required, assemble units into one integral unit with joints flush, tight, and uniform.

2. After installation, carefully dress joints smooth, remove any surface scratches, clean, and polish entire surface.

3. Provide holes and cutouts as required for mechanical and electrical service fixtures. Provide scribe moldings for closures at perimeter walls as recommended by manufacturer for materials involved. Use chemical resistant, permanently elastic sealing compound where recommended by manufacturer.

G. Solid Polymer Counter Surfacing: Install as recommended by the manufacturer in as large pieces available to minimize joints. Form all edges as indicated. Form joints to be imperceptible in the finish work.

H. Weather Barrier Underlayment: Install as recommended by the manufacturer.

I. Siding: Install over building weather barrier underlayment. Install siding in conformance with the manufacturer's printed instructions with panels of maximum length. Provide uniform panel lengths as indicated without exposed intermediate horizontal joints except where indicated. Nail as indicated or if not indicated as recommended by the manufacturer.

J. Retreat cut and penetrated lumber in accordance with Section 06311 – PRESERVATIVE TREATED LUMBER.

END OF SECTION

SECTION 06311 – PRESERVATIVE TREATED LUMBER

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENT.

1.02 SUMMARY

Preservative treat all lumber and plywood unless specifically specified or noted otherwise.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300 – SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's technical product information on all products to be used, including recommendations and restrictions on wood species and uses.

C. Manufacturer's Instructions: Submit manufacturer's written instructions for handling, disposing, and field treating treated lumber.

D. Certificate of Treatment: Submit a certificate of treatment to the University showing compliance with these specifications, both as to kiln drying and type of treatment performed, including dip treatment.

E. Certification: The Contractor shall submit a written certification to the University that all wood used and left in place on this job was treated in accordance with these specifications and that all cuts and penetrations made subsequent to the treatment were coated with preservatives in compliance with paragraph entitled "INSTALLATION" hereinbelow.

F. Safety Data Sheet (SDS): Submit SDS for products used and keep one copy at the project site.

G. Treatment Schedule: Prior to treatment, submit a complete list of all wood products, including each species if treated with different preservative material and the treatment material proposed for use.

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

1.04 QUALITY ASSURANCE

A. Preservatives containing arsenic such as Chromated Copper Arsenate (CCA) and Ammoniacal Copper Zinc Arsenate (ACZA) shall not be used.

B. Perma-Clear 65 or other zinc napthanate products shall not` be used.

C. Comply with all State OSHL and pollution control regulations of the State of Hawaii and EPA.

D. Do not use treatments containing EPA banned chemicals.

E. Materials shall be specifically recommended by the manufacturer for species of wood, use intended, and exposure indicated.

F. Labeling: permanent ink stamp or durable tag permanently fastened as stipulated in ICC IBC, as amended.

G. Do not use oil-born preservatives where food contact is possible.

1.05 WARRANTY

A. The contractor shall issue to the University a written warranty that he will replace all treated wood which is attacked by subterranean termites within a period of 2 years from the date of Project Acceptance (unless a longer period of time is standard with the manufacturer) up to a total cost of $5,000.00 (unless higher amount standard with the manufacturer) or is attacked by dry wood termites or deteriorates due to dry rot within the first 5 years of the Project Acceptance date.

B. The Surety shall not be held liable beyond 2 years from the Project Acceptance date.

PART 2 – PRODUCTS

2.01 GENERAL

A. All wood treated with oil-borne preservatives shall be kiln-dried before treatment to an average moisture content of 12 percent to 15 percent per AWPA standards unless specified otherwise.

B. Wood treated with water-borne preservatives (with the exception of SBX treated wood) shall be air dried or kiln-dried before treatment to an average moisture content of 28 percent or less per AWPA standards. Wood having a moisture content higher than 28 percent is acceptable when treating with SBX materials.

C. Wood shall be treated as noted below.

D. Lumber shall be milled to finish size and shape prior to treating, and it shall be treated before assembly. Plywood may be treated in regular panel sizes.

2.02 MATERIALS

A. Water-Borne Preservatives: Water-Borne Preservatives shall be Perserve ACQ, Preserve Plus ACQ, Wolman E CBA, Hi-Bor SBX, and Timber Saver PT SBX, or accepted equivalent, except as stipulated

otherwise in accordance with American Wood Preservers Associations (AWPA) Standard P5 – "Standards for Waterborne Preservatives", and permitted by EPA. Preservatives shall be EPA registered. (Hawaii use only treatment is not acceptable).

1. Treatment for ACQ and CBA treated wood shall be as recommended by the manufacturer. Preservatives shall be EPA registered.

2. Water-Borne Preservatives used to coat end cuts and penetrations in SBX treated wood shall be Clear-Bor F.T. or an equivalent solution of 10 percent inorganic boron. The end coating solution must be approved and labeled by the Environmental Protection Agency and must be accepted by the State of Hawaii, Department of Agriculture, Pesticides Branch, for this purpose. The treatment solution shall have a colorant added which will tint the wood surface to indicate treatment where wood will be unexposed. The Contractor shall be held responsible for all bleed through of dye.

B. Oil-Borne Preservatives: Oil-Borne Preservatives shall be TRIB II, Type B, Permethrin/IPBC (3-iodo – 2 propynyl butyl carbonate) in a base solution of mineral spirits, manufactured to the manufacturer's quality control and EPA registered, or accepted equivalent. The solvent used in formulating the preservative solution shall meet the requirements of AWPA Standard P9 – "Standard for Solvents for Organic Preservative Systems". For interior application use low odor mineral spirits as the solvent.

PART 3 – EXECUTION

3.01 WOOD PRESERVATION WITH WATER-BORNE PRESERVATIVES

A. Unless otherwise stipulated, all lumber and plywood shall be pressure treated.

B. Lumber and plywood, except as stipulated in items entitled "WOOD PRESERVATION BY PRESSURE TREATMENT WITH OIL-BORNE PRESERVATIVES" and "WOOD PRESERVATION BY DIP TREATMENT" hereinbelow, shall be treated ACQ and CBA materials as specified and in accordance with American Wood Preservers Association (AWPA) Standards C2 – "Lumber, Timbers, Bridge Ties and Mine Ties – Preservative Treatment by Pressure Process", C9 – "Plywood Preservative Treatment by Pressure Processes" and C15 – "Wood for Commercial-Residential Construction" or SBX material, using the full cell pressure method in conformance with AWPA Standard C1 – "All Timber Products – Preservative Treatment by Pressure Processes", or C31, "Lumber Used Out of Contact with the Ground and Continuously Protected from Liquid Water – Treatment by Pressure Processes". Lumber and plywood treated with SBX shall attain the following penetration and retention requirements:

1. Lumber:

a. Penetration requirement for lumber under 5-inch nominal thickness: 0.40-inch in heartwood and 90 percent in sapwood.

b. Penetration requirement for lumber 5-inch nominal thickness and over: 0.50-inch in heartwood and 90 percent in sapwood.

c. Retention requirement for lumber shall be a minimum of 1.50 percent weight/weight or 0.42 pound per cubic foot in an assay zone of 0.0 – 0.6 inch for lumber under 5-inches nominal thickness and 0.0 – 0.75 inch for lumber over 5-inches in nominal thickness.

2. Plywood:

a. Penetration requirement for plywood shall be identical to that noted in AWPA Standard C9.

b. Retention requirement for plywood shall be a minimum of 1.27 percent weight/weight or 0.40 pound per cubic foot through the full thickness.

C. All lumber 2-inches or less in thickness and all plywood shall be dried to a moisture content of 19 percent or less after treatment.

3.02 WOOD PRESERVATION BY PRESSURE TREATMENT WITH OIL-BORNE PRESERVATIVES

A. Exposed lumber 1-1/2 inch (net thickness) and over shall be unincited and pressure treated in accordance with the process specifications noted in the latest edition of AWPA Standards C1, C2 and C9.

B. Wood shall be kiln-dried to an average moisture content of 12 to 15 percent per AWPA standards prior to treatment.

C. Treated wood shall attain the following net retention requirements: 0.052 pound of dry ingredient per cubic foot of treated wood.

D. Lumber and plywood shall be thoroughly dried and virtually odor-free prior to installation.

3.03 WOOD PRESERVATION BY DIP TREATMENT

A. Finish lumber under 1-1/2 inch net thickness; finish plywood; and mill work items, such as for cabinet work and similar wood work that will be exposed to view in the finished work shall be immersion treated for a minimum period of 15 minutes in any of the preservatives listed in paragraph entitled “Oil-Borne Preservatives” hereinabove or in

accordance with the requirements of the Window and Door Manufacturers Association (WDMA) Industry Standard I.S. 4, “Water-Repellent Preservative Non-Pressure Treatment for Millwork”, or in a solution of 1 quart permethrin in 55 gallons of a 0.50 percent IPBC solutions.

B. Lumber and plywood shall be thoroughly dried and virtually odor-free prior to installation.

3.04 INSTALLATION

A. Wherever it is necessary to end cut or penetrate into (such as by drilling or notching) treated wood on the job, all such cuts and penetrations shall be treated in accordance with AWPA Standard M4, “Care of Preservative Treated Wood Products”, as in accordance with the approved preservative manufacturer’s ICC Evaluation services report requirements, using two heavy brush coats of a treating solution as recommended by the manufacturer. Where allowed by preservative manufacturer, spray cut ends and bored holes with “Hudson Bay” type sprayer, 2 coats. Exception: Cuts and penetrations made in SBX treated wood 2-inches or less in nominal thickness need not be field treated.

B. Workers, in the field or in applicable millwork ships, shall read and follow all instructions and recommendations of the preservative treatment manufacturer and wood treatment applicator.

C. Wood for use in renovation shall be thoroughly dried (minimum 10 days air drying) or shall be virtually odor free prior to installation.

3.05 CLEAN UP

Dispose of treated wood in a sanitary landfill or other authorized disposal area. Do not burn treated wood.

END OF SECTION

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07110 - MEMBRANE WATERPROOFING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Provide all below grade waterproofing as indicated.

B. The Contractor shall be an approved applicator of the manufacturer whose membrane waterproofing system is proposed for use. Contractor shall be familiar with the products, equipment, and the specified requirements and methods needed for the proper installation of the membrane waterproofing system.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

B. Manufacturer's Data: Submit copies of the manufacturer's material specifications and application instructions for the membrane waterproofing system and materials which are proposed for use.

C. Applicator's License: Submit copies of the applicator's waterproofing license.

D. Safety Data Sheets (SDS): Submit SDS for each material as applicable.

E. Warranty: Submit Warranty as noted under paragraph entitled "WARRANTY" hereinbelow.

1.04 WARRANTY

A. Contractor Warranty: The Contractor shall execute to the University a 2-year written warranty that the installation will be watertight and that any leaks which develop during that period which are not due to improper use or willful damage will be repaired at no cost to the University.

B. Manufacturer’s Warranty: Furnish manufacturer’s standard material warranty.

1.05 PRODUCT HANDLING

A. Delivery of Materials: Materials shall be delivered to the site in the original unbroken manufacturer's wrapping material and containers with the original labels thereon intact.

B. Storage of Materials at Job Site:

1. Materials shall be stored in accordance with the manufacturer's recommendations.

2. Materials which absorb moisture shall be kept under waterproof cover. Wet materials shall not be permitted to be used on the job and shall be removed promptly from the site.

C. Cautions and Warnings:

1. Materials containing solvents shall be stored in a dry cool area with proper fire and safety precautions.

2. Vapors from bonding adhesives, lap cements, membrane material products, etc., may be harmful if breathed in. They may also be flammable. The Contractor shall consult container labels and Material Safety Data Sheets for specific information and shall employ the necessary safety precautions needed for the products being used.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fluid Applied Membrane Systems (Cold-Applied):

1. Material: One component moisture cured, bitumen-modified polyurethane, Master Seal HLM 5000 or pre-approved equal conforming with ASTM C836.

2. Thickness: Two coats of 60 mil wet film thickness.

3. Reinforcing Fabric: Master Seal 995

B. Accessories: Surface Primers, Sealants, Flashings, etc. shall be as recommended by the membrane manufacturer for the specific project installation and shall be compatible with the substrate and membrane waterproofing with which it is in contact.

C. Protective Layer: Protective layer or membrane waterproofing applied on vertical surfaces below grade shall be Master Seal 997 or pre-approved equal, compatible with the waterproofing membrane over which it is overlayed and acceptable to the membrane manufacturer.

PART 3 – EXECUTION

3.01 INSPECTION OF SURFACES

A. Before the work is started, the Membrane Waterproofing Installer, together with the Contractor and University, shall examine the surfaces

onto which membrane waterproofing is to be applied. Should any condition be found unsuitable, no work shall be done until the unsatisfactory condition has been corrected and is acceptable to the Membrane Waterproofing Installer. Proceeding with the work will imply acceptance of the conditions by the Membrane Waterproofing Installer.

B. Materials used to patch substrate defects shall be compatible with the substrate and the membrane waterproofing.

3.02 INSTALLATION

A. The procedures and details for the application of waterproofing membranes, especially such items as the patching of substrate defects; surface cleaning and preparation; surface priming; installation of bond breakers at joints; mixing of components; number of membrane coats; embedment of reinforcing fabric; details at edges, corners, laps, penetrations and discontinuities; protection of the membrane; repair of damage; etc., shall be in strict accordance with the manufacturer's printed instructions and recommendations. Apply in 2 coats with fabric reinforcement as recommended by the manufacturer.

B. Adjoining surfaces which are not to receive waterproofing shall be protected to prevent spillage of liquid materials outside of the membrane area.

C. A protective layer as specified hereinabove shall be provided over membranes on vertical surfaces below grade.

1. Protective layer/boards shall be neatly trimmed and tightly butted together to provide a continuous cover over the membrane waterproofing.

2. Care shall be taken during the backfilling operation to ensure that the membrane and protective layer/boards are not damaged.

D. Repair of any damage to the membrane waterproofing shall be in strict accordance with the manufacturer's recommendations.

3.03 CLEAN UP

A. The installer shall take care to keep surfaces that will be exposed clean. At the completion of work, the Contractor shall clean all surfaces onto which waterproofing materials have been dropped, spattered, or brushed and repair damages or defects for which the Contractor is responsible. The Contractor shall also remove and properly dispose of leftover materials and debris.

END OF SECTION

SECTION 07210 – BUILDING INSULATION

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. The extent of building insulation work is shown on the drawings, by the generic name.

B. The types of building insulation specified in this Section include, but are not limited to the following:

1. Thermal batt insulation for underside of roof

2. Thermal and acoustical batt insulation for walls and partitions.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's specifications and installation instructions for types of insulation required. Include data substantiating that materials comply with specified requirements.

C. Safety Data Sheets (SDS): Submit SDS for each material as applicable.

1.04 QUALITY ASSURANCE

A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by R values, they represent the rate of heat flow through a homogenous material exactly one-inch thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees Fahrenheit between the 2 exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

B. Fire and Insurance Ratings: Provide insulation materials which are identical to those whose fire performance characteristics, are listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

1. Surface Burning Characteristics: ASTM E84.

2. Fire Resistance Ratings: ASTM E119.

3. Combustion Characteristics: ASTM E136.

C. Insulation Markings: Insulating materials shall be installed such that the manufacturer's R-value mark is readily observable upon inspection as required by the ICC IECC, as amended.

D. Recycled Materials: Provide insulation containing recycled materials to the extent practicable, provided the materials meets all other requirements of this Section. The minimum required recycled materials content by weight are:

1. Rock Wool: 75 percent slag.

2. Fiberglass: 20 to 25 percent glass cullet.

1.05 SAFETY PRECAUTIONS

A. Respirators and Other Concerns: Comply with OSHA 29 CFR 1910.134, "Respiratory Protection", ASTM C930, "Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories", and other Federal, State, and local regulations governing safety. Provide workers with dust/mist respirators, training in their use, and protective clothing as approved by the National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA).

B. Smoking: Do not smoke during installation of blanket insulation.

C. Do not use unfaced insulation in exposed applications where there is potential for skin contact and irritation.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site in original sealed wrapping bearing manufacturer's name and brand description, specification number, type, grade, R value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled or crushed. Comply with manufacturer's recommendations for handing, storing, and protecting of materials before and during installation.

B. Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

C. Handle materials as recommended by the manufacturer.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Thermal and Acoustical Batt Insulation for Walls: ASTM C665, Type I, unfaced, flame spread of 25 or less and a smoke developed rating of 150 or less when rested in accordance with the procedures of ASTM E84, R=13 or as indicated. Provide widths as necessary to snugly fit framing spacing as indicated.

B. Thermal Semi-Rigid Insulation: ASTM C612, Type 1A and 1B, 3 pounds per cubic foot density, unfaced, semi-rigid fiberglass board, R as indicated.

2.02 ACCESSORIES

A. Adhesive: As recommended by the mechanical fastener manufacturer as applicable, or equivalent to GEMCO Tuff-Bond hanger adhesive.

B. Mechanical Fasteners: Corrosion resistant perforated base insulation hangers as recommended by the insulation manufacturer with self-locking galvanized steel washers.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General:

1. Comply with manufacturer's instructions for the particular conditions of installation in each case. If printed instructions are not available or do not apply to the project conditions, consult the manufacturer's technical representative for specified recommendations before proceeding with the work.

2. Extend roof and wall insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

3. Apply a single layer of insulation of the required thickness, unless otherwise shown or required to make up the total thickness for required R value.

4. Insulation shall be installed after construction has advanced to a point that the installed insulation will not be damaged by remaining work. For thermal insulation the actual installed thickness shall provide the R values shown or specified. For acoustical insulation, maintain acoustical rating of assembly.

5. When unfaced insulation is used and the stud depth is larger than the insulation thickness, install wire or metal straps to hold insulation in place.

6. Space insulation from heat producing devices as recommended by the manufacturer, but not closer than 3-inches.

7. Electrical Wiring: Do not install insulation in a manner that would sandwich electrical wiring between 2 layers of insulation.

B. Roof Insulation: Install insulation below roof sheathing with adhesive applied insulation hangers signed for total thickness of required insulation. Cut insulation to fit into all angles, corner, and irregular shapes. Space insulation hangers as recommended by the installation and hangers manufacturers to secure in place and minimize sag.

C. Acoustical and Thermal Batt Wall Insulation: Install as specified in SECTION 09250 – GYPSUM WALLBOARD after cover material has been installed on one side of cavity.

3.02 PROTECTION

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

END OF SECTION

SECTION 07410 – PREFORMED METAL STANDING SEAM ROOFING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Extent of preformed roofing is indicated on the drawings and by provisions of this Section. Provide all materials, including all flashings for a complete system.

B. Type of panels required include formed sheet panels intended for concealed fastener installation.

C. Related Work Described Elsewhere:

1. Roof insulation is provided under SECTION 07210 – BUILDING INSULATION.

2. Furnish matching prefinished sheet metal matching roof material for indicated prefinished related flashing specified in SECTION 07600 – FLASHING AND SHEET METAL.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's product specifications, standard details, installation instructions, and general recommendations, as applicable to materials and finishes for each component and for total system of preformed panels.

C. Shop Drawings: Submit shop drawings of all roofing, flashing, fastenings, supports, anchors, clearances, and connection details to the University for acceptance.

D. Samples: Furnish 4 each, 4-inch long samples of full width panels materials and samples of all other materials to be used to University for acceptance

E. Test Reports: Provide test data demonstrating structural capacity, wind uplift, and resistance to water infiltration performance as specified.

F. Warranty: Submit warranty as noted under item entitled "WARRANTY" hereinbelow.

G. Information Card: For each roof project, furnish a typewritten information card for facility records and a card laminated in plastic, attached to the underside of the roof hatch, or as directed by the University. Cards shall be 8-1/2 inches x 11-inches. Information card shall identify facility name and/or facility designation (letter or number), contractor number, type of roof system installed, including deck type, type of roofing, underlayment, method of application, manufacturer; manufacturer's representative contact information; date of completion; installer's warranty expiration date; installing Contractor and contact information; roofing manufacturer's material warranty expiration date; warranty reference number, and warranty contact information. See Roofing Information Card at end of this Section.

1.04 QUALITY CONTROL

A. Installer: The roofing system installer shall be factory-trained, approved by the metal roofing system manufacturer to install the system, and shall have a minimum 3 years of experience as an approved applicator with that manufacturer. The applicator shall have applied 5 installations of similar size and scope as this project within the previous 3 years.

B. Installation Crew: Provide and maintain same foreman and crew from start to finish of work unless change is accepted by the University and manufacturer's representative. Workmen who will be walking on roof panels shall wear soft-soled shoes that will not damage the panels.

C. Pre-Roofing Conference: After submittals are received and accepted but before roofing work, including associated work are performed, the Contractor shall hold a pre-roofing conference to review the following:

1. Procedure for onsite inspection and acceptance of the roofing substrate and pertinent structural details relating to the roofing system.

2. Contractor's plan for coordination of the work of the various trades involved in providing the roofing system and other components secured to the roofing.

3. Attendees: The pre-roofing conference shall be attended by the Contractor and personnel directly responsible for the roofing installation. Conflicts among those attending the pre-roofing conference shall be resolved and confirmed in writing before roofing work, including associated work, is begun. Prepare written minutes of pre-roofing conference and submit to the University.

1.05 WARRANTY

A. Contractor's Warranty: Furnish written 5-year warranty to the jointly signed by Roofing Contractor, Sheet Metal Contractor, and General Contractor which shall provide for repairs or replacement of roofing and flashing where

leaking occurs due to faulty materials and workmanship at no extra cost to the University from the project acceptance date.

B. Manufacturer's Warranty: Provide manufacturer's warranty for coating system under Hawaiian weather conditions, provide following as a guide for expected warranty:

1. The roofing panels and matching flashings with factory applied Fluoroceram (Durapon 70 or pre-approved equal) paint finish are free from material defects and shall be warranted for 30 years against peeling, chipping, cracking or color change in excess of 5 NBS units during the term of this warranty. For 30 years in the event that the above paint system fails under normal wind and weathering conditions, the manufacturer/supplier shall replace or repair as necessary and panels whose factory color finish that fails. This paint finish warranty commences upon project acceptance.

2. Additionally, the metal roofing system components for the project as identified by the Contract Drawings for this project, shall be warranted for a minimum period of 15 years from the project acceptance date. Manufacturer/Supplier shall replace or repair or repair as necessary any component of the roof system supplied by them, when installed and maintained according to manufacturer's instructions, which fail to provide a watertight and waterproof system due to defective materials. All labor, materials, general conditions, and equipment required to perform any repair work shall be provided by the manufacturer/supplier. Repair work shall be done in a manner that will not disrupt University access to the building.

C. The Surety shall not be held liable beyond 2 years from the project acceptance date,

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle preformed panels, bulk roofing products, and other manufactured items in a manner to prevent damage or deformation.

B. Provide adequate packaging to protect materials during shipment. Do not uncrate materials until ready for use except for inspection. Immediately upon arrival of materials at job site, inspected materials for damage, dampness, and staining. Replace damaged or permanently stained materials that cannot be restored to like-new condition with new material. If materials were wet, remove moisture, restack, and protect panels until used.

C. Stack materials stored on the site on platforms or pallets and cover with tarpaulins or other suitable weathertight coverings which prevent water trapping or condensation. Store panels so that water which might have accumulated during transit or storage will drain off. Do not store the panels in contact with materials that might cause staining, such as mud, lime,

cement, fresh concrete, or chemicals. Protect stored panels from wind damage.

D. Handle material carefully to avoid damage to surfaces, edges, and ends.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Roof Panels: Formed from minimum 24 gauge “Zincalume” or “Gavalume” coated steel conforming to ASTM A792/A792M, Grade 33 with a minimum AZ50 coating. Panel configuration shall be structural standing seam roofing with concealed fasteners. Pan width shall be 14-inches with minimum 1-1/2 inch vertical leg (custom or standard product) and 2 or 3 intermediate stiffening beads as manufactured by HPM Building Supply Custom Metal Roofing, 14-inch or equivalent by Kloeckner Metals, Tomen Building Components, Inc., Centria, MBCI Metal Roof and Wall Systems, Architectural Metal Products, or pre-approved equal. Panels shall be prefinished as specified.

B. Flashing and Closures: Formed of prefinished material to match roof panels of manufacturer’s standard flashings for the panels specified. Configuration of flashing shown on the drawings are intended to indicate basic intent. Other flashing which accomplish the basic intent will be acceptable if standard with the panel manufacturer. Provide metal flashings for locations indicated. Furnish sheet metal flashing items in 8-foot to 10-foot lengths. Single pieces less than 8-feet long may be used at corners, and at ends of runs. Provide accessories and other items essential to complete the sheet metal installation of the same materials as the items to which they are applied. Connect all pieces of linear flashing by a slip joint to permit thermal movement. Exposed flashings and metal closure strips shall match finish of roof panel.

2.02 METAL FINISH

A. General: Apply coatings either before of after forming and fabricating panels, as required by coating process and as require for maximum coating performance capability. Provide standard color indicated or, if not otherwise indicated, as selected by the University.

B. For exposed exterior surfaces, provide thick finish of Durapon 70 or pre-approved equal conforming to AAMA 621 with a primer from 0.2 to 0.3 dry mils and Kynar topcoat from 0.7 to 0.9 dry mils for a total thickness of 0.9 to 1.2 dry mils.

C. Interior/Underside finish shall be off white polyester. Where sheet metal will be used for gutters or similar applications, provide backside with polyester or better finish.

2.03 MISCELLANEOUS MATERIALS

A. Fasteners: Fasteners shall be stainless steel with composite metal and neoprene composition washers. Where required, exposed fasteners shall be gasketed on the exterior side of the covering to waterproof the covering and finished to match roof finish. Concealed fastener and clip system shall be manufacturer approved for system provided and uplift specified.

B. Accessories: Except as indicated as work of another specification section, provide components required for a complete roofing system, including stainless G90 coated galvanized steel clips, standoff clips, sidelap clips, and uplift clips; trim, flashings and expansion joint flashing; single component polyurethane sealants, gaskets, fillers, closure strips, and similar items. All clips shall be stainless G90 coated galvanized steel. Match material/finish of performed roof panels where exposed.

C. Closure Strips: Formed specifically for this purpose of laminated cross-linked polyethylene closed cell-foam or neoprene materials and as standard with manufacturer. Molded closure strips shall be formed to match configurations of the roofing and shall be provided where indicated and where necessary to provide weathertight construction.

D. Sealants: ASTM C920, Type S, Grade NS, Class 25, Use NT, polyurethane or as recommended by the roofing manufacturer. Color, where exposed, shall match roofing.

E. Mastic: As recommended by the roofing manufacturer.

F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15 mil dry film thickness per coat.

G. Prefabricated Pipe Flashing System: A pre-molded flexible pipe sleeve of EPDM in pleasted concentric rings, and bond to a square, corrosion-resistant base of soft, aluminum alloy, allowing conformance of base by hand pressure to roofing panel profile. Pipe flashing system shall be equivalent to “Master Flash” by Aztec Washer or Oatey, “Dektite” by Buildex, Aluminum Flashing by LSP Products Group, or pre-approved equal.

H. Self-Adhering Underlayment: ASTM D1970/D1970M, Polymer modified bituminous sheet materials, minimum 40 mils thick as recommended by the roofing manufacturer. Provide with non-slip surface for safety during roofing operations.

I. Slip Sheet: As recommended by the manufacturer.

J. Flexible Flashing: Aluminum foil faced 45 mil rubberized asphalt or butyl rubber roll sheet as recommended by roofing manufacturer for waterproofing top set flashings.

K. Edge Treatment: Dura Coat Products, Inc. Edge Seal or pre-approved equal for sealing all field cut edges.

2.04 PANEL FABIRICATION AND PERFORMANCE REQUIREMENTS

A. General: Fabricated and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, and as required to fulfill performance requirements, which have been demonstrated by factory testing. Comply with indicated profiles and dimensional requirements, and with structural requirements. Fabricate panels in full lengths from ridge to eave to the greatest extent possible.

B. Metal Gauges: Thickness required for structural performances, but not less than manufacturer's recommended minimums for profiles and applications indicated, and not less than specified under paragraph entitled "Roof Panels" hereinabove.

C. Required Performances: Fabricate panels and other components of roof system for the following installed-as-indicated performances:

1. Roof Loading: As indicated.

2. Project Wind Loads: 100 mph, Exposure B, unless indicated otherwise.

3. Panels must meet minimum UL wind load uplift classification of 90. Provide additional row of clips at eaves for high wind conditions.

D. Performance Criteria:

1. Provide wind uplift resistance in accordance with the current adopted ICC IBC as amended, minimum UL580 Class 90.

2. Structural capacity of metal roofing system shall be determined in accordance with ASTM E1592. A minimum of 2 tested spans are required in order to interpolate allowable load data between tested spans. Extrapolation of data outside the tested spans is not allowed.

3. Provide a design analysis signed by a registered Professional Engineer, confirming that the structural capacity of the metal roofing system as determined in accordance with ASTM E1592 is adequate to resist the design loads required by the current adopted ICC IBC as amended. Analysis shall include calculation verifying the design loads, the uplift pressures, and how those loads affect the various areas of discontinuity clearly shown and distinguished from the typical field roof elements.

4. Resistance to Water Infiltration: Roofing system shall show no infiltration at seams, edges, flashings, counterflashings, and

penetrations when subjected to a rainfall of 5-inches per hour with 80 mph wind.

5. Thermal Movement: The system shall be capable of withstanding thermal movement based on a temperature range of 10 degrees Fahrenheit below design low air temperature and 140 degrees Fahrenheit for light colors.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive standing seam metal roofing and flashing. Provide plumb and true surfaces, clean, even, smooth, and as dry as possible. Ensure that surfaces are free from defects and projections which might affect the installation.

B. Report unsuitable conditions to the University. The manufacturer's technical representative shall approve roof substrate as suitable for roofing system application.

3.02 INSTALLATION

A. General: comply with panel fabricator's and material manufacturer's instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the work securely in place in full and firm contact with concealed anchor clips with provisions for thermal/structural movement as well as carrying the weight of the panels. Obtain acceptance prior to installation on prefinished panels cut in the field and factory applied coverings or coatings that were repaired after being abraded or damaged during handling or installation. Make repairs with material of same color as weather coating. Completely seal openings through panels. Correct defect or errors in materials in an accepted manner. Replace materials which cannot be corrected in acceptance manner with no materials. Provide molded closure strips where indicated and where necessary for weathertight construction.

B. Provide underlayment with 2-inch minimum head lap and 6-inch end laps. Arrange side laps of roofing to leeward of prevailing wind direction. Apply roofing panels with standing seams parallel to slope of roof. Attach clips with a minimum of 3 stainless steel screws per clip unless manufacturer's data allows otherwise for the required performance specified. Attach panels to structure with concealed clips which are incorporated into the panel seams. Clip attachment shall allow roof to move freely and independently of the structure. With clip screws in place, test all clips for freedom of movement before covering with the next panel. All clips that bind and cannot be moved with hand pressure shall be replaced. Before applying roofing over flashing such as at eaves, valleys, and penetrations, place additional sealant on the underside of the pan in the pencil ribs to assure a continuous seal.

C. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4-inch in 20-feet on level/plumb/slope and location line as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles. Layout lines parallel to the rakes at intervals. Use a spacing gauge at each row of panels to ensure that panel width is not stretched or shortened.

D. All field cutting of roofing panels shall be done as recommended by manufacturer's written instructions. Provide edge treatment for al field cut edges.

E. Joint Sealers: Install joint fillers and sealants where indicated and where required for weatherproof performance of panel system. Provide types of sealants/fillers indicated or, if not otherwise indicated, types recommended by panel manufacturer. Refer to SECTION 07920 – SEALANTS of these specification for installation requirements applicable to indicated joint sealers.

F. Flashings: Provide flashing and related closures and accessories in connection with preformed metal panels as indicated and as necessary to provide a weathertight installation. Install flashing to ensure positive water drainage away from roof penetrations. Flash and seal roof at ridge, valleys, eaves, and rakes, at projections through roof, and elsewhere as necessary. Accomplish placement of closure strips, flashing, and sealing material in an accepted manner that will ensure complete weathertightness. Details of installation which are not indicated shall be in accordance with NRCA CD, SMACNA ASMM, panel manufacturer's printed instructions and details of the accepted show drawings. Installation shall allow for expansion and contraction of flashing.

G. Flashing Fasteners: Fastener spacing shall be in accordance with the panel manufacturer's recommendations and as necessary to withstand the indicated design loads for both pullout and pullover. Install exposed fasteners in straight lines within a tolerance of 1/2-inch in the length of a bay. Drive exposed penetrating type fasteners normal to the surface and to a uniform depth to seat gasketed washer properly and drive so as not to damage factory applied coating. Exercise extreme care in drilling pilot holes for fastenings to keep drills perpendicular and centered. Do not drill through sealant tapes. After drilling, remove metal fillings and burrs from holes prior to installing fasteners and washers. Torque used in applying fasteners shall not exceed that recommended by the manufacturer. Remove panels deformed or otherwise damaged by over-torqued fastenings, and provide new panels.

H. Closure Strips: Install closure strips as indicated and as recommended by the manufacturer.

I. Apply bituminous coating or other permanent separation materials on concealed panels surfaces where panels would otherwise be in direct

contact with wood or other substrate materials which as noncompatible (i.e. copper and aluminum) or could result in corrosion or deterioration of either material or finishes.

3.03 CLEAN-UP AND PROTECTION

A. Damaged Units: Replace panels and other components of the work which have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures. Touch-up paint shall not be used without the permission of the University.

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

ROOFING INFORMATION CARD

FACILITY

Building Name _____ Building Desig/No._____

University Job No. _____

ROOF

Type of Roof System _____ Type of Deck _____

Type of Underlayment _____ No. of Piles _____

Product Name / Style _____ Product Color _____

INSTALLAER

Company _____

Contact Person _____ Contact No. _____

MANUFACTURER

Representative _____

Contact Person _____ Contact No. _____

COMPLETION DATE _____

DATE INSTALLER'S WARRANTY EXPIRES _____

DATE MANUFACTURER'S WARRANTY EXPIRES _____

Warranty Reference No. _____

Warranty Contact Person _____

Contact No. _____

END OF SECTION

SECTION 07411 – PREFORMED METAL SIDING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Extent of preformed siting is indicated on the drawings and by provisions of this Section. Provide all materials, including all flashings for a complete system.

B. Type of panels required include formed sheet panels for exposed fasteners.

C. Related Work Described Elsewhere:

1. Weather barrier is specified under SECTION 06200 – FINISH CARPENTRY.

2. Wall insulation is provided under SECTION 07210 – BUILDING INSULATION.

3. Furnish matching prefinished sheet metal matching siding material for indicated prefinished related flashings specified in SECTION 07600 – FLASHING AND SHEET METAL.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's product specifications, standard details, installation instructions and general recommendations, as applicable to materials and finishes for each component and for total system of preformed panels.

C. Shop Drawings: Submit shop drawings of all siding, flashing, fastenings, supports, anchors, clearances, and connection details to the University for acceptance.

D. Samples: Furnish 4 each, 4-inch long samples of full width panel materials and samples of all other materials to be used to University for acceptance.

E. Test Reports: Provide test data demonstrating structural capacity and wind uplift as specified.

F. Calculations: Provide manufacturer's calculations showing pullout and pullover capacity of fasteners and metal panels. Provide a calculations and screw chart with data indicating proposed system conforms to the

performance requirements.

G. Warranty: Submit warranty as noted under item entitled “WARRANTY” hereinbelow.

1.04 QUALITY CONTROL

A. Installer: The applicator shall have applied 5 installations of similar size and scope as this project within the previous 3 years.

B. Installation Crew: Provide and maintain same foreman and crew from start to finish of work unless change is accepted by the University and manufacturer’s representative.

C. Preinstallation Conference: After submittals are received and accepted buy before siding work, including associated work are preformed, the Contractor shall hold a preinstallation conference to review the following:

1. Procedure for onsite inspection and acceptance of the siding substrate and pertinent structural details relating to the siding system.

2. Contractor’s plan for coordination of the work of the various trades involved in providing the siding system and other components secured to the panels and flashing.

3. Attendees: The preinstallation conference shall be attended by the Contractor and personnel directly responsible for the siding installation. Conflicts among those attending the preinstallation conference shall be resolved and confirmed in writing before siding work, including associated work, is begun. Prepare written minutes of the preinstallation conference and submit to the University.

1.05 WARRANTY

A. Contractor’s Warranty: Furnish written 5-year warranty to the University jointly signed by Siding Contractor, Sheet Metal Contractor, AND General Contractor which shall provide for repairs or replacement of siding and flashing where leaking occurs due to faulty materials and workmanship at no extra cost to the University from the project acceptance date.

B. Manufacturer’s Warranty: Provide manufacturer’s warranty for coating system under Hawaiian weather conditions, provide following as a guide for expected warranty:

1. The panels and matching flashings with a factory applied Fluoroceram (Durapon 70 or pre-approved equal) paint finish are free from material defects and shall be warranted for 30 years against peeling, clipping, cracking or color change in excess of 5 NBS units during the term of this warranty. For 30 years in the event that the above paint system fails under normal wind and weathering

conditions, the manufacturer/supplier shall replace or repair as necessary any panels whose factory color finish that fails. This paint finish warranty commences upon project acceptance.

2. Additionally, the metal system components for the project as identified by the Contracting Drawings for this project, shall be warranted for a period of 15 years from the projected date. Manufacturer/supplier shall replace or repair as necessary any component of the siding system supplied by them, when installed and maintained according to manufacturer's instructions, which fail to provide a watertight and weatherproof system due to defective materials. All labor, materials, general condition, and equipment required to perform any repair work shall be provided by the manufacturer/supplier. Repair work shall be done in a manner that will not disrupt the University access to the building.

C. The Surety shall not be held liable beyond 2 years from the project acceptance date.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle preformed panels, bulk products, and other manufactured items in a manner to prevent damage or deformation.

B. Provide adequate packaging to protect materials during shipment. Do not uncrate materials until ready for use except for inspection. Immediately upon arrival of materials at job site, inspect materials for damage, dampness, and staining. Replace damaged or permanently stained materials that cannot be restored to like-new conditions with new material. If materials are wet, remove moisture, restack, and protect panels until used.

C. Stack materials stored on the site on platforms or pallets and cover with tarpaulins or other suitable weathertight coverings which prevent water trapping or condensation. Store panels so that water which might have accumulated during transit or storage will drain off. Do not store the panels in contact with materials that might cause staining, such as mud, lime, cement, fresh concrete or chemicals. Protect stored panels from wind damage.

D. Handle material carefully to avoid damage to surfaces, edges, and ends.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Siding Panels: Formed from minimum 24 gauge "Zincalume" or "Galvalume" coated steel conforming to ASTM A792/A792M, Grade 33 with a minimum AZ50 coating. Panel configuration shall be equivalent to custom 4-rib configuration by HPM Building Supply Custom Metal Roofing, or equivalent by Kloeckner Metals, or pre-approved equal siding with

exposed fasteners. Provide in lengths as indicated so that walls shall be in single lengths without joint. Panels shall be prefinished as specified.

B. Flashing and Closures: Formed of prefinished material to match panels of manufacturer's standard flashings for the panels specified. Configuration of flashings shown on the drawings are intended to indicate basic intent. Other flashings which accomplish the basic intent will be acceptable if standard with the panel manufacturer. Provide metal flashings for locations indicated. Furnish sheet metal flashing items in 8-foot to 10-foot lengths. Single pieces less than 8-feet long may be used at corners, and at ends of runs. Provide accessories and other items essential to complete the sheet metal installation of the same materials as the items to which they are applied. Connect all pieces of linear flashing by a slip joint to permit thermal movement.

2.02 METAL FINISH

A. General: Apply coatings either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability. Provide standard color indicated or, if not otherwise indicated, as selected by the University.

B. For exposed exterior surfaces, provide thick finish of Durapon 70 or pre-approved equal conforming to AAMA 621 with a primer from 0.2 to 0.3 dry mils and Kynar topcoat from 0.7 to 0.9 dry mils for a total thickness of 0.9 to 1.2 dry mils.

C. Interior/underside finish shall be off white polyester. Where sheet metal will be used for gutters or similar applications, provide backside with polyester or better finish.

2.03 MISCELLANEOUS MATERIALS

A. Fasteners: Fasteners shall be stainless steel with composite metal and neoprene composition washers. Exposed fasteners shall be gasketed on the exterior side of the covering to waterproof the covering and finished to match siding finish.

B. Accessories: Except as indicated as work of another specification section, provide components required for a complete siding system, including trim, flashings and expansion joint flashing; single component polyurethane sealants, gaskets, fillers, closure strips, and similar items. Match materials/ finish of preformed panels where exposed.

C. Closure Strips: Formed specifically for this purpose of laminated cross-linked polyethylene closed cell-foam or neoprene materials and as standard with manufacturer. Molded closure strips shall be formed to match configurations of the panels and shall be provided where indicated and where necessary to provide weathertight construction.

D. Sealants: ASTM C920, Type S, Grade NS, Class 25, Use NT, polyurethane or as recommended by the siding manufacturer. Color, where exposed, shall match panels.

E. Mastic: As recommended by the siding manufacturer.

F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15 mil dry film thickness per coat.

G. Edge Treatment: Dura Coat Products, Inc. Edge Seal or accepted equivalent for sealing all field cut edges.

2.04 PANEL FABRICATION AND PERFORMANCE REQUIREMENTS

A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, and as required to fulfill performance requirements, which have been demonstrated by factory testing. Comply with indicated profiles and dimensional requirements, and with structural requirements. Fabricated panels in fill lengths from eave to base to the greatest extent possible.

B. Metal Gauges: Thicknesses required for structural performances, but not less than manufacturer's recommended minimums for profiles and applications indicated, and not less than specified under paragraph entitled "Siding Panels" hereinabove.

C. Required Performances: Fabricated panels and other components of siding system for the following installed-as-indicated performances:

Project Wind Loads: 100 mph, Exposure B (positive and negative pressures per current adopted ICC IBC as amended.)

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive metal siding and flashing. Provide plumb and true surfaces, clean, even, smooth, and as dry as possible. Ensure that surfaces are free from defects and projections which might affect the installation.

B. Report unsuitable conditions to the University. The manufacturer's technical representative shall approve substrate as suitable for siding system application.

3.02 INSTALLATION

A. General: Comply with panels fabricator's and material manufacturer's instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the work securely in place in full and firm contact with

substrate and adjoining panels with provisions for thermal/structural movement as well as carrying the weight of the panels. Obtain acceptance prior to installation on prefinished panels cut in the field and factory applied coverings or coatings that were repaired after being abraded or damaged during handling or installation. Make repairs with material of same color as weathering coating. Completely seal openings through panels. Correct defects or errors in materials in an accepted manner. Replace materials which cannot be corrected in an accepted manner with new materials. Provide molded closure strips where indicated and where necessary for weathertight construction.

B. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4-inch in 20-feet on level/plumb/slope and location line as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. All field cutting of panels shall be done as recommended by manufacturer's written instructions. Provide edge treatment for all field cut edges.

D. Joint Sealers: Install joint fillers and sealants where indicated and where required for weatherproof performance of panel system. Provide types of sealants/fillers indicated or, if not otherwise indicated, types recommended by panel manufacturer. Refer to SECTION 07920 – SEALANTS of these specifications for installation requirements applicable to indicated joint sealers.

E. Flashings: Provide flashing and related closures and accessories in connection with preformed metal panels as indicated and as necessary to provide a weathertight installation. Install flashing to ensure positive water drainage away from penetrations. Flash and seal siding at head and sill, door, window, and similar openings and elsewhere as necessary. Accomplish placement of closure strips, flashing, and sealing material in an accepted manner that will ensure complete weathertightness. Details of installation which are not indicated shall be in accordance with the SMACNA ASMM panel manufacturer's printed instructions and details of the accepted shop drawings. Installation shall allow for expansion and contraction of flashing.

F. Fasteners: Fastener spacing shall be in accordance with the panel manufacturer's recommendations and as necessary to withstand the indicated design loads for both pullout and pullover. Install fasteners as recommended by the manufacturer of the panels. Install fasteners in straight lines within a tolerance of 1/2-inch in the length of a bay. Drive exposed penetrating type fasteners normal to the surface and to a uniform depth to seat gasketed washers properly and drive so as not to damage factory applied coating. Exercise extreme care in drilling pilot holes for fastenings to keep drills perpendicular and centered. Do not drill through sealant tapes. After drilling, remove metal filings and burrs from holes prior to installing fasteners and washers. Torque used in applying fasteners shall not exceed that recommended by the manufacturer. Remove panels deformed or otherwise damaged by over-torqued fastenings, and provide

new panels.

G. Closure Strips: Install closure strips as indicated and as recommended by the manufacture.

H. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with wood or other substrate materials which are noncompatible (i.e. copper and aluminum) or could result in corrosion or deterioration of either material or finishes.

3.03 CLEAN-UP AND PROTECTION

A. Damaged Units: Replace panels and other components of the work which have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures. Touch-up paint shall not be used without the permission of the University.

B. Cleaning: Upon completion of panel installation, clean finished surfaces as recommended by panel manufacturer, and maintain in a clean condition during construction. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings, and drilling debris and scrub the work clean. Exposed metal surfaces shall be free from dents, creases, waves, scratch marks, and solder or weld marks.

END OF SECTION

SECTION 07600 – FLASHING AND SHEET METAL

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Provide all labor, materials, and equipment necessary to fabricate and install flashing, coping and other related work as shown on drawings and as specified herein.

B. Related Work Specified Elsewhere:

1. Coordinate installation of sheet metal work with SECTION 07410 – PREFORMED METAL STANDING SEAM ROOFING and SECTION 07411 – PREFORMED METAL SIDING.

2. Sealants are specified under SECTION 07920 – SEALANTS.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01330 – SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's product data on all manufactured items.

C. Shop Drawings: Submit shop drawings with reference made to detail numbers on the contract drawings to the Contracting Officer for acceptance. Contract drawings are general in nature. Furnish additional details for all the similar and unusual conditions necessary to fabricate the flashing and sheet metal work. Shop drawings shall show all fasteners and relationship to adjacent work. No fabrication will be permitted before acceptance is secured. Tracing or reproducing drawing details is unacceptable.

D. Warranty: Submit warrant as stipulated in item entitled "WARRANTY" herein below.

1.04 QUALITY ASSURANCE

A. Sheet metal fabrications shall conform to State and local codes, SMACNA (latest edition), and industry standards.

B. Roof penetrations shall be installed weather tight in such a manner to maintain integrity of the roofing.

C. Fastening and cleating shall withstand all positive and negative wind pressures for 100 mph Exposure B winds, unless indicated otherwise, in accordance with current ICC IBC as amended.

1.05 WARRANTY

A. The Contractor shall furnish to the University a written warranty on the sheet metal for a 2-year period after the Project Acceptance Date. The warranty shall provide for the repair of all leaks as well as a repair and replacement of damage to the building and/or its finishes at no cost to the University. Where flashing is associated with a system with longer warranty period, flashing warranty shall match applicable system.

B. The surety shall not be held liable beyond 2 years from the project acceptance date.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Flashing Associated with Metal Roofing and Siding: Provide materials from the same source, material, and finish as metal roofing provided under SECTION 07410 – PERFORMED METAL STANDING SEAM ROOFING and Metal siding provided under SECTION 07411 – PREFORMED METAL SIDING.

B. Nails and Fasteners: Use the same metal or a metal compatible with the item. Use stainless steel fasteners to fasten dissimilar metals.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 but containing no asbestos fibers, or cold-asphalt emulsion complying with ASTMD 1187/D1187M.

PART 3 – EXECUTION

3.01 INSTALLATION AND WORKMANSHIP

A. Surface to which sheet metal is to be applied shall be even, smooth, sound, thoroughly clean and dry, and free from defects that might affect the application. Report any unsatisfactory surfaces to the Contracting Officer. In the absence of such a report, the Contractor shall be held responsible for the finished product.

B. All accessories or other items essential for the completeness of the sheet metal installation, though not specifically indicated on the drawings or specified, shall be provided. All such items unless otherwise indicated on the drawings or specified, shall be of the same kind of materials as the item to be applied. Nails, screws, rivets and bolts shall be of the type best suited for the purpose intended and shall be of a composition that is compatible with the metal to which it will contact.

C. Except as otherwise indicated on the drawings of specified, the workmanship of sheet metal work, method of forming joints, anchoring, cleating, provisions for expansion, etc., shall conform to the standards details and recommendations of the Sheet Metal and Air Conditioning Contractors National Association's "Architectural Sheet Metal Manual", and shall be subject to the approval of the Contracting Officer. Exposed edges shall be folded back neatly to form a minimum ½-inch hem on the concealed side. Fabricate for waterproof and weather-resistant performance, with expansion, or deterioration of the work.

D. Seams: Straight and uniform in width and height with no sealants showing on the face.

1. Flat-Lock Seams: Finish not less than 3/4-inch wide.

2. Lap Seams: Finish soldered seams not less than one-inch wide. Overlap seams not soldered, not less than 3-inches.

3. Loose-Lock Expansion Seams: Not less than 3-inches wide and shall provide minimum one-inch movement within joint. Joint shall be completely filled with exterior sealant, applied at not less than 1/8-inch thick bed.

4. Flat Seams: Make seams in the direction of the flow.

E. All sheet metal work shall be watertight and wind-tight in compliance with the purpose intended for the items indicated on the drawings or specified herein. Sheet metal shall be held firmly in place and shall not rattle.

F. Protection from Contact of Dissimilar Materials: Surfaces in contact with dissimilar metal shall be painted with heavy-bodied bituminous paint or shall be separated by means of moisture proof building felts.

3.02 PROTECTION

Protect all sheet metal work until final acceptance of the work.

3.03 CLEAN-UP

A. Clean exposed sheet metal work at completion of installation. Grease and oil films, handling marks, contamination from steel wool, fittings, and drilling debris shall be removed and the work scrubbed clean. Exposed metal surfaces shall be free of dents, creases, waves, and scratch marks.

B. At completion of the work, clean up and remove rubbish and debris from the premises which resulted from this work.

END OF SECTION

SECTION 07920 – SEALANTS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Completely close with sealant all joints indicated or specified to be sealed to a watertight condition without staining substrates.

B. Related Work Described Elsewhere: Glazing sealants are provided under SECTION 08800 – GLAZING.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

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

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

D. Color Samples: Submit 4 sets of color finish samples of sealants.

E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Warranty: Submit warranty as stipulated in item entitles "WARRANTY" hereinbelow.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized installer who is approved or licensed for installation of elastomeric sealants required for this project.

B. Source Limitations: Obtain each type of sealant through one source from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing: Submit to sealant manufacturers, for testing samples of materials that will contact or affect

sealants. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain optimum adhesion of sealants to joint substrates. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

D. Stain-Test Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have no stained porous joint substrates indicated for Project.

1.05 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver sealant 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. Sealant materials shall be handled in accordance with the manufacturer's specifications and installed prior to expiration to shelf life.

1.06 WARRANTY

A. Provide a 2-year written warranty against leaks, air infiltration, cracks, and other failures of the installation and materials. Where sealant is associated with a system with longer warranty period, sealant warranty shall match applicable system.

1. Repair of 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 at no additional cost to the University.

B. The Surety shall not be held liable beyond 2 years from the project acceptance date.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General: Provide sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of

service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Sealants:

1. At Exterior and Interior Vertical and Overhead Moving Joints: One-part polyurethane-based sealant, conforming to ASTM C 920, Type S. Grade NS, Class 25, Use NT. Provide one of the following, or pre-approved equal.

   a. Vulkem 116; Tremco Corp.
   b. Chem-Calk 900; Bostik Construction Products Div.
   c. Sikaflex 1a; Sika Corp.
   d. Dynatrol 1-XL; Pecora Corp.
   e. NP-1; MasterSeal.

2. At Interior Vertical and Overhead Non-Moving Joints: Non-Elastomeric Sealant; acrylic-emulsion type, conforming to ASTM C 834. Provide one of the following, or pre-approved equal:

   a. AC-20 Acrylic Latex: Pecora Corp.
   b. Tremco Acrylic Latex 834; Tremco Corp.
   c. Chem-Calk 600; Bostik Construction Products Div.
   d. NP-420; MasterSeal.

3. At Horizontal Traffic-Bearing Joints: One part polyurethane based sealant, conforming to ASTM C920, Type S, Grade P, except provide NS at sloped conditions, Class 25, Use T. Provide one of the following, or pre-approved equal:

   a. Sikaflex 1c SL or Sikaflex 1a; Sika Corp.
   b. Vulkem 45; Tremco, Inc.
   c. Urexpan NR-201; Pecora Corp.
   d. SL-1 or NP-1; Masterseal.

4. 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 pre-approved equal:

   a. Dow Corning 786; Dow Corning Corp.
   b. SCS 1700 Sanitary; General Electric Co.
   c. Tremsil 600 White; Tremco, Inc.
   d. 898 or 893, No. 345; Pecora Corp.

5. 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 a pre-approved equal:

a. Extru-Seal; Pecora Corp.
b. 440 Tape; Tremco, Inc.
c. Chem-Tape 40; Bostik Construction Products Div.

6. Acoustical Sealant: Provide one of the following, or pre-approved equal:

a. Exposed and Concealed Joints: Non-sag, paintable, non-staining, latex sealant complying with ASTM C834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
(1) AC-20 FTR; Pecora Corp.
(2) Sheetrock Acoustical Sealant; USG.
(3) Tremflex 834; Tremco.

b. Concealed Joints: Non-drying, non-hardening, non-skinning non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
(1) BA-98; Pecora Corp.
(2) Tremco Acoustical Sealant; Tremco.
(3) Pro-Series SC-170; Ohio Sealants.

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

D. Sealant Backer Rod: Compressible rod stock of polyethylene foam, polyethylene-jacketed polyethylene foam, butyl rubber foam, neoprene foam, or other flexible, permanent, durable, nonabsorptive material conforming with ASTM C 1330 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.

E. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer. Provide self-adhesive tape where required.

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

PART 3 – EXECUTION

3.01 EXAMINATION

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

3.02 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 repellents; water; and surface dirt.

2. Clean concrete and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form release agents from concrete.

4. Steel Surfaces in Contact with Sealant: Scrape and wirebrush to remove loose mill scale. Remove dirt, oil, or grease by solvent cleaning, and wipe surfaces with clean cloths.

5. Clean metal, glass, and other nonporous surfaces by chemical cleaners or other means, which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

6. Do not permit solvents to air dry. Wipe surfaces free of solvent using clean, dry white cloth or white lintless paper.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

D. Examine joint size and correct to achieve depth ratio of ½ of joint width with a minimum width and depth of ¼-inch, maximum width of 1-inch unless specifically allowed otherwise by the sealant manufacturer.

3.03 INSTALLATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

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

C. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.

D. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

E. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths, which allow optimum sealant movement capability.

    a. Do not leave gaps between ends of joint fillers.

    b. Do not stretch, twist, puncture, or tear joint fillers.

    c. Remove absorbent joint fillers, which have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.

3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.

4. Compress backing material minimum of 30 percent when inserted in joint. Backing material for upper portion of joint shall be round rod or semi-circular in cross-section where in contract with sealant.

F. Primer: Immediately prior to application of the sealant, clean out all loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete, masonry units, wood, and other porous surfaces in accordance with compound manufacturer's instructions. Do not apply primer to exposed finish surfaces.

G. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

H. Joint Sizes: Install sealants to depths as indicated or as recommended by sealant manufacturer buy within the following general limitations:

1. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to depth equal to 50 percent of joint width, but not more than 1/2-inch deep or less than 1/4-inch deep.

2. For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to depth in range of 75 percent to 125 percent of joint width.

I. 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 sealants with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C1193, unless otherwise indicated.

2. Provide flush joint configuration per Figure 5B in ASTM C1193, where indicated.

3. Use anti-tack agent where necessary to protect freshly applied sealant from public traffic and dirt.

4. Slightly recess joints to facilitate painter's line. Hand tool and finish joints throughout construction.

5. Comply with manufacturer's specifications and recommendations.

3.04 CLEANING

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

3.05 PROTECTION

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

END OF SECTION

DIVISION 8 – DOORS AND WINDOWS

SECTION 08110 – STEEL DOORS AND FRAMES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Provide standard steel doors and frames as indicated and scheduled on drawings.

B. Related Work Described Elsewhere:

1. Finish hardware as specified in Section 08710 – FINISH HARDWARE.

2. Glazing is specified in Section 08800 – GLAZING.

3. Field applied painting is specified in Section 09900 – PAINTING.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300 – SUBMITTALS.

B. Manufacturers Data: Submit manufacturer's technical product data substantiating that products comply with requirements.

C. Shop Drawings: Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections, gauges, and finishes. Show anchorage and accessory items.

D. Schedule: Furnish schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

1.04 QUALITY ASURANCE

A. Provide doors and frames complying with ANSI/SDI A250.8, "Recommended Specifications for Standard Steel Doors and Frames", and as herein specified.

B. Door Hardware Mounting Heights: The Contractor shall be responsible to coordinate all mounting heights of various finish hardware with all project requirements. Accessible hardware shall be mounted per ADAAG Section 404.2.7.

C. Wind Pressure Requirements: Exterior doors shall have been tested, rated, and factory marked for the positive and negative wind pressures as indicated or as calculated in accordance with ASCE-7 for the windspeed, exposure, and importance factor for this project and ICC IBC.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver hollow metal work cartooned or crated to provide protection during transit and job storage. Provide temporary steel spreaders securely fastened to the bottom of each welded frame.

B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to the University; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover in a dry, secure place. Place units on minimum 4-inch high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chambers. If cardboard wrapper on door becomes wet, remove carton immediately. Provide ¼-inch spaces between stacked doors to promote air circulation.

D. Handle manufactured materials as recommended by the manufacturer.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Galvanized Steel Sheets: All doors shall be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel per ASTM A 1008/A 1008M, “Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable”, and ASTM A 568/A 568M, “Specification for Steel, Sheet, Carbon, Structural and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements”. Sheet shall be galvanized to ‘G-90’ minimum coating weight per ASTM A 924/A 924M, “Specification for General Requirements for Steel Sheet, Metallic-Coated by Hot-Dip Process”. Internal reinforcing shall be manufactured of hot rolled pickled and oiled steel per ASTM A 1011/A 1011M, “Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability and Ultra-High Strength”.

B. Core Materials: Polyurethane foam core, self-extinguishing, non-toxic or 1 pound density mineral fiber at steel reinforced doors.

C. Support and Anchors: Fabricate of not less than 18 gauge galvanized sheet steel.

D. Frame Anchors:

1. Wall Anchors for Attachment to Drywall Partitions:

   a. Use manufacturer's adjustable type compression anchors with knocked down die mitered frames at drywall locations.

   b. Use stud anchors sized to accommodate frame jamb depth and face dimension on all welded frames.

2. All frame jamb anchors to be provided; one each jamb per 30-inches of frame height or fraction thereof, (3 minimum).

3. Floor Anchors: Angle clip type:

   a. 16 gauge minimum.

   b. To receive 2 fasteners per jamb.

   c. Welded to the bottom of each jamb.

E. Inserts, Bolts, and Fasteners: Manufacturer's standards units, except hot-dip galvanize, complying with ASTM A 153/A 153M, "Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware", Class C or D as applicable.

F. Factory Applied Primer Paint: Rust-inhibitive enamel paint, either air-drying or baking, suitable as a base for specified finish paints conforming to ASNI/SDI A250.10, "Test Procedures and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames". Primers shall be free from asbestos, lead, mercury, chromate, and cadmium.

2.02 FABRICATION, GENERAL

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI A250.8 requirements as follows:

   1. Exterior Flush Panel Doors: Level 3, extra heavy-duty, Model 2, minimum 16 gauge faces.

   2. Doors shall conform to ANSI/SDI A250.4, "Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware reinforcing", minimum Level A performance for doors as applicable.

B. Fabricate exposed faces of doors and panels from only cold-rolled steel.

C. Fabricate frames, concealed stiffeners, reinforcement, edge channels, and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).

D. Fabricate all doors and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gauge inverted steel channels, flush end cap cover plate, and sealed to prevent water intrusion. Door hinge edge shall be one-piece full height, 14-gauge channel, formed and tapped for hinges. Doors shall have a beveled (1/8-inch in 2-inches) lock edge and square hinge edge.

E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

F. Finish Hardware Preparation: Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI/SDI A250.8, ANSI/SDI A250.6, and additional requirements of ANSI/BHMA A 156.115 specifications for door and frame preparation for hardware.

1. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site. Provide minimum gauge hardware reinforcing for mortise or surface applied hardware as follows:

d. Hinges:

(1) 10 Gauge or equivalent number of threads on doors.
(2) 1 gauge on frames.

e. Locks: 12 gauge or equivalent number of threads.

f. Surface Closers: 12 gauge.

2. Locate finish hardware as indicated on final shop drawings or, if not indicated in accordance with ANSI/SDI A250.8, "Recommended Specification for Standard Steel Doors and Frames", and the Americans with Disabilities Act Accessibility Guidelines (ADAAG) Section 404.2.7.

G. Factory Painting:

1. Clean, Phosphatize, and prime paint exposed surfaces of steel door and frame units, including galvanized surfaces.

2. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.

3. Apply factory coat of prime paint to an even consistency to provide a uniformly finished surface ready to receive finish paint.

2.03 STANDARD STEEL DOORS

Provide metal doors of types and styles indicated on drawings or schedule. Fill all doors with mineral fiber insulation at steel reinforced doors or polystyrene foam panel reinforcement at standard hollow metal.

2.04 STANDARD STEEL FRAMES

A. Provide metal frames for doors, sidelights and windows of type and style as shown on drawings and schedules conforming with ANSI/SDI A250/8. Conceal fastenings, unless otherwise indicated. Fabricate frames of cold-rolled furniture steel minimum 14 gauge for exterior and 16 gauge for interior to conform with door physical performance level.

1. Fabricate frames with mitered corners, welded construction.

a. Welded Frames: Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth. Weld frames in accordance with the recommended practice of the Structural Welding Code Sections 1 through 6, AWS D1.1/D1.1M, and in accordance with the practice specified by the producer of the metal being welded.

2. Form all frames of hot dip galvanized steel.

3. Frames shall comply with ANSI/SDI A250.4, minimum Level A, one million cycle swing test performance for a 4070 door frame.

B. Door silencers: Except on weatherstipped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames.

C. Plaster Guards: Provide 26 gauge steel plaster guards or mortar boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

D. Template Hardware: Factory cut doors and frames for all template hardware, including hinges, bolts, etc.

E. Side Light and Free Standing Window Frames: Frames shall be constructed as specified in ANSI.SDI A250.8 and shall be non-removable from the non-secure side of the unit.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

B. Placing Frames: Comply with provisions of ANSI/SDI A250.11, "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.

1. Anchors: Provide sufficient anchorage to attach to wall and floor in accordance with ANSI/SDI A250.4, test compliance minimum Level A of one million cycles, or anchorage as detailed on drawings to specific wall conditions. Anchor exterior door frames for wall pressure requirements.

2. Place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

C. Door Installation:

1. Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI A250.8.

2. Weatherstripping shall be installed at exterior door openings to provide a weathertight installation.

D. Door Clearances: Unless otherwise recommended by the manufacturer, provide uniform clearances as listed below:

1. Head, Jamb, and Lock Edge: 1/8-inch maximum.

2. Meting Stile: 1/4-inch maximum (3/16-inch maximum for fire doors).

3. Threshold: 1/8-inch (1/4-inch maximum)

3.02 ADJUST AND CLEAN

A. Factory Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of factory coating and apply touch-up of matching air-drying coating.

B. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating conditions.

END OF SECTION

SECTION 08210 – WOOD DOORS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

A. Extent and location of each type of wood door is indicated on drawings and in schedules.

B. Types of doors required include solid core flush wood doors with wood veneer faces.

C. Related Work Describe Elsewhere:

1. Metal door frames for wood doors are specified in SECTION 08110 – STEEL DOORS AND FRAMES.

2. Door hardware is provided under Section 08710 – FINISH HARDWARE. Door producer shall review and certify the finish hardware schedule is in conformance with the doors being furnished.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300 – SUBMITTALS.

B. Manufacturer's Data: Door manufacturer's technical data for each type of door, including details of core and edge construction, and trim for openings.

C. Shop Drawings: Submit shop drawings indicating location and size of each door, door swing, stile and rail dimensions, veneers, elevation of each kind of door, details of constructions, all openings, location and extent of hardware blocking, fire ratings, and other pertinent data.

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

1.04 QUALITY ASSURANCE

A. Quality Standards: Comply with the following standards:

1. WDMA Quality Standard: ANSI/WDMA I.S.-1A "Wood Flush Doors", of Wood Door Manufacturers Association (WDMA).

2. AWI Quality Standards: "Architectural Woodwork Standards" (AWS), including Section 9, "Doors" for grade of door, core construction, finish, and other requirements exceeding those of WDMA quality standard.

B. WDMA Quality Marking: Mark each wood door with WDMA Wood Door Certification Hallmark certifying compliance with applicable requirements of ANSI/WDMA I.S.-1A Series. For manufacturers not participating in WDMA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.

C. WDMA Performance Duty Levels: Architectural wood flush doors shall be heavy duty unless indicated otherwise.

D. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies per ICC IBC Section 715, "Opening Protectives", NFPA 252 "Fire tests for Door Assemblies", and UL 10C, "Fire Tests of Door Assemblies", and which are labeled and listed for ratings indicated by UL, Warnock Hersey or other testing and inspection agency acceptable to authorities having jurisdiction. These requirements shall take precedence over details indicated or specified. Labels shall be metal with raised letters and shall bear the rating followed by the letter "s", name and file number of the door manufacturer and the service conducting the inspection. Labels shall be factory applied and shall not be painted.

E. Factory seal all doors on all 6 sides using manufacturer's standard.

F. Manufacturer: Obtain doors of similar finish from a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of ANSI/WDMA I.S.-1A Section G-20, "Care and Installation at Job Site", as well as with manufacturer's instructions.

B. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

C. Do not walk on or stack other materials on top of stacked doors. Do not drag doors across one another.

D. For all doors not factory finished, seal all four edges immediately after delivery.

E. Store doors away from threat of termite or other insect infestation.

F. Plastic wrapping shall be cut to allow doors to acclimatize once they are protected from the weather.

G. Handle manufactured materials as recommended by the manufacturer.

1.06 PROJECT CONDITIONS

Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project's geographical location: AWS "Architectural Woodwork Standards", "Care and installation at the Job Site" for door type as indicated.

1.07 WARRANTY

A. General: Warranties shall be in addition to, and not a limitation of, other rights the University may have under the Contract Documents.

B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by Manufacturer, installer and Contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty shall be in effect during following minimum period of time after date of Project Acceptance, unless longer warranty is standard with the manufacturer.

2. Solid Core Interior Doors: Two years.

C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 – PRODUCTS

2.01 INTERIOR FLUSH WOOD DOORS

A. Solid Core Doors for Opaque (Paint) Finish: Comply with the following requirements:

1. Faces: Any closed-grain hardwood of mill option.

2. Grade: AWS Custom, WDMA Custom.

3. Construction: SLC-5 or SLC-7 (Stave lumber core, 5 or 7-ply) or EC-5 or EC-7 (Engineered Core).

2.02 FABRICATION

A. Wood Doors: Fabricate wood doors to produce doors in sizes indicated for job-site fitting. Stile edge bands of doors to be painted shall be mill option specie. No visible finger joints will be accepted in stile edge bands. When used, locate finger-joints under hardware.

B. Adhesives: Adhesives shall be in accordance with WDMA I.S.-1A, requirements for Type II Bond Doors (water repellent) for interior doors. Adhesives for interior doors shall contain no formaldehydes.

C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standard for kind(s) of doors required.

1. Light Openings: Trim openings with moldings of material and profile indicated or if not indicated, as standard with the manufacturer.

D. Finish Hardware: Locate hardware to comply with DHI-WDHS-3 and each door that is an element of an accessible route shall comply with Americans with Disabilities Act Accessibility Guidelines (ADAAG) Section 404.2.7. Comply with finish hardware schedules, door frame shop drawings, ANSI/SDI A250.8, ANSI/SDI A250.6, and additional requirements of ANSI/BHMA A 156.115, and hardware templates.

2.03 PRESERVATIVE TREATMENT

Treat all solid core doors at factory with water repellent after manufacturing has been complete, in accordance with WDMA Industry Standard I.S.-4 “Water-Repellent Preservative non-Pressure Treatment for Millwork”.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine installed door frames prior to hanging door:

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.

2. Reject doors with defects that cannot be repaired in a manner that is imperceptible. Replace doors which cannot be field repaired to match new as approved by the University at no additional cost to the University. Doors warped in excess of ¼-inch when measured in accordance with ANSI/WDMA I.S.-1A shall be rejected.

B. Do no proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Hardware: For installation see Section 08710 – FINISH HARDWARE.

B. Manufacturer's Instructions:

1. Install wood doors to comply with manufacturer's instructions and of referenced AWS and WDMA standard and as indicated.

2. Install fire-rated doors in corresponding fire-rated frames in accordance with the more restrictive requirements of NFPA 80, "Fire Doors and Fire Windows", and current ICC IBC as amended. Securely affix installation instructions to each door.

C. Job Fit Doors: Align and fit doors in frame with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

1. Fitting Clearances for Non-Rated Doors: Provide 1/8-inch at jambs and heads; and ½-inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 3/8-inch clearance from bottom of door to top of threshold unless indicated for undercut.

2. Fitting Clearances for Fire-Rated Doors: Comply with the more restrictive requirements of NFPA 80 and the current ICC IBC as amended.

3. Bevel non-rated doors 1/8-inch in 2-inches at lock and hinge edges.

4. Bevel fire-rated doors 1/8-inch in 2-inches in lock edge; trim stiles and rails only to extent permitted by labeling agency.

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

3.03 ADJUSTING AND PROTECTION

A. Operation: Rehang or replace doors which are hinge bound and do not swing or operate freely. Replace or rehang doors which are warped, twisted, or which are not in true planes.

B. Protection: Protect doors as recommended by door manufacturer to assure that wood doors will be without damage or deterioration at time of Project Acceptance.

END OF SECTION

SECTION 08710 – FINISH HARDWARE

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Hardware for all doors other than hardware specified in specific door sections.

B. Weatherstripping for exterior doors.

C. Furnish and deliver to the building site, all finishing hardware required for all doors, etc., complete as indicated on the drawings and as specified.

D. It is the intent of these specifications to cover in general the class and character of all finish hardware required.

E. The hardware list specified has been made for the convenience of the Contractor and covers in general the necessary hardware for doors, etc., All other doors, etc., shown on the drawings and not covered by the general characterization shall be fitted with appropriate hardware of the same standards as the hardware described throughout these specifications. Contractor shall furnish hardware schedule as specified.

F. Suppliers proposing substitutes of equivalent products of other than manufacturers named shall submit schedules listing product and manufacturer specified and the product and manufacturer of proposed substitute. This schedule shall be submitted accordance to Section 01001 – GENERAL REQUIREMENTS, paragraph entitled "SUBSTITUTION OF MATERIALS AND EQUIPMENT".

G. Products Furnished but Not Installed Under This Section: Section 08110 – STEEL DOORS AND FRAMES: Furnish templates for door and frame preparation.

H. Related Work Described Elsewhere:

1. Door silencers are provided under Section 08110 – STEEL DOORS AND FRAMES.

2. Coordinate the work with others directly affected sections involving manufacturer or fabrication of internal reinforcement for door hardware.

3. Access control hardware is provided under SECTION 08712 – ACCESS CONTROL HARDWARE.

4. Cylinders, cores, keys, and keying system are provided under SECTION 08715 – HIGH SECURITY KEYING SYSTEM.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300 – SUBMITTALS.

B. Schedule: Furnish copies of the schedule of hardware in compliance with specifications and drawings. Schedule format shall be vertical type as listed in DHI document "Sequence and Format for the Hardware Schedule". List each opening and hardware to be applied. State materials finish and manufacturer's number for each item. Required types are listed.

C. Manufacturer's Data: Submit manufacturer's descriptive literature along with schedule.

D. Templates: Furnish hardware templates of each fabricator of doors, frames, and other work to be factory-prepared for the installation of hardware. Upon request, check Shop Drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

E. Tools and Maintenance Instructions: Furnish a complete set of special wrenches, tools, maintenance instructions, lubrication requirements, and inspection procedures applicable to each different or special hardware component.

F. Certification: After completion and inspection by hardware supplier of all construction work, certify on an accepted form, that all items of finish hardware have been adjusted and are working properly.

G. Project Record Documents: Submit project record documents and record actual locations and installed cylinders and their master key code.

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

1.04 QUALITY ASSURANCE

A. Perform work in accordance with Americans with Disabilities Act Accessibility Guidelines ADAAG Section 206.5, NFPA 101, "Life Safety Code", and current adopted ICC IBC as amended. Each door that is an element of an accessible route shall comply with ADAAG Section 309.4, section 404 and Section 404.2.7. Operable parts such as hardware shall be mounted minimum 34-inches and no higher than 48-inches above finish floor or ground.

B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented

experience. Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

C. Hardware Supplier: Company specializing in architectural finish hardware, with a local stock warehouse, who has furnished hardware in Hawaii for a period of not less than three years. Products which are not locally stocked or serviced or which must be special ordered are not acceptable.

D. Hardware Supplier Personnel: Employ an experienced Architectural Hardware Consultant (AHC), or University accepted equivalent, who is available at reasonable times during the course of the Work, to the University and Contractor for consultation about Project's hardware requirements, to verify specified hardware with door function and hardware finishes, and to establish keying system.

E. Wind Pressure Requirements: Finish hardware for exterior doors shall have been tested, rated, and factory marked for the positive and negative wind pressures as indicated or as calculated in accordance with ASCE-7 for the windspeed, exposure, and importance factor for this project and ICC IBC.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for accessibility and requirements applicable to fire rated doors and frames.

B. Definition: "Door Hardware" includes items known commercially as finish hardware which are required for swing and sliding doors, except special types of unique and non-matching hardware specified in same section as door and door frame.

C. Requirement: Doors shall conform to ADAAG Section 206.5.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to prevent damage of any kind and to maintain security of materials at the site.

B. Inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

C. Deliver individually packaged hardware items at proper times to proper locations (shop or project site) for installation.

D. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

E. Provide secure lock-up for hardware delivered to project but not yet installed. Control handling and installation of hardware items which are

not immediately replaceable, so that completion of the Work will not be delayed by hardware losses, both before and after installation.

F. Handle manufactured materials as recommended by the manufacturer.

1.07 WARRANTY

A. Contractor's Warranty: Furnish minimum one-year Contractor warranty.

B. Manufacturer's Warranty:

1. Door Closer Warranty: Furnish minimum 10-year manufacturer's warranty on door closers.

2. Electrical Component Warranty: Furnish minimum 2-year manufacturer's warranty on electrical components.

3. Where longer warranty is standard with the manufacturer, furnish the longer warranty.

C. The Surety shall not be held liable beyond 2-years from the project acceptance date.

1.08 MAINTENANCE MATERIALS

A. Furnish special wrenches and tools applicable to each different or special hardware component.

B. Furnish maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 – PRODUCTS

2.01 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware is indicated in "HARDWARE GROUPS" at end of this section. Products are identified by using proprietary catalog numbers, and are used to establish quality and function of products desired.

B. Product numbers indicated in the HARDWARE GROUPS are those of the manufacturers listed and are used to establish the quality of products intended. Provide listed products or pre-approved equal.

2.02 MATERIALS AND FABRICATION

A. Hand of Door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of indicated door.

B. Base Metals: Produce hardware units of basic metal and forming method specified, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standard for each type hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish optional materials or forming methods for those indicated, except as otherwise specified.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated. Fasteners exposed to the weather shall be stainless steel.

D. Furnish appropriate screws for installation with each hardware item. Provide Phillips flat head screws except as otherwise indicated. Finish exposed screws to match hardware finish. If exposed in surfaces of other work, to match finish of such other work as closely as possible, including prepared-for-paint finish in surfaces to receive painted finish.

E. Expansion shields in concrete or masonry shall fill the depth and diameter of drilled holes.

F. Provide concealed fasteners for hardware units which are exposed when door is closed, except to the extent no standard units of the type specified are available with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the Work. In such cases, provide sleeves for each through bolt or use sex screw fasteners.

G. Bring to the attention of the University any discrepancy between the Hardware Groups and door schedule prior to ordering.

2.03 HINGES

A. General: Hinges shall conform to ANSI/BHMA A156.1, and the requirements of this specification.

B. Templates: Provide only template-produced units.

C. Screws: Furnish Phillips flat head or machine screws for installation of units, except furnish Phillips flat head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges.

D. Hinges Pins: Except as otherwise indicated, provide hinge pins as follows:

1. Nonferrous Hinges: Stainless steel pins.

2. Exterior, Out-Swing Doors: Non-removable pins (NRP).

3. Interior Doors: Nonrising pins.

4. Tips: Flat button and matching plug, finished to match leaves.

E. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 84-inches or less in height and one additional hinge for each 6-inches of additional height.

F. Size of hinges shall be as follows:

Door Thickness/Width	Hinge Height	Hinge Width
1-3/4 inch to 36-inches	4-1/2 inch	4 or 4-1/2 inch
1-3/4 inch over 36-inches	5-inch	4-1/2 Extra Heavy Ball Bearing
1-3/4 inch over 48-inches	5-inch	4-1/2 Extra Heavy Ball Bearing

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

G. Hinges: The following hinges will be considered equal subject to project conditions:

1. Hager BB1191

2. Stanley FBB191

3. McKinney TA2314

4. Or pre-approved equal

2.04 LOCK CYLINDERS AND KEYING

A. The cylinders listed in the hardware schedule at the end of this Section for the respective locks are for reference only. Cylinders, keys, and keying shall be provided under SECTION 08715 – HIGH SECURITY KEYING SYSTEM.

2.05 LOCKS, LATCHES, AND BOLTS

A. General: Mortise locks and latches shall conform to ANSI/BHMA A156.13, bored locks and latches shall conform to ANSI/BHMA A 156.2, bolts shall conform to ANSI/BHMA A156.16, ADAAG Section 404.2, and the requirements of this specification.

B. Mortise locksets shall be manufactured in a single sized case formed from 12 gauge minimum steel. The case shall be closed on all sides and

back. The lockset shall have a field-adjustable, beveled armored front, with a 0.125-inch minimum thickness.

C. Mortise locksets shall have freewheeling outside levers on all exterior doors. The freewheeling lever design shall allow the lever to swing freely up to 70 degrees, when the door is locked.

D. Strikes: Provide manufacturer's standard wrought box strike for each latch of lock bolt, with lip extended to protect frame, and finish to match hardware set. Provide dustproof strikes for foot bolts, except where special threshold construction provides nonrecessed strike for bolts.

E. Lock Throw:

1. Provide ¾-inch minimum throw of latch and 1-inch minimum for deadbolt.

2. Flush Bolt Heads: Minimum of 1/2-inch diameter rods of brass, bronze or stainless steel, with minimum 12-inches long rod for doors up to 7-feet in height; minimum 42-inches long rod for doors up to 9-feet 6-inches in height.

F. Provide locksets, latches, and cylinders equal in all respects to those specified in the Hardware Groups. All thumb turns shall conform to ADAAG Section 309.4.

G. Mortise Lockets: The following mortise locksets will be considered equal subject to project conditions:

1. Schlage L9000 Series

2. Sargent 8200 Series

3. Corbin Russwin ML2000 Series

4. Yale 8800 Series

5. Or pre-approved equal

2.06 CLOSERS AND DOOR CONTROL DEVICES

A. General: Closers shall conform to ANSI/BHMA A156.4, ADAAG Section 404.2.8 and Section 404.2.9 and the requirements of this specification.

B. Size of Units: Comply with manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather, and anticipated frequency of use. Where parallel arm closers are installed, provide closer unit one size larger than recommended for use with standard arms.

C. Maximum effort to operate doors shall not exceed 8.5 pounds for exterior doors and 5 pounds for interior doors, such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards.

D. Provide parallel arm or regular arm closer as required to mount closer on door face least exposed to public traffic.

E. Closers shall have brass adjustment operating valves for closing speed, latching speed, and backcheck control as a standard feature.

F. Closer covers shall be rectangular, full cover type, high impact non-corrosive, and flame retardant.

G. Closer shall not require removal for adjustments to be made.

H. Door Closers: The following door closers will be considered equal subject to project conditions:

1. LCN 4041 Series

2. Corbin Russwin DC6000 Series

3. Norton 7500 Series

4. Sargent 351 Series.

5. Or pre-approved equal

2.07 WEATHERSTRIPPING AND DOOR SEALS

A. Provide noncorrosive fasteners as recommended by manufacturer for application indicated.

B. Weatherstrip: ANSI/BHMA A156.22, except where furnished as part of an entrance door package or as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf.

C. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

D. Smoke Seals: Provide continuous seals at each edge of door leaf.

E. Thresholds: Provide all thresholds as indicated on the door schedule conforming to ANSI/BHMA A156.21 and ADAAG Section 404.2.5.

2.08 FINISHES

A. Finishes: Identified in schedule at end of section.

1. Designations used are those listed in ANSI/BHMA A156.18 "Materials and Finishes", including coordination with traditional U.S. finishes shown by certain manufacturers for their products.

2. If no BHMA finish is established, match specified product.

B. Provide matching finishes for hardware units at each door or opening to greatest extent possible, except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where base metal or metal forming process is different for individual units of hardware exposed at same door or opening.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified for applicable units of hardware by referenced standards.

PART 3 – EXECUTION

3.01 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. Pre-Installation Meeting: Before start of work under this contract, the Contractor, hardware installer, hardware manufacturer's representative or supplier and the University shall meet to review the hardware installation instructions and installation conditions.

B. Verify that doors and frames are ready to receive Work and dimensions are as indicated.

3.03 INSTALLATION

A. Install each hardware item in compliance with manufacturer's instructions and recommendations.

B. Mount hardware units at height indicated in ANSI/SDI A250.8, "Recommended Specification for Standard Steel Doors and Frames", except:

1. As otherwise indicated or as required to comply with governing regulations and ADAAG Section 404.2.7.

2. Mount deadbolt (if any) centerline to conform with ADAAG Section 404.2.7 above latchset handle centerline.

C. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work. Do not install surface mounted items until finishes have been completed on the substrate.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Set metal thresholds for exterior doors in full bed of butyl rubber, polyisobutylene mastic sealant, or preformed butyl-polyisobutylene sealant tape as specified under Section 07920 - SEALANTS.

G. Fit face of all mortise parts snug and flush.

H. Operating parts shall move freely and smoothly without binding, sticking or excessive clearance.

I. Protect hardware from damage or marring of finish during construction. Use strippable coatings, removable tapes or other accepted means.

J. Ensure that hardware displays no evidence of finish paint after building cleanup with exception of prime coated hardware installed for finish painting. The Contractor may achieve this by sequencing installation, removing after fittings, and reinstalling after painting is completed, providing protection, cleaning original hardware finish, or other accepted means.

K. Latch and Bolt: Install latch to automatically engage in keeper, whether activated by closer or manual push. In no case shall additional manual pressure be required to engage latch in keeper.

L. Closers:

1. Do not mount closers on corridor side of door except at exterior doors.

2. Carefully adjust closers to operate noiselessly and evenly and to conform to ADAAG Section 404.2.8 and Section 404.2.9.

3. Have manufacturer's representative regulate closers prior to University's acceptance of work.

3.04 FIELD QUALITY CONTROL

A. Required certified Architectural Hardware Consultant from door hardware supplier to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

B. The manufacturer's representative shall instruct the user's staff on the hardware's maintenance procedures (type of lubricant needed and frequency of maintenance).

3.05 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace items which cannot be adjusted to operate freely and smoothly as intended for application made.

B. Clean adjacent surface soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the Work during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area.

1. Clean operating items as necessary to restore proper function and finish of hardware and doors.

2. Adjust door control devices to compensate for final operation of ventilating equipment and to conform to ADAAG Section 404.2.8 and Section 404.2.9 requirements.

3. Lubricate bearings surface of moving parts and adjust latching and holding devices for proper function.

4. Test keys in every lock for proper operation and conformance with keying system.

3.06 HARDWARE GROUPS

MANUFACTURER LIST

CATEGORY	VENDOR NAME	MFG
ELECTRICAL HINGE	BY McKINNEY PRODUCTS COMPANY	MCK
HINGE	BY McKINNEY PRODUCTS COMPANY	MCK
SFIC CORE	BY MEDECO SECURITY LOCKS, INC.	MED
DOOR BOTTOM	BY PEMKO MANUFACTURING CO.	PEM
DOOR SEAL	BY PEMKO MANUFACTURING CO.	PEM
THRESHOLD	BY PEMKO MANUFACTURING CO.	PEM
FLUSH BOLT	BY ROCKWOOD MANUFACTURING CO.	ROC
KICKPLATE	BY ROCKWOOD MANUFACTURING CO.	ROC

WALL STOP (CONVEX)	BY ROCKWOOD MANUFACTURING CO.	ROC
CLASSROOM LOCK	BY SARGENT MANUFACTURING COMPANY	SAR
DOOR CLOSER	BY SARGENT MANUFACTURING COMPANY	SAR
ELECTRONIC EXIT DEV	BY SARGENT MANUFACTURING COMPANY	SAR
ELECTRONIC LOCK	BY SARGENT MANUFACTURING COMPANY	SAR
PRIVACY SET	BY SARGENT MANUFACTURING COMPANY	SAR
SURFACE VR EXIT DEV	BY SARGENT MANUFACTURING COMPANY	SAR

HW GROUP – 001

4.0 EA	HINGE	TA2314 4.5 X 4.5 US26D-NRP	MCK
2.0 EA	ELECTRICAL HINGE	QC12-TA2314 4.5 X 4.5 US26D	MCK
1.0 EA	ELECTRONIC EXIT DEV	H1-8774F ETMQ US26D	SAR
1.0 EA	SURFACE VR EXIT DEV	55-8710F US26B	SAR
1.0 EA	DOOR SEAL	PK55D25	PEM
2.0 EA	DOOR CLOSER	351 CPS EN SRI	SAR
2.0 EA	KICKPLATE	K1050 10" X 35.5" 630 PULL SIDE	ROC
2.0 EA	KICKPLATE	K1050 10" X 34.5" 630 PUSH SIDE	ROC
2.0 EA	DOOR BOTTOM	210DV 36"	PEM
1.0 EA	THRESHOLD	171A 72"	PEM
	(See section 08715 – High Security Keying System for IC core)		

HW GROUP - 002

2.0 EA	HINGE	TA2314 4.5 x 4.5 US26D	MCK
1.0 EA	ELECTRICAL HINGE	QC12-TA2314 4.5 X 4.5 US26D	MCK
1.0 EA	ELECTRONIC LOCK	H1-70-82271 TRMQ US26D	SAR
1.0 EA	DOOR CLOSER	1431 O EN	SAR
1.0 EA	WALL STOP (CONVEX)	406 630	ROC
1.0 EA	DOOR BOTTOM	4131CSL 42"	PEM
1.0 EA	DOOR SEAL	PK55D17	PEM
1.0 EA	THRESHOLD	171A 42"	PEM
	(See section 08715 – High Security Keying System for IC core)		

HW GROUP – 003

3.0 EA	HINGE	TA2314 4.5 x 4.5 US26D	MCK
1.0 EA	PRIVACY SET	49-8265 TRMQ US26D WBX	SAR
1.0 EA	MORTISE DEADLOCK	70-4877 US26D	SAR
1.0 EA	DOOR CLOSER	1431 O EN	SAR
1.0 EA	WALL STOP (CONVEX)	406 630	ROC
1.0 EA	DOOR BOTTOM	4131CSL 36"	PEM
1.0 EA	DOOR SEAL	PK55D17	PEM
1.0 EA	THRESHOLD	171A 36"	PEM
	(See section 08715 – High Security Keying System for IC core)		

HW GROUP – 004

6.0 EA	HINGE	TA2314 4.5 X 4.5 US26D-NRP	MCK
1.0 EA	ELECTRICAL HINGE	QC12-TA2314 4.5 X 4.5 US26D	MCK
1.0 EA	ELECTRONIC LOCK	H1-70-82271 TRMQ US26D	SAR
2.0 EA	FLUSH BOLT	555 626	ROC
2.0 EA	DOOR CLOSER	1431 O EN	SAR
1.0 EA	THRESHOLD	171A 72"	PEM

(See section 08715 – High Security Keying System for IC core)

HW GROUP – 005

3.0 EA	HINGE	TA2314 4.5 X 4.5 US26D-NRP	MCK
1.0 EA	CLASSROOM LOCK	8237 TRMQ US26D WBX	SAR
1.0 EA	DOOR CLOSER	1431 O EN	SAR
1.0 EA	WALL STOP (CONVEX)	406 630	ROC
1.0 EA	THRESHOLD	171A 36"	PEM
	(See section 08715 – High Security Keying System for IC core)		

HW GROUP – 006

3.0 EA	HINGE	TA2314 4.5 x 4.5 US26D	MCK
1.0 EA	PRIVACY SET	49-8265 TRMQ US26D WBX	SAR
1.0 EA	MORTISE DEADLOCK	70-4877 US26D	SAR
1.0 EA	DOOR CLOSER	1431 O EN	SAR
1.0 EA	WALL STOP (CONVEX)	406 630	ROC
1.0 EA	DOOR BOTTOM	4131CSL 42	PEM
1.0 EA	DOOR SEAL	PK55D17	PEM
1.0 EA	THRESHOLD	171A 42"	PEM
	(See section 08715 – High Security Keying System for IC core)		

HW GROUP - 007

2.0 EA	HINGE	TA2314 4.5 x 4.5 US26D	MCK
1.0 EA	ELECTRICAL HINGE	QC12-TA2314 4.5 X 4.5 US26D	MCK
1.0 EA	ELECTRONIC LOCK	H1-70-82271 TRMQ US26D	SAR
1.0 EA	DOOR CLOSER	1431 O EN	SAR
1.0 EA	WALL STOP (CONVEX)	406 630	ROC
1.0 EA	DOOR BOTTOM	4131CSL 42"	PEM
1.0 EA	DOOR SEAL	PK55D17	PEM
1.0 EA	THRESHOLD	171A 42"	PEM
	(See section 08715 – High Security Keying System for IC core)		

END OF SECTION

SECTION 08712 – ELECTRONIC ACCESS CONTROL

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. As specified in SECTION 01001 – GENERAL REQUIREMENTS.

B. Related work described elsewhere:

1. SECTION 08715 – HIGH SECURITY KEY AND LOCK SYSTEM
2. SECTION 16050 – ELECTRICAL GENERAL REQUIREMENTS
3. SECTION 16402 – WIRING SYSTEMS

1.02 SUMMARY

A. The work included in this section of the specifications shall furnish, deliver, and install new electronic access control components where indicated to “provide a new” or “tie in to existing” campus-wide electronic access control system as specified.

B. A Door Lock/Access Control Schedule is provided in the plans for “information only” of existing doors campus wide. The Contractor shall be responsible for field verification of all existing doors, locksets and cylinder types as required to provide a new electronic access control system before submitting a bid. No increase in price will be permitted for Contractors not having visited the site and confirmed conditions and quantities.

C. The work included in this section will also include complete set up including entering all doors, buildings and key symbols for the key management software specified herein.

D. Examine the drawings, specifications, and jobsite verification to check all components so they will be suitable and of perfect fit, installed where and when required.

E. The following materials and services, as generally described, are encompassed by this system specification and shall include but not limited to:

1. Door Hardware
2. EAC Hardware

3. EAC Software
4. EAC Credentials
5. System Installation
6. System Setup
7. System Support
8. End-User Training

F. Certification: Installation, setup and servicing of all components shall be performed by a contractor whom is trained, certified and authorized by the system manufacturer(s) to perform such duties.

1.03 REFERENCES AND ABBREVIATIONS

A. The standards, technologies, methods, algorithms, systems, entities or other items defined as follows shall hereinafter be referenced by the respective and associated abbreviation or acronym; most current edition.

1. ISO – International Organization for Standardization.

2. IEC – International Electrotechnical Commission.

a. 60086 – Portable Primary Batteries

3. ISO/IEC JTC 1 – ISO/IEC Joint Technical Committee 1

a. 7810 – Physical Characteristics for Identification Cards.
b. 14443 – Contactless Integrated Circuit Cards

4. IEEE – Institute of Electrical and Electronics Engineers.

a. 802.15.4 – Low-Rate Wireless Personal Area Networks

5. ANSI – American National Standards Institute

a. A115.1 – Mortise Lock Preparation
b. A115.2 – Cylindrical Lock Preparation
c. A156.2 – Bored Locks and Latches
d. A156.3 – Exit Devices
e. A156.13 – Mortise Locks and Latches

6. UL – Underwriters Laboratories, Inc.

a. UL 10B – Fire Tests of Door Assemblies
b. UL 10C – Positive Pressure Fire Tests of Door Assemblies
c. UL 1034 – Burglary-Resistant Electric Locking Mechanisms

7. FCC – Federal Communications Commission

8. EAC – Electronic Access Control

9. ESS – Electronic Security System

10. LAN – Local Area Network

11. WAN – Wide Area Network

12. VLAN – Virtual Local Area Network

13. IP – Internet Protocol

14. DMZ – Demilitarized Zone

15. PPD – Portable Programming Device

16. LED – Light Emitting Diode

17. AES – Advanced Encryption Standard

18. USB – Universal Serial Bus

19. NFC – Near Field Communication

20. CSC – Contactless Smart Card

21. PCD – Proximity Coupling Device

22. PICC – Proximity Integrated Circuit Card

23. RFID – Radio Frequency Identification

24. RAID – Redundant Array of Independent Disks

25. RF – Radio Frequency

26. UPS – Uninterruptible Power Supply

1.04 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

B. Complete Submittals: Shall include scheduling of all doors sorted by buildings, electronic access control type and any other information required for each door. Furnish manufacturers product data including descriptive and technical data for verification purposes.

C. Keying Schedule: Keying of locks shall be as indicated on a Key Schedule submitted by the supplier with information obtained from the Windward Community College (WCC) Facilities Management Office. Door designations shall be the same as those used on drawings.

D. Electronic Access Control Software: Submittals shall include complete details, specifications including required processor, MB hard disk space, operating system, etc.

E. Warranty: Submit warrant as stipulated hereinafter.

1.05 DELIVERY, STORAGE AND HANDLING

Contractor shall deliver and store products in manufacture's unopened packaging in an enclosed area in accordance with manufacturer's recommendations.

1.06 PROJECT CONDITIONS

A. Contractor shall verify that environmental conditions, including temperature and humidity, are within the manufacturers stated product limits prior to and during installations. Commencement of installation shall constitute contractor's acceptance of existing corrections.

B. Contractor shall furnish door hardware, EAC hardware of proper design and use on existing doors and frames of the proper thickness, profile, swing, security and similar requirements indicated as necessary for the proper installation and function, regardless of omissions or conflicts in the information stated within the contract document.

C. Should items of hardware not definitely specified be required for the completion of work, the Contractor shall furnish such items of type and quality comparable to adjacent hardware and appropriate for services required.

D. Where items of hardware are not definitely or correctly specified, are required for completion of the work, Contractor shall provide a written

statement of such omission, error, or other discrepancy to University, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the design and function intent.

1.07 REPRESENTATION AND SERVICE

Provide services of a competent EAC specialist whom is familiar with the installation, operation, configuration, programming, and service of the EAC system specified. Specialist shall meet with the University to develop the Electronic Access Control System and coordinate installation.

1.08 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Engage qualified manufacturers with a minimum five (5) years of documented experience in providing access control and security systems equipment and software similar to that indicated for this Project and that have a proven record of successful in-service performance.

1. Software and access control systems components shall be previously and thoroughly tested together with proven installations similar in size and functionality to the design requirements indicated for this Project.

B. Installer Qualifications: Systems Integrators, verifiably factory trained and certified by the primary product manufacturers, with a minimum three (3) years documented experience installing complete integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance. Qualifications include, but are not necessarily limited, to the following:

1. References: Provide a list of references for similar projects including contact name, phone number, name and type of project.

2. Professional Staffing: Firms to have a dedicated access control system integration department with full time, experienced professionals on staff experienced in providing on site consulting services for both electrified door hardware and integrated access control systems installations.

3. Factory Training: Installation and service technicians are to be competent factory trained and certified personnel capable of maintaining the system.

4. Service Center: Firms shall have a service center capable of providing training, in-stock parts, and emergency maintenance and repairs at the Project Site with 24-hour/7days a week maximum response time.

C. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

1. Comply with NFPA 70 “National Electrical Code”, including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), “Accessibility Guidelines for Buildings and Facilities (ADAAG)” and ANSI A117.1.

3. Comply with NFPA 101 “Life Safety Code” for doors in a means of egress.

4. Comply with NFPA 80 “Fire Doors and Windows” for fire labeled opening assemblies.

5. The installation access control system shall conform to all local jurisdiction requirements.

D. Pre-Submittal Conference: Conduct conference with attendance by representatives of Supplier/Dealer, Systems Integrator, and Contractor to review proper methods and procedures for receiving, handling, and installing the access control system hardware. At completion of installation, provide written documentation that components were applied to manufacturer’s instructions and recommendations and according to approved schedules.

1. Inspect and discuss electrical roughing-in and similar preparatory work performed by other trades.

2. Review and verify sequence of operation descriptions for each unique access controlled opening.

3. Review and finalize construction schedule and verify availability of materials.

4. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.09 WARRANTY

The contractor shall submit warranty document(s) for EAC system components. The warranty period shall be two (2) year from the date of acceptance. Defective materials shall be replaced or repaired by the Contractor at no cost to the University.

1.10 COORDINATION

A. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

B. Access Control System Electrical Coordination: Coordinate the layout and installation of scheduled electrified door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.

C. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing electrified door hardware and access control system components. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing access control system hardware to comply with indicated requirements.

D. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.11 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for the University's continued adjustment, maintenance, and removal and

replacement of the installed access control system hardware and components.

B. Maintenance Service: Beginning at Project Acceptance, and running concurrent with the specified warranty period, provide continuous twelve (12) months full maintenance by skilled employees of the Systems Integrator. Include repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used by the manufacturer and installation of original products.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. General: This technical specification is performance-based according to the requirements of the University. Manufacturers and part numbers referenced within the attached hardware schedule are included to demonstrate design intent and illustrate hardware which satisfies the requirements of this technical specification.

B. Exclusions: Certain details regarding door hardware have been excluded from this technical specification and the attached hardware schedule. Contractor is responsible for verifying all conditions and ensuring the correct application, which shall be submitted and approved by the University, of items not other otherwise specified. Details excluded are, but not limited to:

1. Finish (match existing)
2. Door Width
3. Door Height
4. Door Handing
5. Trim Style (match existing)
6. Lever Style (match existing)
7. Cylinders (for mechanical hard-key override; see SECTION 08715 – HIGH SECURITY KEY AND LOCK SYSTEM.

C. Substitutions:

1. This technical specification is not proprietary product designation and manufacturers are listed for the purpose of establishing requirements.

2. Approved Electronic Access Control System Manufacturers:
   a. Johnson Controls (JCS)

3. The access control hardware contained in this specification represents a complete engineered system. If alternate products are submitted, it is the responsibility of the Supplier/Dealer/ Integrator to provide an acceptable complete and working system layout. Complete systems to include, at a minimum, required power supplies, power transfers, and integrated locking hardware and accessories.

4. Requests for substitution shall be submitted in good faith and as a declaration that the proposed alternative system meets or exceeds the performance and technical requirements described within this system specification.

5. Requests for substitution shall be submitted with appropriate documentation that describes technical, function and performance information of the proposed alternative system.

6. Requests for substitution shall be submitted in accordance with SECTION 01001 – GENERAL REQUIREMENTS.

2.02 DESIGN AND PERFORMANCE

A. Compliance:

1. All work shall tie into the existing campus EAC system, unless otherwise noted.

2. The EAC system architecture shall consist of the system components listed herein to satisfy the specific design intent of the EAC system.

3. Each EAC system component shall adhere to the prescribed purpose, performance, design intent and function of said component.

4. Each EAC system component shall adhere to the prescribed technical and operational requirements of said component.

B. Principal of Operation:

1. The EAC system shall utilize a fully integrated combination of wired access control hardware and electronic offline locks.

   a. The purpose of wired access control hardware is to provide maximum reliability for access control conditions deemed critical, including, but not limited to, perimeter points of ingress and egress, which shall be seamlessly integrated and controlled by the a unified system.

   b. The purpose of offline lock hardware is to provide additional alternative methods for access control conditions deemed non-critical, including, but not limited to, limited occupancy and/or traffic, which shall be seamlessly integrated and controlled by the unified system.

2. All system components shall be seamlessly integrated, controlled and managed by the existing EAC system and interface established at this campus, no exceptions. Said components shall include, but not be limited to, the following:

   a. Wall Reader
   b. System Controller
   c. Offline Lock
   d. Credential
   e. Wired Door Hardware
   f. Wired Access Control Hardware

C. System Components:

1. Wall Reader

   a. Wall reader shall be used at specified wired door(s) in which the door(s) are mechanically secured by electric door hardware.

   b. The wall reader shall perform the following functions:

      1) Establish secure communication with the credential.
      2) Retrieve and authenticate information contained on the credential.

3) Communicate information with the system controller.

c. Shall be compatible with one or more of the following CSC technologies:

1) MIFARE
2) MIFARE DESFire EV 1
3) HID iCLASS

2. System Controller

a. Shall communicate with the ACS system server securely via TCP/IP protocol.

b. Shall communicate with expansion module(s) via RS-485, when applicable.

c. Shall locally store and maintain EAC system information to allow continued nominal operation in the event that communication with the EAC system server is interrupted or otherwise unavailable.

d. The expansion module(s) shall provide for increased door capacity, when applicable.

e. Shall require a unique IP address on the designated EAC system network.

3. Offline Lock

a. Power shall be supplied by 1 battery set. A battery set shall be defined as individual standard battery cells which are of an identical manufacturer and brand, have identical chemistry and are of an identical manufacturing production. Individual battery cells shall be compliant with either of the following standards.

1) IEC 60086 LR6
2) IEC 60086 FR6

b. One battery set shall provide sufficient operating energy for a minimum for 30,000 electronic openings.

c. The battery set shall be easily replaceable by the end-user without the need of special instruction or technical capacity.

d. Lockset shall function as an independent EAC system device. Power and/or data transmission to the lockset via wire, cable or other solid-material conductor shall not be permissible.

e. Emissions radiated by the lockset shall be standards-compliant:

1) FCC, Part 15, Class A

f. Lockset shall contain a PCD for the purpose of interfacing with a PICC credential.

g. Shall be compatible with the following standard CSC technologies:

1) MIFARE
2) MIRFARE DESFire EV1
3) HID iCLASS

h. Shall be compliant with ISO/IEC JTC -1 standard:

1) ISO/IEC 14443A-1
2) ISO/IEC 14443A-2
3) ISO/IEC 14443A-3
4) ISO/IEC 14443A-4

i. Lockset shall conform to ANSI A156.2, Series 4000, Grade 1.

j. Lockset shall conform to UL standard:

1) UL 10B
2) UL 10C
3) UL1034

k. Lockset shall retain a rolling history of the most recent 1,000 system events.

4. Credential – Credential shall have embedded CSC/PICC technology.

a. CSC/PICC technology shall be conformant with:

1) MIFARE
2) MIRFARE DESFire EV1

b. CSC/PICC technology shall be compliant with ISO/IEC JTC-1 standards:

1) ISO/IEC 14443-1
2) ISO/IEC 14443-2
3) ISO/IEC 14443-3
4) ISO/IEC 14443-4

c. CSC/PICC technology shall have 4KB total integrated memory.

d. CSC/PICC technology shall operate on the RF frequency 3.56 MHz.

e. CSC/PICC technology shall utilize the encryption standard AES-128.

f. Credential shall be furnished black and white in color.

g. Credential shall be printable.

5. System Software.

a. System software shall provide an interface to seamlessly manage all devices connected into the integrated system, including by not limited to:

1) All devices and hardware related to wired doors.
2) All devices and hardware related to offline locks.

b. System software shall have the capacity to manage up to 10,000 number doors and/or other points of control.

c. System software shall manage up to 500,000 credentials.

d. All components of the system shall be fully integrated so that any form of redundant data input or similar tasks are

eliminated in their entirety. This requirement shall apply to all aspects of the system installation, setup and operation.

e. All EAC system data shall centrally reside within a single database on the system server.

1) Use of more than one database to manage, control or integrate all system components shall not be permissible.

f. Backup database(s) which mirror or archive the sole primary database shall be permissible if said database(s) are used for recovery operations and are otherwise not manipulated during nominal operation of the EAC system.

g. Software functioning as the EAC system server shall reside on a single server computer, to be furnished by the Contractor as specified. (or tie into existing system)

h. Software functioning as an EAC system client workstation shall reside on three client computers, to be furnished by the Contractor as specified.

6. System Server

a. Shall utilize an operating system compatible with the EAC system.

b. Shall be enterprise-grade hardware which has been deemed suitable to the specific application and approved by the EAC system manufacturer. Documentation of such approval shall be furnished by the Contractor to the University, at request.

c. Shall utilize a RAID disk array with a minimum of two hot-swappable drives.

d. Shall utilize two hot-swappable power supplies.

e. Shall utilize a commercial-grade UPS.

f. Shall utilize a processor, memory and other components not further specified that meet or exceed the requirements of the EAC system manufacturer.

g. Shall be of a standard 19-inch rack-mountable form factor.

h. Shall include an LCD monitor, keyboard and pointing device which are integrated and of a standard 19-inch rack-mountable form factor.

i. Shall require two unique IP addresses on the designated EAC system LAN.

j. Shall be approved by the University.

7. System Client Workstation (if required)

a. Shall utilize an operating system compatible with the EAC system.

b. Shall be of commercial-grade hardware which has been deemed suitable to the specific application and approved by the EAC system manufacturer. Documentation of such approval shall be furnished by the Contractor to the University.

c. Shall utilize a commercial-grade UPS or be connected to a circuit which is otherwise sustained in the event of a critical power failure.

d. Shall utilize a disk(s), processor, memory and other components not further specified that meet or exceed the requirements of the EAC system manufacture.

e. Shall be of a standard tower form factor.

f. Shall include a 17-inch (minimum) LCD monitor, keyboard and pointing device.

g. Shall require a unique IP address on the designated EAC system LAN.

h. Shall be approved by the University.

PART 3 – EXECUTION

3.01 GENERAL

A. Examine scheduled openings, which Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the Installed access control system.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.

C. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

D. Notify University of any discrepancies or conflicts between the specifications, drawings and scheduled access controlled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.02 PREPARATION

Doors and frames at scheduled access controlled openings to be properly prepared to receive specified electrified and access control hardware and connections without additional in-field modifications.

3.03 INSTALLATION

A. Install each item of electronic access control equipment to comply with manufacturer's written instructions and according to specifications.

B. Mounting Heights: Mount electronic door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

C. Boxed Power Supplies: Verify locations.

1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control hardware and equipment.

D. All consoles, terminals, and controllers shall be factory wired before shipment to the job site.

E. Cabinet doors shall open a minimum of 170 degrees to avoid booking personnel movement. Each door shall be equipped with a cylinder lock, a tamper switch and a piano-type hinge with welded tamperproof pins.

F. Provisions shall be made for field wiring to enter the cabinet via standard knockouts at the top, bottom and sides of controller cabinets.

G. Each wire shall be identified at both ends with the wire designation corresponding to the wire numbers shown on the wiring diagram.

H. All exposed wiring within the cabinets, consoles, and terminals shall be formed neatly with wires grouped in bundles using non-metallic, flame-resistant wiring cleats or wire ties.

I. All ferrous metal work shall be painted, in accordance with the manufacturer's standards.

J. Final connect the system control switches (integrated card keying locking hardware, remote readers, keypads, display terminals, biometrics), and monitoring, and signaling equipment to the related Controller devices at each opening to properly operate the electrified access control hardware according to system operational narratives.

K. System Application Software: "Install, and test application(s) software and databases or tie into existing software system and database" for the complete and proper operation of systems involved. Prior to assigning software license(s), confirm to the University.

3.04 FIELD QUALITY CONTROL

A. Field Inspections: Engage an authorized systems manufacturer representative to perform a final inspection of the installed electronic integrated door hardware and access control system and state in report wither installed work complies with or deviates from requirements, including wither each component representing the opening assembly is

properly installed, adjusted, operating and performing to system operational narratives.

B. Testing and Commissioning:

1. The Contractor shall be responsible for testing and commissioning the installation in accordance with all applicable documents in the Contract set prior to final acceptance of the access control system installation. The following testing and documentation shall be performed and provided to the University.

   a. Testing shall be comprehensive and sufficient to demonstrate compliance with each requirement.

   b. A proposed test plan shall be submitted to the Architect and the University's representative for acceptance before commencement of final test.

   c. Final tests shall be conducted in the presence of the Architect and the University's representative.

2. Adjust and check each operating item of integrated access control door hardware, and each door opening to ensure proper secured operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.

4. Pre-Testing: Program and adjust the system and pretest all components writing, and functions to verify they conform to specified requirements. Provide testing reports indicating devices tested, pass/fail status, and actions taken to resolve problem(s) on failed tests.

5. Acceptance Test Schedule: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

6. Provide "as-built" drawings showing each device and wiring connection and electronic enclosure legends indicating cabling in and out.

7. Provide a complete set of operating instructions for access control hardware devices and a complete software user manual. The documentation includes module reference guides for each electronic enclosure.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by access control system installation.

B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure access control door hardware is without damage or deterioration at time of owner occupancy.

3.06 TRAINING AND INSTRUCTION

A. Central server operator training shall include a minimum of forty-eight (48) hours on-site by a factory trained professional instructor. Training conducted by unqualified personnel is unacceptable. Include a minimum of eight hours of client software application (client workstation) at each of the facilities for local administrative staff.

B. Training materials shall consist of the following:

1. Formal course outline and agenda.
2. Operator training student guide for each student.
3. Hands-on practice with online equipment.
4. Written examinations.
5. Electronic files of training material.

C. Video imaging training sessions shall be made available to the University at no additional costs on DVD.

3.07 ACCESS CONTROL SYSTEM HARDWARE SETS

MANUFACTURER LIST

CATEGORY	VENDOR NAME	MFG
CABINET ENCLOSURE	BY	JCS
EXPANSION MODULE	BY	JCS
SYSTEM CONTROLLER	BY	JCS
WALL READER	BY	HID
OFFLINE BORED LOCK	BY	SAR
OFFLINE MORTISE LOCK	BY	SAR
ELEC BORED LOCK	BY	SAR

ELEC CVR EXIT DEV	BY	SAR
ELEC MORT EXIT DEV	BY	SAR
ELEC MORTISE LOCK	BY	SAR
ELEC RIM EXIST DEV	BY	SAR
ELEC SVR EXIT DEV	BY	SAR
DOOR POSITION SWITCH	BY	SAR
POWER SUPPLY 12VDC	BY	SEC
POWER SUPPLY 24VDC	BY	SEC
POWER TRANSFER	BY	SEC

END OF SECTION

SECTION 08715 - HIGH SECURITY KEYING SYSTEM

PART 1 -GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Provide all materials, labor, equipment, and tools necessary for high security cylinders (see Hardware Groups in Section 08710 – FINISH HARDWARE) and keys for all locksets, to match the University of Hawaii Windward Community College MEDECO High Security Keying System, including installation.

B. Related Work Described Elsewhere: Section 08710 – FINISH HARDWARE and SECTION 08712 – ELECTRONIC ACCESS CONTROL for locksets and construction cylinders. Removal of construction cylinders is included in this Section.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300 - SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's descriptive data for verification purposes.

C. Keying Schedule: Keying of locks shall be as indicated on a University of Hawaii Key Schedule form submitted by the supplier with information obtained from the Windward Community College Facilities Management Office. Door designations shall be the same as those used on drawings and hardware schedule.

D. Project Record Documents: Record of actual door locations of installed cylinders and their master key codes for submittal to the University.

1.04 DELIVERY

A. Examine the drawings, specifications, and details in order to check all cylinders so they will be suitable and of perfect fit, and delivered where and when required.

B. All cylinders shall be delivered at the site, packed in manufacturer’s original package with all trimmings, screws, and accessories. Each cylinder shall be clearly marked with proper door number that corresponds with the keying schedule so that installers can clearly identify the proper location of each cylinder.

C. Upon delivery of the cylinders to the job site, the General Contractor shall have a responsible person check in the material at the place for storage. The cylinders shall be protected from damage at all times, both prior to and after installation.

1.05 REPRESENTATIVE

A. Provide services of a competent hardware specialist who is familiar with installation and operation of Windward Community College MEDECO high security key system. Representative shall be available for meetings with University Representatives and Contractor, to establish keying system.

PART 2 -PRODUCTS

2.01 CYLINDERS

A. Cylinder and Cores: As specified under SECTION 08710 – FINISH HARDWARE. They shall be the appropriate MEDECO X 4 cylinder and core for the respective manufacturer of the lockset. Provide all locksets with original factory high security cylinders. Cylinders shall be removable without disassembly of locksets.

B. Keys: Provide 4 keys per lock, stamped with key code symbol as directed by Windward Community College. Stamp all keys “DO NOT DUPLICATE”.

C. Permanent Keying Instructions: All new locks shall be keyed as directed in the following instructions.

1. Prior to acceptance of the keys, the Contractor shall remove construction master and together with Windward Community College, and hardware supplier, shall inspect each lock with the cut keys and Master Key.

2. Upon acceptance of the project, the Contractor shall arrange for temporary keys, obtained from the University, if further access is required. Should the Contractor lose any key, Contractor shall be responsible for all costs associated with rekeying of affected cylinders and cutting of new keys at no additional cost to Windward Community College.

3. It shall be the responsibility of the hardware supplier to meet with the Windward Community College to review the keying requirements and establish the final keying arrangements.

4. The Contractor shall submit keying schedule, coordinated with hardware schedule, clearly showing how the Windward Community College final instructions on keying of locks have been fulfilled. Final keying schedule shall be subject to adjustments.

PART 3 -EXECUTION

3.01 PRE-INSTALLATION MEETING

A. Call for a "pre-installation" meeting between Contractor, hardware installer, and hardware manufacturer's representative or supplier or competent hardware specialist, the Architect, and the University to review the hardware installation instructions and installation conditions.

3.02 HARDWARE SUPPLIER'S INSPECTION

A. Prior to installation and before final inspection of the work under this contract and acceptance of the project by the Windward Community College, the supplier of hardware and other items specified in this Section and SECTION 08710 – FINISH HARDWARE shall visit the site and carefully inspect all parts for conformance to the specifications, adequacy for intended use, proper functioning, appearance, finish and successful operation.

B. Verify the installation and operation of the hardware and cylinders/keys to final acceptance.

1. All keys cut for the project shall be tested to ensure proper operation.

2. Instruct the Windward Community College staff on the hardware's maintenance procedures (type of lubricant needed and frequency of maintenance).

3.03 HARDWARE SCHEDULE

A. Hardware schedule for doors is shown under SECTION 08710 – FINISH HARDWARE. Cores specified below:

HW GROUP – 001

1.0 EA	SFIC CORE	33N60006-DEJ-26	MED

HW GROUP - 002

1.0 EA	SFIC CORE	33N60006-DEJ-26	MED

HW GROUP – 004

1.0 EA	SFIC CORE	33N60006-DEJ-26	MED

HW GROUP – 005

1.0 EA	SFIC CORE	33N60006-DEJ-26	MED

HW GROUP – 006

1.0 EA	SFIC CORE	33N60006-DEJ-26	MED

HW GROUP - 007

1.0 EA	SFIC CORE	33N60006-DEJ-26	MED

END OF SECTION

SECTION 08800 – GLAZING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Provide all glass and glazing materials to complete all glazing work as shown and as specified herein.

B. Related Work Described Elsewhere: Framed mirrors at toilet rooms are provided under SECTION 10800 – TOILET ACCESSORIES.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300 – SUBMITTALS.

B. Manufacturer's Data: Submit copies of manufacturer's product specifications, and instructions for handling, storing, installing, cleaning, and protecting each type of glass and glazing material. Provide data indicating structural and physical characteristics of each type of glass and glazing.

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

1.04 QUALITY ASSURANCE

A. Glass Standards: All glass, except as noted otherwise, shall comply with ASTM C 1036, "Flat Glass". Tempered glass shall comply with ASTM C 1048, "Heat-Strengthened and Fully Tempered Flat Glass".

B. Safety Glass Standard: All glass indicated on the drawings or as required to be safety glass shall meet all the requirements of the "Safety Standard for Architectural Glazing Material", 16 CFR Part 1201, dated January 6, 1977, of the Consumer Product Safety Commission or ANSI Z97.1, "Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings".

C. Exterior glass thickness and strengths (annealed or heat-treated) shall be as indicated but not less than required to withstand a wind loading pressure (positive and negative) acting normal to pant of glass as calculated in accordance with the 2012 ICC IBC as amended by the State with factors; Ultimate Design Wind Speed 130 mph, Exposure B, Kzt = 1.2 and KD = 0.7; and ASTM E1300, "Determining Load Resistance of Glass in Buildings", and ASTM E330/E330M, "Structural Performance of

Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference".

D. Limit glass deflection to 1/200 flexure limit of glass with full recovery of glazing materials.

E. Sealants for glazing shall conform to AAMA 800, "Voluntary Specifications and Test Methods for Sealants", and AAMA 850, "Fenestration Sealant Guide Manual".

F. Sealed Insulating Glass Unit Surfaces and Coating Orientation:

1. Surface 1: Exterior surface of outer pane (surface facing outdoors of outboard lite).

2. Surface 2: Interior surface of outer pane (surface facing indoors of outboard lite).

3. Surface 3: Exterior surface of inner pane (surface facing outdoors of inboard lite).

4. Surface 4: Room side surface of inner pane (surface facing indoors of inboard lite).

G. Insulated Glass: Insulated glass shall be certified through the Insulated Glass Certification Council (IGCC) to ASTM E 2190, "Standard Specification for Insulating Glass Unit Performance and Evaluation".

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, dry locations and do not unpack until needed for installation.

B. Comply with manufacturer's instructions for shipping handling, storing and protecting glass and glazing materials. Exercise exceptional care to prevent edge damage to glass.

1.06 LABELING

A. Each piece of glass shall be of domestic manufacture and label, except as noted otherwise, showing the name of the manufacturer and the grade or quality thereof. The labels shall be intact before and after installations. When glass is not cut to size by the manufacturer, and is furnished unlabeled from local stock, the Contractor shall submit an affidavit stating the quality, thickness, type and manufacturer of the glass furnished.

B. All safety glass shall bear a marking as specified in ANSI Z97.1 on each separate glass panel that shall remain visible after installation as required by IBC Section 2403.1 and 2406.2 as applicable.

1.07 ENVIRONMENTAL REQUIREMENTS

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

1.08 WARRANTY

A. Manufacturer's Warranty: Furnish manufacturer's warranty for insulated glass units against development of material obstruction to vision (such as dust or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a minimum 5 year period, unless longer period is standard with the manufacturer, following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the University.

B. The Surety shall not be held liable beyond 2 years from the project acceptance date.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Glass: All glass products shall be of the quality as manufactured by Vitro Architectural Glass (PPG), Pilkington North America LOF, ASG Industries, CE Glass Company, Globe Amerada Glass Co., Guardian Industries Corp., Interpane Glass Co., Oldcastle Building Envelope, National Guard Products, Sierracin/Sylmar, Viracon, Inc., or pre-approved equal.

1. Insulated Glazing: Insulating glass shall be Class A preassembled units of dual-seal construction consisting of 2 lites of glass (PPG Azuria at exterior and Clear at Interior) as specified, separated by a spacer with desiccant and dehydrated space hermetically sealed. The insulation glass units shall be free of parallax or optical distortions. Glass shall be heat treated as recommended by the coating manufacturer. Dimensional tolerance shall be as specified in the Insulating Glass Manufacturers Alliance (IGMA) TR-1200, "Commercial Insulating Glass Dimensional Tolerances". Provide safety glass at side light. Airspace shall be 1/2-inch. Glazing shall have the following minimum performance requirements:

a. Visible Transmittance: 61 percent.

b. Visible Light Reference: 11 percent, exterior and 14 percent interior.

c. U-Valve (Winter Night-Time): 0.47

d. Solar Heat Gain Coefficient: 0.39

e. Light to Solar Gain (LSG): 1.56

B. Glazing Compounds – Sealant for Exterior Glazing: One-part silicone, medium modulus, ASTM C920, Type S, Grade NS, Class 50, Use NT, M, G, A, and O, equivalent to Dow Corning 795 Silicone Building Sealant, General Electric Corp., SilGlaze II SCS2800, Tremco, Inc. Spectrum 2, Pecora 895NST, or pre-approved equal as recommended by the glass manufacturers.

C. Miscellaneous Glazing Materials:

1. Cleaners, Primers and Sealers: Of type recommended by sealant manufacturer.

2. Setting Blocks: Neoprene or EPDM, 100 percent silicone, 80-90 A durometer hardness as recommended by the glass manufacturer.

3. Spacers: Neoprene or EPDM, 50-60 Shore A durometer harness.

2.02 FABRICATION

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

PART 3 – EXECUTION

3.01 GENERAL

A. Perform all glazing in strict accordance, minimum edge and face clearances, glazing material tolerances, and weep system in strict accordance with applicable provisions of the “Glazing Manual” and “Sealant Manual” published by the Glass Association of North America (GANA).

B. Verify that openings for glazing are correctly sized, within tolerance, and glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

C. Insulated glass shall be installed in accordance with manufacturer’s instructions and IGMA TM-3000, “Glazing Guidelines for Sealed Insulating Glass Units”, and as herein specified.

3.02 INSTALLATION

A. Glass shall be set true and tight by skilled glaziers. Glazing compound shall be neatly and cleanly run with corners carefully made, using putty

knife for all work. Glazing stops shall be carefully handled and accurately secured in place.

B. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6-inches from corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.

C. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

D. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.

E. Set units of glass in each series with uniformity of draw, bow and similar characteristics.

F. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise noticed.

G. Force sealants into glazing channels to eliminate voids and to ensure complete “wetting” or bond of sealant to glass and channel surfaces.

H. Tool exposed surfaces of sealants to provide a substantial “wash” away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not “walk” out when installation is subjected to movement.

J. Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacture to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

K. Glass where secured by glazing stops, shall unless shown on drawings or specified herein, be set in full bed of glazing compound. Then force glazing stop into glazing compound on both sides and struckoff flush.

L. Glass where required or recommended by glass frame manufacturer shall be set in extruded vinyl or neoprene glazing strips provided by others and shall be installed in strict accordance with manufacturer's instructions.

M. Laminated Glass: Conform to manufacturer's recommendations for edge clearance, type of sealant and tape, and method of installation.

N. Sheet glass shall be cut and set with the visible lines or waves horizontal.

O. Insulating Glass Unit: Do not grind, nip, or cut edges or corners of units after the units have left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike fames or other objects. Installation shall conform to applicable recommendations of IGMA TM-3000.

3.03 PROTECTION AND REPLACEMENT

A. Glass shall be immediately protected against damage. Glazed openings shall be identified with suitable warning tapes, cloth or paper flags, or other acceptable method that will not damage glazing or surrounding materials.

B. At completion of work, imperfect glass which cannot be properly cleaned shall be replaced in kind. Broken, chipped, abraded, cracked or otherwise damaged glass must be replaced subject to the acceptance of the University.

3.04 CLEANING AND WASHING

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

B. Glass to be cleaned according to:

1. GANA Glass Informational Bulletin GANA 01-0300 – Proper Procedures for Cleaning Architectural Glass Products.

2. GANA Glass Informational Bulletin GANA TD-02-0402 – Heat-Treated Glass Surfaces Are Different.

C. Do not use scrapers or other metal tools to clean glass.

END OF SECTION

DIVISION 9 - FINISHES

SECTION 09250 – GYPSUM WALLBOARD

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS

1.02 SUMMARY

A. Complete all gypsum wallboard work as indicated or required by the drawings and as specified herein. Work shall include, but not limited to the following”

1. Gypsum wallboard on metal framing and furring.

2. Metal stud framing for wallboard.

3. Metal ceiling suspension system.

B. Related Work Described Elsewhere:

1. Exterior studs are provided under SECTION 05400 – COLD-FORMED METAL FRAMING.

2. Thermal Insulantion is provided under SECTION 07210 – BUILDING INSULATION.

3. Acoustical sealants are specified in SECTION 07920 – SEALANTS.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

B. Manufacturer's Data: Material description and manufacturer's recommended installation procedures for each material.

C. Shop Drawings: Submit shop drawings indicating fabrications and location of control and expansion joints, including plans, elevations, sections, details, and attachment to adjoining work. - Submit setting drawings for backing plates and anchors.

D. Safety Data Sheets (SDS): Submit SDS for each product as applicable.

1.04 QUALITY ASSURANCE

A. Industry Standard: Comply with applicable requirements of GA-216, "Application and Finishing of Gypsum Board", GA-214, "Recommended

Specification: Levels of Gypsum Board Finish", and GA-201, "Using Gypsum Board for Walls and Ceilings", by the Gypsum Association, except where more detailed or more stringent requirements are indicated, including the recommendations of the manufacturer.

B. Transverse Loading: The non-load bearing metal framing shall be capable of carrying a transverse load of 5 psf without exceeding the allowable stress or a deflection of L/360. Increase stud gauge, decrease stud spacing, or provide hidden from view lateral bracing to comply with these requirements at no additional cost to the University.

C. Gypsum Board Terminology: Refer to ASTM C 11, "Terminology Relating to Gypsum and Related Building Materials and Systems", for definition of terms for gypsum board assemblies not defined in this section or in referenced standards.

D. Provide support systems and attachments conforming with AISC 341, "Seismic Provisions for Structural Steel Buildings".

E. Seismic: Brace partitions in accordance with ICC IBC Section 1621, Architectural, Mechanical, and Electrical Component Seismic Design Requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver gypsum wallboard materials in sealed containers and bundles, fully identified with manufacturer's name, brand, type, and grade; store in a dry well ventilated space, protected from the weather, under cover and off the ground. Stack gypsum panels flat to prevent sagging. Joint materials shall be stored in accordance with manufacturer's printed instructions. Damaged or deteriorated materials shall be removed from jobsite.

B. Environmental Limitations: Comply with GA-238, "Guidelines for the Prevention of Mold Growth on Gypsum Board", and ASTM C 840, "Application and Finishing of Gypsum Board", requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

1.06 SAFETY PRECAUTIONS

A. Respirators and Other Concerns: Comply with OSHA 29 CFR 1910.134, "Respiratory Protection", ASTM C 930, "Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories", and other Federal, State, and local regulations governing safety. Provide workers with dust/mist respirators, training in their use, and protective clothing as approved by the National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) when installing insulation or sanding joint compound.

B. Smoking: Do not smoke during installation of blanket insulation.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General: Provide panels in maximum lengths and widths available that will minimize joints and correspond with the applicable support system. All gypsum board shall achieve a score of 10 for mold resistance per ASTM D 3273, “Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber”.

B. Gypsum Wallboard: ASTM C 1396/C 1396M, "Gypsum Board", 5/8-inch thick, tapered edge type, 48-inches wide, Type "R", or Type “W/R” (water resistant) where indicated on drawings.

C. Wallboard and Sheathing Fasteners: ASTM C 1002, "Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs", standard bugle head self-drilling, self-tapping corrosive-resistant drywall screws. Screws for structural studs shall conform to ASTM C 954, "Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033-inch (0.84 mm) to 0.112-inch (2.84 mm) in Thickness".

D. Reinforced Tape and Cement: ASTM C 475/C 475M, "Joint Compound and Joint Tape for Finishing Gypsum Board", materials for treating joints and fastener heads shall be as manufactured or recommended by the Manufacturer of the wallboard used.

E. Non-Load Bearing Studs: Comply with ASTM C 754, "Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products", for conditions indicated. ASTM C 645, "Nonstructural Steel Framing Members", studs shall be 6-inch unless indicated otherwise on the drawings. Studs shall be rolled formed channel of 25, 22, and 20 gauge galvanized steel, ASTM A 653/A 653M, "Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process", G60 coating. Gauges for equivalent structural and composite limiting height studs are acceptable. Provide holes and notches for conduit or electrical wiring.

F. Tracks: Metal floor and ceiling tracks shall be rolled formed channel of gauge electro-zinc plated steel of same gauge as stud with width dimensions suitable to corresponding stud sizes indicated on the drawings.

G. Furring Channels: ASTM C 645, hat-shaped, 7/8-inch deep, hot-dipped galvanized, 25 gauge.

H. Framing Fasteners: ASTM C 754, or ASTM C 1513, “Steel Tapping Screws for Cold-Framed Steel Framing Connections”, except as specified otherwise. Screws used in fire-resistive rated construction shall be of type approved for use by governing building code and fire rating test. For concrete and masonry, provide metal slots with adjustable inserts or

adjustable wall furring brackets. Powder actuated fasteners shall be type and size as recommended by the manufacturer of the material being fastened.

I. Ceiling Support Materials and Systems:

1. General: Size ceiling support components to comply with ASTM C 754, "Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products", unless indicated otherwise.

2. Direct Suspension Systems: Manufacturer's standard zinc-coated or painted steel system of furring runners, furring tees, and accessories designed for concealed support of gypsum drywall ceilings; of proper type for use intended equivalent to one of the following:

a. Armstrong World Industries, Inc.

b. Chicago Metallic Corp.

c. USG Interiors, Inc.

d. Pre-approved equal.

3. Wire for Hangers and Ties: ASTM A 641/A 641M, "Zinc-Coated (Galvanized) Carbon Steel Wire", Class 1 zinc coating, soft temper, 8 gauge for hangers supporting up to 12.5 square feet and 6 gauge where supporting up to 16 square feet and 18 gauge for ties.

J. Wallboard Accessories: ASTM C 1047, "Accessories for Gypsum Wallboard and Gypsum Veneer Base", Vinyl Corp. Plastic Components Inc., Vinyl Tech or pre-approved equal.

1. Standard Corner Bead: Vinyl Corp. Corner Bead CB 125 at all outside corners of wall, ceiling, and soffit as indicated.

2. Casing Trim: Vinyl Corp. "L" Bead SB 50 or 58, "J" Bead MJB 50 or 58, as applicable, or as indicated.

3. Control Joint: Vinyl Corp. CJV 16.

4. Other Accessories: As indicated or necessary for complete installation.

5. All accessories shall be vinyl, PVC, or pre-approved equal.

K. Joint Treatment Materials: ASTM C 475/C 475M; type recommended by manufacturer for the application indicated, except as otherwise noted. Perforated tape, and joint and topping compound, or "all-purpose" compound.

L. Laminating Adhesive: Special adhesive or joint compound specifically recommended for laminating gypsum boards.

PART 3 – EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

A. General: Comply with ASTM C 840, "Application and Finishing of Gypsum Board", Gypsum Association GA-216, and ASTM C 754 as applicable to the type of substrate and drywall support system indicated.

B. Tolerances:

1. Maximum variation of finish surface from true flatness shall be 1/8-inch in 10-feet in any direction unless specified otherwise.

2. Maximum variation of plumbness of wall shall be 1/8-inch in 10-feet of height.

3. Maximum variation from true position shall be 1/8-inch.

C. Ceiling Support Suspension Systems:

1. Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to inserts, clips or other anchorage devices or fasteners as indicated. Ensure that structural anchorage provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.

2. Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.

3. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

4. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

5. Secure hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.

6. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.

7. Sway brace ceiling to conform to the applicable seismic load and uplift, applicable requirements of ASTM E 580/E 580M, "Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions", and the manufacturer's recommendations.

8. Space main runners 4-feet on center and space hangers 4-feet on center along runners, except as otherwise shown.

9. Level main runners to a tolerance of 1/8-inch in 12-feet, measured both lengthwise on each runner and transversely between parallel runners.

10. Wire-tie or clip furring members to main runners and to other structural supports as indicated or as recommended by the manufacturer.

11. Direct-Hung Metal Support System: Attach perimeter wall track or angle wherever support system meets vertical surfaces. Mechanically join support members to each other and butt-cut to fit into wall track.

12. Space furring member 16-inches on center, except as otherwise indicated.

13. Install auxiliary framing at termination of drywall work and at openings for light fixtures and similar work, as required for support of both the drywall construction and other work indicated for support thereon.

14. Do not connect or suspend steel framing from ducts, pipes or conduit.

15. Keep hangers and braces 2-inches clear of ducts, pipes, and conduits.

D. Metal Wall and Soffit Framing:

1. Install supplementary framing, blocking, and bracing to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar work which cannot be adequately supported on gypsum board alone to comply with details indicated and with recommendations of gypsum board manufacturer, or if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.

2. Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.

3. Install runner tracks at floors, ceilings, and structural walls and columns where gypsum drywall stud system abuts other work, except as otherwise indicated.

4. Extend partition stud system through ceilings and elsewhere as indicated to the structural support or substrate above the ceiling except where indicated to terminate at the ceiling line.

5. Space studs and furring 16-inches on center, except as otherwise indicated.

6. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

7. Do not bridge building expansion joints with steel framing or furring. Frame both sides of joints independently.

8. Frame door openings with vertical studs securely attached by screws at each jamb either directly to frames or to jamb anchor clips on door frame in accordance with door manufacturer's recommendations; install runner track sections (for jack studs) at head and secure to jamb studs. Provide runner tracks of same gauge as jamb studs. Space jack studs same as partition studs.

9. Install 20 gauge studs at each jamb for all doors 2'-8" wide to 4-feet wide weighing not more than 200 pounds; and for all doors less than 2^{1}-8" wide weighing more than 100 pounds but not more than 200 pounds.

10. Install double 20 gauge studs for single doors up to 4-feet wide, weighing more than 200 pounds but not more than 300 pounds; screw attach web of back-to-back studs direct to jamb anchor clips

nested between flange of stud.

11. Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

12. Install each steel framing and furring member so that fastening surface does not vary more than 1/8-inch from plane of faces of adjacent framing.

13. Seal tracks with continuous beads of acoustical sealant along each face prior to installation of gypsum board.

E. Gypsum Wallboard, General:

1. Locate exposed end-butt joints as far from center of walls and ceilings as possible.

2. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16-inch open space between boards. Do not force into place.

3. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that both tapered edge joints abut and mill-cut or field-cut end joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

4. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

5. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.

6. Cover both faces of stud partition framing with gypsum board as indicated.

7. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4-inch to 3/8-inch space and trim edge with J-type semi-finishing edge trim. Seal joints with acoustical sealant. Do not fasten drywall directly to stud system runner tracks.

8. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

9. Install insulation at framing as indicated after cover material has been installed on one side of cavity. Size insulation to width of members spacing. Press friction fit insulation between members as recommended by the insulation manufacturer. When unfaced insulation is used and the stud depth is larger than the insulation thickness, install wire or metal straps to hold insulation in place.

F. Methods of Gypsum Wallboard Application:

1. On ceilings, apply gypsum board prior to wall/partition board application, to greatest extent possible and at right angle to framing, unless otherwise indicated.

2. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels' not less than one framing member.

3. Single-Layer Application:

a. On partitions/walls higher than 8'-1", apply gypsum board vertically (parallel), unless otherwise indicated, and provide sheet lengths which will minimize end joints.

b. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular); use maximum length sheets possible to minimize end joints.

4. Single-Layer Fastening Method: Apply gypsum boards to supports by fastening with screws, spaced not to exceed 16-inch centers for walls and 12-inch centers for ceilings.

G. Installation of Trim Accessories:

1. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, attach trim in accordance with manufacturer's instructions and recommendations.

2. Install corner beads at external corners.

3. Install edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

4. Install J or LC-type semi-finishing trim where indicated.

5. Install control joints where indicated or necessary in large ceiling and wall expanses per GA-201. Use door header to ceiling or floor to ceiling in long partitions and wall furring runs and from wall to wall in large ceiling areas. Where joint will be conspicuous, obtain acceptance prior to installation.

3.03 DRYWALL FINISHING

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

1. Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated that does not require tape.

2. Apply joint compound in 3 coats (not including prefill of openings in base) and sand between last 2 coats and after last coat. Fastener heads, dents, gouges, and cut-outs shall be filled with joint compound and sanded.

3. Accessories at exposed joints, edges, corners, openings, and similar locations shall be taped, floated with joint compound, and sanded in accordance with manufacturer's instructions and MSDS to produce surfaces ready for gypsum board finishes.

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

1. Level 1: For ceiling plenum areas and other concealed areas.

2. Level 2: Where wall panels form substrates for tile.

3. Level 3: For wall surfaces to receive heavy-duty wallcoverings.

4. Level 4: For ceiling surfaces to receive flat paint.

5. Level 5: For wall surfaces to receive semi-gloss enamel.

6. Where Level 5 gypsum board finish is indicated, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories; and apply a thin, uniform skim coat of joint compound over entire surface. For skim coat, use joint compound specified for third coat, or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Touch up and sand between coats and after last coat as needed to produce

a surface free of visual defects, tool marks, and ridges and ready for decoration.

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

8. Where Level 3 gypsum board finish is indicated, embed tape in joint compound and apply first and fill (second) coats of joint compound.

9. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.

10. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.

3.04 BACKING PLATES AND ANCHORS

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

3.05 CLEANING AND REPAIRING

A. After installation and before painting, correct surface damage and defects. Leave surface clean and smooth, satisfactory to the painter. No painting shall be done over gypsum board work until the joints are thoroughly dry. Joints and fastenings are to be invisible after painting.

B. Remove drywall materials from electrical boxes, hardware, fixtures, flooring, and similar items and surfaces not intended to receive drywall materials.

END OF SECTION

SECTION 09510 - ACOUSTICAL CEILING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Provide suspended lay-in acoustical ceiling systems as indicated and herein specified.

B. Related Work Specified Elsewhere:

1. Acoustical sealants are specified in SECTION 07920 - SEALANTS.

2. FRP lay-in panels are provided under SECTION 09760 – DECORATIVE FIBERGLASS REINFORCED PANELS.

3. Coordinate location of all mechanical items with DIVISION 15 - MECHANICAL.

4. Coordinate location of all electrical items with DIVISION 16 - ELECTRICAL.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's technical product data and installation instructions for suspension system and lay-in panels substantiating that all products comply with project requirements.

C. Shop Drawings: Submit shop drawings which clearly show all components of the systems to be installed at this project. Include suspension system, furring, jointing, method of anchoring and fastening, and locations of mechanical and electrical features. Jointing diagrams shall show typical arrangement of the panels in each space, including the terminations at margins of ceilings and at intersections with vertical surfaces. Include typical details of the following:

1. Intermediate framing for hanger supports that fall between structural framing members.

2. Hanger fastenings at structural framing members and at main runners.

3. Acoustical-unit support at ceiling penetrations.

4. Splicing method for main and cross runners.

5. Seismic restraint system.

D. Samples: Submit 4 samples of each type of acoustical unit, edge molding, and suspension runner.

E. Maintenance Instructions: Submit manufacturer's maintenance instructions for acoustical ceilings.

F. Receipt of Delivery: Three copies of the receipt signed by the user's representative, attesting to delivery of extra lay-in panels as required under item entitled "EXTRA LAY-IN PANELS" hereinbelow.

1.04 DESIGN CRITERIA FOR CEILING SYSTEMS

A. Suspended Ceiling Attenuation Class: The ceiling attenuation class (ceiling CAC range) of the ceiling system shall be as specified when determined in accordance with ASTM E 1414/E 1414M, "Airborne Sound Attenuation between Rooms Sharing a Common Ceiling Plenum". Test ceiling shall be continuous at the partition and shall be assembled in the suspension system in the same manner that the ceiling will be installed on the project.

B. Ceiling Sound Absorption: Determine the NRC in accordance with ASTM C 423, "Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method".

C. Light Reflectance: Determine light reflectance factor in accordance with ASTM E 1477, "Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers", test method.

D. Seismic: Install ceiling system in accordance with ASTM E 580/E 580M, "Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions", and ICC IBC Section 1613, Earthquake Loads.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical units in the manufacturer's original unopened containers with brand name and type clearly marked. Handle materials carefully and store them under cover in dry, watertight enclosures.

B. Handle manufactured materials as recommended by the manufacturer.

1.06 ENVIRONMENTAL CONDITIONS

For 24 hours before, during, and 24 hours after installation of acoustical units, maintain temperature and relative humidity at typical in-service conditions. Interior finish work such as concrete work shall be completed and dry before installation. Mechanical, electrical, and other work above the ceiling line shall be

completed and accepted prior to the start of acoustical ceiling installation.

1.07 EXTRA LAY-IN PANELS

The Contractor shall provide a minimum of one percent extra lay-in panels in labeled full original manufacturer's containers for each type and color used for ceilings to the University upon completion of the project. Materials shall be in the same lot number used in the project.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Acoustical Ceiling Tile Units: ASTM E 1264, "Classification for Acoustical Ceiling Products", and the requirements for each type. For convenience and to establish standards of quality and design, the following list indicates items manufactured by Armstrong World Industries, Inc. Equivalent products, accepted by the University, of the following manufacturers will be accepted:

1. USG Interiors Inc.

2. Celotex Corporation

3. Pre-approved equal

The products of other manufacturers are acceptable provided they meet or exceed the materials and construction requirements as specified.

B. Composition Lay-In Panels:

1. Type: Type III (Non-asbestos mineral composition) with factory-applied standard white washable painted finish.

2. Form: 2.

3. Class: A, flame spread 25 or less.

4. Pattern: CD.

5. Noise Reduction Coefficient (NRC) Grade: Minimum 0.55.

6. Ceiling Attenuation Class (CAC): Minimum 30.

7. Light Reflectance (LR) Coefficient: LR-0.81 or greater.

8. Nominal Size: 24 x 24-inches.

9. Edge Detail: Square lay-in.

10. Design: Armstrong Fissured, No. 756 or pre-approved equal.

2.02 SUSPENSION SYSTEM

A. Suspension System: ASTM C 635/C 635M, "Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings", and the following requirements:

1. Type: Exposed grid, 15/16-inch standard width. Provide grid for high humidity exposure.

2. Structural Classification: Intermediate duty for main runners.

3. Finish: Surfaces exposed to view shall be of uniform width and shall be aluminum or galvanized steel with factory applied white baked enamel finish in colors to match ceiling tile. Zinc coated steel shall receive a phosphate treatment prior to painting.

4. Accessories: Provide manufacturer's standard wall or edge moldings.

B. Hanger Wires: ASTM A 641/A 641M, "Zinc-Coated (Galvanized) Carbon Steel Wire", Class 1, 12 gauge, galvanized steel.

C. Fasteners: Rust-resistant of the type recommended by the manufacturer. Size fasteners for 5 times design load indicated in ASTM C 635/C 635M, Table 1, Direct Hung, unless indicated otherwise.

PART 3 – EXECUTION

3.01 PREPARATION

The Acoustical Contractor shall be responsible for the examination and acceptance of all surfaces and conditions affecting the installation of his work. Start of this work shall constitute acceptance of all work conditions. Unsatisfactory conditions shall be reported to the University so that corrective measures can be taken.

3.02 INSTALLATION

A. General: Installation shall conform to the manufacturer's directions for the suspension system and lay-in panels used and to the layout shown on the drawings for the size grid to be installed.

B. Suspended Ceilings: ASTM C 636/C 636M, "Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels", and ASTM E 580/E 580M.

1. Hangers: Space hangers 4-feet on centers each direction. Lay hangers out for each individual room or space. Install additional hangers where required to support framing around beams, ducts, columns, grilles, and other penetrations through the ceiling.

2. Suspension Members: Keep main runners and carrying channels clear of abutting walls and partitions. Provide at least two main runners for each ceiling span.

3. Acoustical Units: Edges of ceiling tiles shall be in close contact with metal supports and in true alignment. Arrange units so that units less than 1/2 width are minimized. Units in exposed-grid system shall be held in place with manufacturer's standard hold-down clips, at units weighing less than 1 psf or for vertical panels.

4. Wall or Edge Molding: Install wall molding at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

5. Tolerance: Ceilings shall be flat and level within 1/8-inch in 10-feet.

6. Sealing: Apply a continuous ribbon of acoustical sealant on vertical leg of wall or edge moldings.

7. Where cut edges of lay-in panels are exposed or panel face is scratched, paint edges or face to match standard facing with coating as recommended by the manufacturer.

3.03 CLEANING AND REJECTION

A. The Contractor shall exercise all necessary precautions to avoid damaging or soiling the units. All damaged units shall be replaced with new units by the Contractor.

B. Following defects shall be cause for rejection or replacement of tiles or panels by Contractor:

1. Crooked or open joints.

2. Soiled tiles or panels not cleaned to original condition.

3. Fractures, cracks or corner chips.

4. Color variation.

5. Loose or fallen tiles and panels.

6. Warped tiles and panels.

7. Units damaged from leaking roof.

END OF SECTION

SECTION 09620 - POLYURETHANE FLOORING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 - GENERAL REQUIREMENTS.

1.02 SUMMARY

Provide seamless heavy duty poured polyurethane flooring systems with integral cove base as indicated.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's technical information and installation details to describe materials to be used.

C. Certificates: Submit manufacturer's certificate of compliance that materials meet specification requirements.

D. Mock-Ups: Provide on-site mock-ups of each flooring system for University's approval.

E. Safety Data Sheets (SDS): Submit SDS for all materials.

1.04 QUALITY ASSURANCE

A. Contractor shall be an established firm regularly engaged in satisfactory installation of similar materials for the past 5 years. Contractor shall provide a letter of certification by manufacturer that Contractor is a current qualified installer.

B. Single Source Responsibility: Provide fillers, broadcast media, underlayment, polyurethane body coat produced by the same manufacturer with no less than 10 years' experience in the manufacture and supply of these principal materials for work in this Section.

C. Verification must be supplied by the manufacturer that the polyurethane concrete based flooring system has passed, with an Observed Growth Rating of one, ASTM G 21, "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi". This result will ensure that the polyurethane concrete based flooring system will not support the growth of hazardous fungi.

D. Verification must be supplied by the manufacturer that the polyurethane concrete based flooring system has passed, ASTM G 22, "Standard Practice for Determining Resistance of Plastics to Bacteria", Procedure B. No evidence of E. coli or Salmonella Choleraesuis growth should be

observed.

E. Mock-Ups: Provide on-site mock-ups of each type of polyurethane flooring complete with associated integral cove base. Location shall be as directed by the University. Size shall be minimum 36-inch square with cove base. Remove all unaccepted installations and provide new as directed by University. Remove accepted mock-ups from site prior to flooring installation.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Material shall be delivered to project site in manufacturer's original unopened containers bearing manufacturer's name, product, and color.

B. Materials shall be stored indoors, protected from damage, moisture, direct sunlight, and temperatures above 80 degrees Fahrenheit.

C. Handle materials in accordance with manufacturer's recommendations.

1.06 PROJECT CONDITIONS

A. Evaluate the substrate condition, including moisture content and extent of substrate leveling and repairs required, if any. Compare results with manufacturer's recommendations.

B. Coordinate flooring work with other trades to ensure adequate illumination, ventilation, and dust free environment during application and curing of flooring.

C. Comply with material manufacturer's recommended temperature limitations for flooring application.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Poured Polyurethane Flooring: UCRETE MF slip resistant polyurethane concrete flooring system as manufactured by BASF Corporation or pre-approved equal, pigmented as indicated.

Physical Properties:

a. Flooring system shall comply with the following minimum test standards:

Property	Test Standard	Result
Compressive Strength	ASTM C 579	7792/7387 psi
Tensile Strength	ASTM C 307	845 psi
Flexural Strength	ASTM C 580	0.0003 psi
Density	ASTM C 905	130.47 lb./ft. $^{-3}$
Water Absorption	ASTM C 413	Less than 0.1 percent
Compressive Modulus	BS 6319: PT6	0.0004 psi
Service Temperature		-40 degrees Fahrenheit to 248 Degrees Fahrenheit
Impact Resistance	ASTM C 131/C 535	IR greater than 4

b. Flooring system shall show no chemical attack when tested in accordance with ASTM D 1308 at ambient temperature for 7 days immersion against the following reagent and concentrations noted.

Reagent:

(a) Boric Acid 100 percent.

(b) Phosphoric Acid 80 percent.

(c) Castor Oil 100 percent.

(d) Acetic Acid 20 percent.

(e) Ethylene Glycol 100 percent.

(f) Fatty Acid 100 percent.

(g) Hydrochloric Acid 35 percent.

(h) Formic Acid 70 percent.

(i) Glycolic 100 percent.

(j) Sodium hypochlorite 27 percent.

(k) Maleic Anhydride 100 percent.

(l) Picric 5 percent.

(m) Citric Acid 40 percent.

(n) Lactic Acid 85 percent.

(o) Isopropanol 100 percent

(p) Copper Sulfate (in solution).

(q) Nitric Acid 30 percent.

(r) Glycolic Acid 100 percent.

(s) Muriatic Acid 35 percent.

(t) Benzoic Acid 100 percent.

(u) Stearic Acid All.

(v) Sulfuric Acid 30 percent.

(w) Butanol 100 percent.

(x) Amyl Acetate All.

B. Poured Polyurethane Flooring: UCRETE MF slip resistant polyurethane concrete flooring system as manufactured by BASF Corporation or pre-approved equal, pigmented as indicated.

Physical Properties:

a. Flooring system shall comply with the following minimum test standards:

Property	Test Standard	Result
Compressive Strength	ASTM C 579	7243 psi
Tensile Strength	ASTM C 307	$1.6x10^{-6}$ psi
Flexural Strength	ASTM C 580	$2.6x10^{-6}$ psi
Density	ASTM C 905	122.9 lb./ft. $^{-3}$
Water Absorption	ASTM C 413	Less than 0.1 percent
Compressive Modulus	BS 6319: PT6	0.0004 psi
Service Temperature		-40 degrees Fahrenheit to 140 Degrees Fahrenheit
Impact Resistance	ASTM C 131/C 535	IR greater than 4

b. Flooring system shall show no chemical attack when tested in accordance with ASTM D 1308 at ambient temperature for 7 days immersion against the following reagent and concentrations noted.

Reagent:

(a) Boric Acid 100 percent.

(b) Phosphoric Acid 80 percent.

(c) Castor Oil 100 percent.

(d) Acetic Acid 20 percent.

(e) Ethylene Glycol 100 percent.

(f) Fatty Acid 100 percent.

(g) Hydrochloric Acid 35 percent.

(h) Formic Acid 70 percent.

(i) Glycolic 100 percent.

(j) Sodium hypochlorite 27 percent.

(k) Maleic Anhydride 100 percent.

(l) Picric 5 percent.

(m) Citric Acid 40 percent.

(n) Lactic Acid 85 percent.

(o) Isopropanol 100 percent.

(p) Copper Sulfate (in solution).

(q) Nitric Acid 30 percent.

(r) Glycolic Acid 100 percent.

(s) Muriatic Acid 35 percent.

(t) Benzoic Acid 100 percent.

(u) Stearic Acid All.

(v) Sulfuric Acid 30 percent.

(w) Butanol 100 percent.

(x) Amyl Acetate All

C. Cove Base: UCRETE RG (cove base) slip resistant polyurethane concrete wall system as manufactured by BASF Corporation or pre-approved equal, pigmented as indicated.

Physical Properties:

a. Cove system shall comply with the following minimum test standards:

Property	Test Standard	Result
Compressive Strength	ASTM C 579	$6.5x10^{-6}$ psi
Tensile Strength	ASTM C 307	$1.01x10^{-6}$ psi
Flexural Strength	ASTM C 580	0.0003 psi
Density	ASTM C 905	130.47 lb./ft. $^{-3}$
Water Absorption	ASTM C 413	Less than 0.1 percent
Service Temperature		-40 degrees Fahrenheit to 248 Degrees Fahrenheit
Impact Resistance	ASTM C 131/C 535	IR greater than 4

b. Cove system shall show no chemical attack when tested in accordance with ASTM D 1308 at ambient temperature for 28 days immersion against the following reagent and concentrations noted.

Reagent:

(a) Boric Acid 100 percent.

(b) Phosphoric Acid 80 percent.

(c) Castor Oil 100 percent.

(d) Acetic Acid 20 percent.

(e) Ethylene Glycol 100 percent.

(f) (Fatty Acid 100 percent.

(g) Hydrochloric Acid 35 percent.

(h) Formic Acid 70 percent.

(i) Glycolic 100 percent.

(j) Sodium hypochlorite 27 percent.

(k) Maleic Anhydride 100 percent.

(l) Picric 5 percent.

(m) Citric Acid 40 percent.

(n) Lactic Acid 85 percent.

(o) Isopropanol 100 percent.

(p) Copper Sulfate (in solution).

(q) Nitric Acid 30 percent.

(r) Glycolic Acid 100 percent.

(s) Muriatic Acid 35 percent.

(t) Benzoic Acid 100 percent.

(u) Stearic Acid All.

(v) Sulfuric Acid 30 percent.

(w) Butanol 100 percent.

(x) Amy1 Acetate All.

D. Moisture Vapor Barrier System: MasterTop VB 240FS by BASF Corporation or pre-approved equal.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Mortar must have a 7-day minimum curing period. The surface must be clean and dry, physically sound and free of contamination. Surfaces must be free of holes, voids or defects. Cracks and abrupt changes in surface profile must be corrected. All curing compounds and seaters must be removed.

B. Verify that moisture content is within range acceptable to manufacturer using calcium chloride test kit in accordance with ASTM F 1869. Alternatively, ASTM F 2170 can be used to determine the Relative Humidity within the concrete and mortar substrate.

C. Contractor must report, in writing, surfaces left in improper condition by other trades. Application will constitute acceptance of surfaces by the applicator.

3.02 PREPARATION

A. Prepare surfaces by shot blast or similar mechanical method, as recommended by manufacturer.

B. Patch all depressions, divots, honeycombed, or scaled concrete with

polyurethane concrete filler, as recommended by manufacturer.

C. Fill all static (non-moving) cracks or control joints, greater than 180 days old, with polyurethane concrete, as recommended by manufacturer.

D. All control joints less than 180 days old must be re-cut and honored through flooring system, filled with control joint filler as recommended by manufacturer.

E. Fill all active (moving) cracks or joints with a firm but flexible (or non-rigid) sealant material, as recommended by manufacturer. Expansion joints should be re-cut in finished floor and filled with elastomeric joint sealant.

F. Saw cut a groove in the concrete or mortar (key way) at all free edges around perimeters, along channels or expansion joints, at doorways and columns, with a depth and width equal to twice the thickness of the flooring system. Refer to manufacturer's Standard Construction details.

3.03 PRIMING

Provide primer as recommended by the manufacturer.

3.04 INSTALLATION

A. Comply with flooring system manufacturer's recommendations.

1. Mix component polyurethane concrete flooring system according to manufacturer's instructions.

2. Spread the mix evenly over the substrate and close using a steel trowel. Avoid over troweling as this will result in gloss variations and impaired slip resistance. Install to a thickness of 1/4-inch to 1/2-inch depending on requirements.

3. Using a roller as recommended by the manufacturer, back roll over the surface. The roller should be passed over the surface no more than 2 times.

B. Moisture Vapor Barrier System: Install as recommended by the manufacturer.

C. Cove Base: Install a 6-inch high integral cove base with a nominal one-inch radius onto wall surfaces unless indicated otherwise. Cove base installations shall follow the manufacturer's construction cove details.

3.05 CLEANUP

Remove waste materials, rubbish and debris and dispose of them in accordance with local regulations. Leave work areas in a clean condition.

3.06 PROTECTION

A. Protect the completed flooring system from water, airborne particles or other surface contaminates until cured and tack free, approximately 12 hours at 70 degrees Fahrenheit after application, or until all other trades on the construction project are completed with their project work.

B. Protect Polyurethane Composite flooring from UV light which may cause a change in color hue but will not affect the physical properties of the system.

END OF SECTION

SECTION 09651 - RESILIENT BASE

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

Provide resilient base where scheduled and as specified herein.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's product data for base and adhesive, including installation instructions.

C. Samples: Submit 4 samples of bases shall be submitted to the University for color selection.

D. Safety Data Sheets (SDS): Submit SDS for each material as applicable.

1.04 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered to the job site in original unopened containers marked with grade and manufacturer’s brand name. Handle and store materials carefully in accordance with manufacturer’s instructions.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Resilient Wall Base: Resilient base shall conform to ASTM F1861, "Resilient Wall Base", Type TS or Type TP, rubber, Group 1 or 2, 4-inch high, topset type, 1/8-inch thick with a smooth exposed surface and textured bonding surface on its unexposed face. Provide Style B, cove type. Provide preformed outside corners. The rubber material shall be free from offensive odor and its color shall be uniform throughout the thickness of the base. Base shall be equivalent to Burke Mercer Flooring Products Cove Base, Johnsonite, Roppe, Mannington, Azrock, Armstrong, Tarkett, or accepted equivalent.

B. Adhesives: Base adhesive shall be water based, rubber-resin formula, as recommended by the manufacturer for the specific materials used. Material shall be beige or white, solvent free with zero VOC content, low odor, no ammonia, and non-flammable in wet state. Do not use adhesive not intended for its purpose.

PART 3 – EXECUTION

3.01 INSTALLATION OF MATERIALS

A. Resilient base shall continue behind removable and/or portable cabinets, cases, etc. Installation shall not begin until the work of other trades, including painting, has been completed.

B. All work shall be done by experienced tradesmen in strict accordance with recommended specifications of the respective manufacturer. Where not contrary to manufacturer's recommendations, adhesive shall be applied with a notched trowel in a thin and even coat.

C. Resilient base shall be applied onto thoroughly-dried walls with cove base adhesive only. Because of the thermoplastic character of base, care shall be taken not to stretch it during installation since it will shrink and leave a gap at joints. The top and bottom edges shall be in firm contact with the wall and floor. Pre-molded interior and exterior corners shall be used unless otherwise accepted by the University. If corners are formed on the job, the wrap around from corner shall not be less than 12-inches long. Otherwise, the resilient base shall be continuous around the corners. On masonry and similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

D. Prohibit traffic on finished floor for 24 hours after installation.

3.02 CLEANING AND PROTECTION

A. Spots of adhesive shall be removed immediately as work progresses. Contractor shall be responsible for protecting the resilient bases until acceptance of the project. Clean bases, but do not polish them.

END OF SECTION

SECTION 09760 – DECORATIVE FIBERGLASS REINFORCED PANELS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Provide prefinished polyester glass reinforced plastic sheets and molding trims adhered to prepared walls and for lay-in ceiling panels.

B. Related Work Described Elsewhere:

1. Substrate is provided under SECTION 09250 – GYPSUM WALLBOARD.

2. Suspension system for FRP ceiling lay-in panels is provided under SECTION 09510 – ACOUSTICAL CEILINGS.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's technical product data to indicate compliance with these specifications, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

C. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.

D. Selection Samples: Submit manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

E. Samples for Verification: Submit 4 each section of panel for each finish selected indicating the color, texture and pattern required.

1. Submit complete with specified applied finished.

2. For selected patterns show complete pattern repeat.

3. Exposed Molding and Trim: Provide samples of each type, finish and color.

F. Safety Data Sheets (SDS): Submit SDS for each material applicable.

1.04 QUALTIY ASSURANCE

Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with ASTM E 84, “Surface Burning Characteristics of Building Materials”, minimum wall required rating – Class C.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials factory packaged on strong pallets.

B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Marlite, Crane Kemlite, or pre-approved equal.

B. Product: Standard FRP.

2.02 WALL PANELS

A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319, “Glass-Fiber Reinforced Polyester Wall and Ceiling Panels”.

1. Coating: Multi-layer print, primer and finish coats or applied over-layer.

2. Dimensions:

a. Thickness: Minimum 3/32-inch nominal.

b. Width: 4-feet nominal.

c. Length: 9-feet nominal.

3. Tolerance:

a. Length and Width: +/- 1/8 inch.

b. Square: Not to exceed 1/8-inch for 8-foot panels or 5/32-inch for 10-foot panels.

B. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.

C. Front Finish: Pebble, color as indicated.

2.03 CEILING PANELS

Marlite P100CP White, 2-foot square by 0.090-inch thick or preapproved equal.

2.04 WALL MOLDINGS

A. PVC: Extruded PVC Trim Molding Profiles for panel thickness as required.

1. Inside Corner.

2. Outside Corner.

3. Edge.

4. Spline.

5. Color: To match panels or as selected by the University.

2.05 ACCESSORIES

A. Adhesive: As recommended by the manufacturer for the required substrates.

B. Sealant: Color matched where exposed as recommended by the manufacturer.

PART 3 – EXECUTION

3.01 PREPARATION

A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surfaces.

B. Repair defects prior to installation. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill identifications.

C. Ceiling suspension system is level and grid conforms with lay-in panel size.

3.02 INSTALLATION

A. Comply with manufacturer's recommended procedures and installation sequence.

B. Cut sheets to meet supports allowing 1/8-inch clearance for every 8-foot of panel. Cut and drill with carbide tipped saw blades or drill bits, or cut

with shears.

C. Apply wall panels to substrate, vertically oriented with seams plumb and pattern aligned with adjoining panels. Install panels with manufacturer's recommended gap for panel field and corner joints.

1. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.

2. Comply with manufacturer's instructions regarding method of application spread rate, drying time, open time, and temperature and humidity limitations.

3. Align and plumb the first sheet before allowing the glue lines to come together, then apply the sheet slowly from one side to the other to expel air. Roll uniformly with hard rubber roller.

4. Keep faces clean during application.

D. Apply wall panel moldings to all panel edges using silicone sealant providing for required clearances.

1. All moldings must provide for a minimum 1/8-inch of panel expansion at joints and edges, to insure proper installation.

2. Apply sealants to all moldings, channels and joints between the system and different materials to assure watertight installation.

E. Install ceiling panels in suspension system as recommended by the manufacturer. Cut panels where required.

3.03 CLEANING

A. Remove excess sealants from panels and moldings. Wipe panel down using a damp cloth and mild soap solution of cleaner.

B. Refer to manufacturer's specific cleaning recommendations.

C. Do not use abrasive cleaners.

END OF SECTION

SECTION 09900 – PAINTING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

A. The work includes painting and finishing of exterior and interior items and surfaces throughout the project, whether scheduled or not, except as otherwise indicated. Painting shall include new work and existing new surfaces made bare or damaged during construction and existing surfaces. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of the work and is included in this section.

B. The work includes field painting of exposed bare and covered pipes and conduits (including color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under the electrical work, such as junction boxes, raceways and cabinets, except as otherwise indicated.

C. “Paint” as used herein means all coating systems materials, including primers, enamels, sealers, stain, varnish, and fillers, and other applied materials whether used as prime, intermediate or finish coats, except as specifically noted herein.

D. Paint all exposed surfaces whether or not colors are designated in “schedules”. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. If color or finish is not designated, the University will select these from standard colors available for the materials systems specified.

1.03 PAINTING NOT INCLUDED

A. The following categories of work are not included as part of the field-applied finish work, or are included in other sections of these specifications.

1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under the various sections for miscellaneous metal, hollow metal work, and similar items. Also, for fabricated components such as shop-fabricated or factory-built mechanical and electrical equipment or accessories.

2. Mechanical and Electrical Work: The prime coat for mechanical and electrical work is specified in Divisions 15 – MECHANICAL

and 16 – ELECTRICAL, respectively. Finish coats are as specified herein.

3. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) solid phenolic, plastic laminate, acoustic materials, high performance organic coated metal, and finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets.

4. Concealed Surfaces (Present and Future): Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, and pipe spaces.

5. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, copper, chromium plate, and similar finished materials will not require finish painting, unless otherwise indicated.

6. Labels: Do not paint over any code-required labels, such as Underwrites' Laboratories, or any equipment identification, performance rating, name, or nomenclature plates.

1.04 SUBMITTALS

A. Submit in accordance with Section 01300 – SUBMITTALS.

B. Schedule of Finishes: Submit Four (4) sets of proposed painting finish schedules shall be submitted to the University for Acceptance. The schedule shall indicate the wet film thickness (mils) at which the proposed paints/coatings will be applied that are necessary to achieve the final dry film thickness indicated on the Schedule of Finishes under item entitled "SCHEDULE OF FINISHES" hereinbelow.

C. Color Samples: Submit the following to the University for acceptance.

1. Four (4) sets of each color finish sample.

2. After the color finish sample has been accepted, one set of color finish samples painted onto 8 1/2-inch x 11-inch cardboard shall be submitted. The cardboard shall be divided into three horizontal strips and painted as follows:

a. Prime 3 strips.

b. First coat bottom 2 strips.

c. Second coat bottom strip.

D. Schedule of Operations: Before work on the project is commenced, submit complete sets of a work schedule showing Contractor's sequence of operations and dates.

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

F. Certification: Submit copies of asbestos-free, lead-free, zinc-chromate-free, strontium-chromate-free, cadmium-free, and mercury free paint certificates.

G. Manufacturer's Product Data Sheets: Submit copies of the Manufacturer's Product Data Sheets for the primers, paints, coatings, solvents, sealing and patching materials, sealants and caulking, and other materials being used. Data sheets shall indicate thinning and mixing instructions, required film thickness (mil) and application instructions.

H. Manufacturer's Material Safety Data Sheet (MSDS): Submit copies of the Manufacturer's Material Safety Data Sheets for coating, solvents, and other hazardous materials.

1.05 ANALYZING AND TESTING

A. All paints and their applied thickness shall be subject to testing whenever the University deems necessary to determine conformation to the requirements of these specifications. Should testing by a laboratory be required, the laboratory shall be selected by the University and the cost of testing shall be borne by the Contractor. However, should test results show that the paint is in compliance with this specification, the cost will be borne by the University.

B. All rejected material shall be removed from the job site immediately. Surfaces painted with the rejected material shall be redone at no additional cost to the University.

C. Where the required paint thickness is deficient, the affected surface(s) shall be recoated as necessary to provide the required paint thickness at no additional cost to the University.

1.06 QUALITY ASSURANCE

A. Painting Terminology: Refer to ASTM D 16, "Standard Terminology for Paint, Related Coatings, Materials, and Applications".

B. Gloss/Sheen Levels: ASTM D 523, “Specular Gloss”, as follows:

Description	Units @ 60 degrees	Unites @ 85 degrees
Matte or flat	0 to 5	10 max
Velvet	0 to 10	10 to 35
Eggshell	10 to 25	10 to 35
Satin	20 to 35	35 min
Semi-Gloss	35 to 70	
Gloss	70 to 85	
High Gloss	more than 85	

Refer to Material Finish Code on drawings for sheen.

1.07 WARRANTY

A. The Contractor shall warrant that the work performed under this section conforms to the contract requirements and is free of any defect in the materials used and workmanship performed by the Contractor. Such warranty shall continue for a period of two (2) years from the Project Acceptance date and the Contractor shall remedy any such defect which is discovered during that period at no cost to the University.

B. The University will notify the Contractor in writing within a reasonable time after discovery of any failure or defect.

C. Should the Contractor fail to remedy any failure or defect described in Paragraph A above within 10 working days after receipt of notice thereof, the University shall have the right to repair or otherwise remedy such failure or defect and charge the Contractor for the cost of same.

1.08 SPECIAL REQUIREMENTS

A. Codes: The Contractor shall comply with the State OSHL (Occupational Safety and Health Law) and all pollution control regulations of the State Department of Health.

B. Safety methods used during coating applications shall comply with SSPC-PA Guide.

C. Protections:

1. Persons:

a. The Contractor shall take all necessary precautions to protect public pedestrians, including tenants from injury.

b. The Contractor shall provide, erect, and maintain safety barricades around scaffolds, hoists, and wherever

Contractor's operation create hazardous conditions in order to properly protect the public and workmen.

2. Completed Work: The Contractor shall provide all necessary protection for wet paint surfaces.

3. Protective Covering: The Contractor shall provide and install protective covering over equipment, floor, and other areas that are not scheduled for treatment. Protective covering shall be clean, sanitary drop cloth or plastic sheets. Paint applied to surfaces not scheduled for treatment shall be completely removed and surfaces shall be returned to original condition.

4. Safeguarding of Property: The Contractor shall take whatever steps may be necessary to safeguard his work and also the property of the University and other individuals in the vicinity of the work area during the execution of this Contract. Contractor shall be responsible for and make good on any and all damages and for losses to work or property caused by his or his employee's negligence. Where the damaged property cannot be cleaned and restored to its original condition (i.e. prior to being damaged) it shall be replaced with a new product of equal quality. No proration or use of "used" products will be permitted.

5. Fire Safety: The Contractor shall direct his employees not to smoke in the vicinity and to exercise precautions against fire at all times. Waste rags, plastic (polyester sheets), empty cans, etc., shall be removed from the site at the end of the each day.

D. Right of Rejection: The University will have the right to reject all work which is not in compliance with the plans and specifications. Rejected work will be redone at no additional cost to the University. In addition, the University will 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.

E. Sequence of Operations: The sequence of operations shall divide the surfaces into work areas and present a schedule for:

1. Surface preparation and spot prime.

2. Prime coat.

3. First finish coat.

4. Second finish coat.

F. Inspection and Acceptance: The Contractor shall obtain written acceptance from the University upon completions 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 of work. The Contractor shall give the University one day (24 hours minimum) advance notice of completion of any phase of work or a work area only when he deviates from the previously submitted work schedule. The Contractor shall provide necessary access to areas to be inspected. Failure to obtain acceptance of any phase work for a work area may result in redoing the operation at no cost to the University.

G. Sample Panels: Prior to commencing with the work, the Contractor shall prepare a sample panel(s) of approximately 10 square feet indicative of the specified surface preparation and required number of paint coats to be applied for acceptance by the University. The intent of this requirement is to ensure adequate coverage/thickness and/or hiding value of the paint and proper hue. The location where the sample panel(s) is to be prepared will be selected by the University.

H. Ventilation of Interior Spaces Following Painting: Following the completion of interior painting and prior to final acceptance, the interior spaces shall be ventilated and allowed to "air-out" to remove paint odors such that no odors exist at the University's occupancy date. Where necessary and as deemed by the University, the Contractor shall provide fans to mechanically ventilate the space(s).

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint materials to the job site in original unopened containers with original labels intact.

B. No paint material, empty cans and paint brushes and rollers, drop cloths and rags, may be stored in buildings, but shall be stored in separate storage facilities away from the buildings. Receiving, opening, and mixing of painting materials shall be done in this area.

C. Storage of painting materials on job site will not be permitted.

D. Ensure the safe use of paint materials and the safe disposal of waste, at the end of each work day.

E. Handle manufactured materials as recommended by the manufacturer.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Asbestos Prohibition: All paint shall be asbestos free.

B. Lead Prohibition: All paint shall be lead-free.

C. Mercury Prohibition: All paint shall be mercury-free.

D. Chromate Prohibition: All paint shall be free of zinc-chromate and/or strontium-chromate.

E. Cadmium Prohibition: All paint shall be cadmium-free.

F. Material shall be equal in quality to that specified under the Schedule of Finishes and any given finish shall be as labeled by one manufacturer. Materials for interior use shall be very low or zero voc.

G. All materials shall be delivered to the job site in undamaged original containers bearing the manufacturer's label and shall be stored in such a manner as to prevent damage. All rejected materials shall be removed from the job site immediately.

H. Paints shall be as manufactured by Sherwin Williams or other manufacturer's pre-approved by the University.

I. Thinning of paint shall be done using material recommended by the manufacturer. Mix proprietary products according to manufacturer's printed specifications. Compound thinner, mineral oil, kerosene, refined linseed oil, or gasoline shall not be used for thinning.

J. Except for metal primers all paint shall contain the maximum amount of mildewcide per gallon of paint permitted by the mildewcide manufacturer without adversely affecting the quality of paint.

K. The supplier shall submit a signed certification indicating the amounts of mildewcide added by both the paint manufacturer and the paint supplier. Mercurial fungicide shall not be used.

2.02 SCHEDULE OF FINISHES

A. The Schedule of Finishes is made for the convenience of the Contractor and indicates the types and quality of finishes to be applied to the surfaces. Refer to Finish Schedule for symbols indicating location for various finishes. Provide additional systems for surfaces to be painted not listed hereinafter.

B. All paints unless otherwise noted, are the products of Sherwin Williams and are so named to establish desired quality and standard of materials. Painting materials, equal to those mentioned by trade name under the various treatments may be used, provided they are pre-approved by the University.

C. Treatments shall be applied on exposed surfaces of designated materials, in conformity with instructions of the paint product used.

D. Exterior Painting:

1. T1-11 Siding and Wood Trim:

Finish (2) coats: SuperDeck Exterior Waterborne Solid Color Deck Stain, SD7 Series or Woodscapes Acrylic Solid Color House Stain, A15 series

2. Hollow metal doors and frames:

Prime (1) coat: Pro Industrial DTM Primer/ Finish, B66W11 (250 sq.ft/gal.: 5.0 mils wet, 2.5 mils dry)

Finish (2) coats: Pro Industrial DTM Acrylic, Semi-gloss, B66-1150 Series @ 267 sq.ft./gal

3. New and Existing Metal:

Spot Prime (1) coat: Macropoxy 920 Pre-Prime, B58T101/B58V10 for RUSTY METAL (800-100 sf./gal.; 1.0-2.0 mils dry)

Prime (1) coat: Macropoxy 646 Fast Cure Epoxy, B58V600 (230 sf/gal.; 7.0 mils wet, 5.0 mils dry)

Finish (2) coats: Hi-solids Polyurethane Gloss, B65-300/B60V30 Series (347 sf/gal.; 4.5 mils wet, 3.0 mils dry per coat.

4. PVC Downspouts:

Prime (1) coat: PrepRite ProBlock Latex Primer, B51W620 (350 sf/gal.; 4 mils wet, 1.5 mils dry)

Finish (2) coats: A-100 Exterior Latex Gloss, A8 Series (350-400 sf/gal.; 4 mils wet, 1.4 mils dry per coat.

E. Interior Panting:

1. Gypsum board (new):

Prime (1) coat: PrepRite ProBlock Latex Primer, B51W620 (350 sq.ft/gal.: 4 mils wet, 1.5 mils dry)

Finish (2) coats: ProMar 200 Zero VOC Interior Latex, B31-2600 Series
(350-400 sq.ft./gal.; 4 mils wet, 1.6 mils dry per coat)

2. Wood Doors:

Prime (1) coat:	PrepRite ProBlock Latex Primer, B51W620 (350 sq.ft/gal.: 4 mils wet, 1.5 mils dry)
Finish (2) coats:	Solo Int/Ext Acrylic Semi-gloss, A76 Series (350-400 sq.ft./gal.; 4 mils wet, 1.5 mils dry per coat)

2.03 COMPATIBILITY OF PAINTING SYSTEMS AND SUBSTRATES

A. The Contractor shall ensure that painting systems specified are compatible with existing painted surfaces. Alkyd paints shall not be applied over existing latex coating. Alkyd paints shall not be used over cementitious surfaces. Latex paints shall not be applied directly over alkyd paints without proper conditioner and accepted by the University.

B. Field Tests for Alkyd or Latex Paints: The Contractor shall perform the following field tests for compatibility of substrates to new paint systems prior to ordering paint:

1. Latex films will dissolve when wiped with rubbing alcohol; alkyd films will not.

2. When sanded, latex films will "clog" sandpaper; alkyd films will sand clean.

3. Alkyds will soften after applying a 10 percent solution of Drano in water; latex films will not soften.

4. Alkyds will burn when exposed to a flame; latex film will not burn.

5. Paints which do not respond to two or more of these tests are probably epoxy, urethane, or other type of coating.

6. Provide a packaged swab test in accordance with the package directions.

7. Existing paint identified or suspect of having lead-containing paint shall be tested in a manner that does not produce airborne or uncontrolled lead debris.

C. Should there be any discrepancies between the specified Schedule of Finishes and the existing paint systems, the Contractor shall notify the University in writing of any incompatible systems specified and submit a revised Schedule of Finishes for acceptance when necessary. With the acceptance of the revised Schedule of Finishes, the Contractor shall make any corrections and/or revisions necessary to resolve the discrepancies and/or inconsistencies. The Contractor shall not proceed with any painting systems that are incompatible, although specified

otherwise, until all incompatible conditions detrimental for the proper application and performance of the painting systems have been corrected. The failures due to the application of the incompatible paint systems shall be corrected at no additional cost to the University Proceeding with the work shall imply acceptance of the specified Schedule of Finishes and the compatibility with the existing painted surfaces by the Contractor.

PART 3 – EXECUTION

3.01 SURFACE PREPARATION

A. General:

1. Surface preparation shall be in accordance with the Painting and Decorating Contractors of America, "Architectural Specification Manual", methods are applicable to all substrates.

2. Scrub surfaces with stiff nylon bristle brush and T.S.P. solution at rate of ¾ cup T.S.P. per gallon of warm water to remove accumulated film of wax, oil, grease, smoke, dust, dirt, chalky, or other foreign matter which would impair bond or bleeding through new finish. Thoroughly sponge wipe surfaces with clean water. Allow surfaces to thoroughly dry before priming, painting, calking, or sealing.

   a. Following sponge wiping, the surfaces shall be allowed to dry for a minimum of 24 hours.

   b. Wood surfaces shall have a maximum moisture content of 12 percent when measured with an electronic moisture meter.

3. Cracks and openings found at joints and where different materials abut each other (e.g. CMU/concrete, CMU or concrete/wood, etc.) shall be sealed with a caulking compound compatible with the substrate and primer/paint. The caulking shall be applied and allowed to set in accordance with the manufacturer's recommendations and instructions. Caulking is specified in SECTION 07920 – SEALANTS.

4. Mildew Removal: Remove all mildew and sterilize the surface to be painted using one of the following methods:

   Apply a treatment solution composed of the following ingredients and in the noted proportions to the affected surface using a sponge of low-pressure sprayer:

   2/3 cup TSP (Trisodium Phosphate)
   1 quart household bleach

3 quarts warm water

Note: Household bleach shall not be mixed with ammonia or any detergents or cleaners containing ammonia as this will create a poisonous gas.

Scrub the surface as necessary to completely remove the mildew.

Or,

Apply a commercial mildew treatment solution such as Purex, Jomax Remover or equal in strict accordance with the manufacturer's recommendations and instructions.

Following treatment, the surface shall be cleaned with potable water and allowed to thoroughly dry before priming, painting or the applying of sealing and caulking compounds.

B. The painting contractor shall be wholly responsible for the finish of his work and shall not commence any part of it until surfaces are in proper condition. If painting contractor considers any surfaces unsuitable for proper finish of his work, he shall notify the University of this fact in writing and he shall not apply any material until the unsuitable surfaces have been made satisfactory, or until the University has instructed him to proceed. Major defects shall be restored by the proper trades. In general, follow paint manufacturer's directions for surface preparation for the paint to be applied.

C. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen in the trades involved.

D. Puttying of nail holes, cracks, and blemishes shall be done after priming coat has become hard and dry and before second coat is applied.

E. Alkalinity and Moisture Testing of Cementitious Surfaces:

1. Prior to paint application, interior and exterior concrete and masonry 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.

2. Perform alkalinity and moisture content tests of surfaces to be painted. Cementitious surfaces shall be cured for not less than 30 days prior to painting, but no less than 14 days and then only if the moisture meter tests indicated moisture of less than 17. Make surface moisture test by use of a commercially available moisture

meter. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition as specified before application of paint. Efflorescence is caused on cementitious surfaces by moisture entering or contained in the substrate. Water-soluble salts are brought to the surface where the water evaporates, leaving a deposit of residual salts, a white, salty deposit. Here they carbonate and destroy the bond within the substrate components, causing the surface to crumble and break away.

3. Where the alkalinity level exceeds the resistance level of the primer proposed for use, the surface shall be neutralized (e.g. muriatic acid wash) as necessary to reduce the levels to within that acceptable by the primer and thoroughly rinsed with clean water.

F. Top, bottom, and side edges of doors to be finished the same as face of doors after they are fitted by the carpenter.

G. Surfaces adjacent to areas being finished shall be protected and left clean of paints, stains, etc. Clean drop cloths shall be used until completion of job.

H. Unprimed galvanized metal shall be washed with a solution of chemical phosphoric metal etch and allowed to dry.

I. Metal surfaces shall be made clean and free of any defects or condition that may produce unsatisfactory finish. Touch-up any chipped or abraded places on surfaces that have been shop coated with the proper primer.

J. Gypsum Board and Plaster Surfaces:

1. Surface Cleaning: Surfaces shall be dry. Remove loose dirt and dust by brushing or rubbing with a dry cloth prior to application of the first coat material.

2. Repair of Minor Defects: Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.

K. Plywood and Wood Surfaces:

1. Surface Cleaning: Surfaces shall be free from dust and other deleterious substances and in a condition accepted by the prior to receiving paint or other finish. Do not use water to clean uncoated wood.

2. Knots and Resinous Wood: Prior to application of paint, treat knots and resinous wood with an application of surface sealer.

3. Open Joints and Other Openings: Fill with whiting putty. Sand smooth after putty has dried.

4. Checking: Where checking of the wood is present, sand the surface, wipe, and apply a coat of pigmented orange shellac. Allow to dry before paint is applied.

L. PVC Trims and Accessories: Paint to match adjoining surfaces unless specifically indicated to remain unpainted.

3.02 PAINT APPLICATION

A. General

1. Apply coating materials in accordance with SSPC-PA 1. SSPC-PA1 methods are applicable to all substrates, except as modified herein. Thoroughly work coating materials into joints, crevices, and open spaces. Touch-up damaged coatings before applying subsequent coats.

2. Materials shall be applied in accordance with the manufacturer's specifications and the finished surfaces shall be free from runs, sags, drips, ridges, waves, laps, streaks, brush marks, and variations in color, texture, and finish (glossy or dull). The coverage shall be complete and each coat shall be so applied as to produce a film of uniform thickness. No paint, varnish or enamel shall be applied until the preceding coat is thoroughly dry and acceptance.

3. No exterior painting of unprotected surfaces shall be done in rainy, damp weather. Coats shall be applied only to surfaces that are thoroughly dry.

4. Interior areas shall be broom clean and dust free before and during the application of coating material.

5. Mixing shall be done outside the building.

B. Application:

1. Paint application shall be by brush or roller painting or combination thereof or as required by manufacturer. Any type of spraying is not permitted.

2. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying. Provide each coat in specified condition to receive the next coat.

3. Primers and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by the manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover the surface of the preceding coat or surface completely, and there shall be a visually perceptible difference in shades of successive coats.

4. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in selected colors.

5. Colors: Each coat shall be tinted a different shade from the preceding coat. Colors shall be in accordance with the color schedule on' fie drawings or as selected by the University.

6. Finish Film Thickness: Apply primer, intermediate, and finish coats to not less than 1.5 mils dry film thickness, 4 mils wet unless recommended otherwise in writing by the manufacturer, for each coat and in accordance with the manufacturer's recommendations. Verify mil thickness by use of a suitable wet film gauge. Use a Tooke or other dry film gauge to test for total dry film thickness.

3.03 MECHANICAL AND ELECTRICAL WORK

A. Paint visible surfaces of ductwork or plenum spaces, and interior surfaces visible through grilles.

B. Paint shop primed metal surfaces of mechanical and electrical equipment with two finish coats of paint to match adjoining wall or ceiling surfaces. Prime unprimed bare metal surfaces with specified prime coat.

C. Stencil all exposed piping with painted black letters indicating the service and with an arrow indicating the direction of flow. Stencil where pipes enter and leave each area and at not over 30-foot intervals within an area. Width of color band, size of legend letters, and position of legend shall conform to the requirements of ASME A13.1, "Scheme for the Identification of Piping Systems".

3.04 MISCELLANEOUS

A. Installation of Removed Items: After completion of final paint coat, removed items shall be reinstalled.

B. At the completion of other trades, touch up damaged surfaces.

3.05 CLEAN UP

A. During the progress of the work, all debris, empty crates, waste, drippings, etc., shall be removed by the Contractor and the grounds about the areas to be painted shall be left clean and orderly at the end of each work day.

B. Upon completion of the work, staging, scaffolding, containers, and all other debris shall be removed from the site. All paint, shellac, oil or stains splashed or spilled upon adjacent surfaces not requiring treatment (hardware, fixture, and floor) shall be removed and the entire job left clean and acceptable.

C. Work to correct punchlist items shall be performed during non-business hours if the work will inconvenience the building occupants. Where necessary for access during non-business hours, the Contractor shall pay for custodial staff to gain entry and to secure the building. All punchlist items shall be completed prior to Project Acceptance.

END OF SECTION

SECTION 10440 – SIGNAGE

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Provide all signage as shown and as specified herein, including Corian signs with plastic and fiberglass inserts.

B. Sign Locations: As indicated and scheduled.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.

C. Shop Drawings: Submit shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, reinforcements, accessories, layout, and installation details. Furnish message list for each sign required, including large-scale details of wording and layout of lettering.

D. Samples: Submit the following samples of each sign component for initial selection of color, pattern, and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for Initial Selection of Color, Pattern, and Texture: Manufacturer's color charts consisting of actual sections of material, including the full range of colors available for each material required.

2. Samples for Verification of Color, Pattern, and Texture Selected, and Compliance with Requirements Indicated:

a. Submit a full-size sample panel and frame for each material indicated. Include a panel and frame for each color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

b. Acceptable samples will be returned and may be used in the work.

E. Safety Data Sheet (SDS): Submit SDS for all adhesives.

1.04 QUALITY ASSURANCE

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

B. Signage Color: Where signage is part of an existing signage system, color, style, and appearance shall match existing except as indicated or specified otherwise.

1.05 ACCESSIBILITY COMPLIANCE

A. The Americans with Disabilities Act Accessibility Guidelines (ADAAG). Signage shall comply with ADAAG Section 206, Section 216, and Section 703 and for mounting heights, finish, Braille characters and type of characteristics. See DCAB Interpretive Opinions for further clarification.

B. Where a required illuminated "EXIT" sign occurs, provide an additional companion "FIRE EXIT" sign matching the interior signage as specified, mounted on the latch side of the door conforming with ADAAG Section 216.4.

1.06 DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle materials in strict conformance of the manufacturer's instructions and recommendations.

PART 2 – PRODUCTS

2.01 MATERIALS

General Requirements: Character proportion, color contrast, dimension, depth, and heights of symbols, Grade II braille, and letters, location, and mounting heights shall be in accordance with the requirements noted in the Americans with Disabilities Act Accessibility Guidelines (ADAAG) Section 216 and Section 703 and HRS 103-50.

2.02 CORIAN SIGN FRAMES

A. Provide Corian or pre-approved equal (solid polymer) signs as indicated to match existing similar signs.

B. Sign and frames shall be mounted with concealed fasteners.

C. The products of the following manufacturers are acceptable provided they meet the materials and construction specified and are installed as specified hereinafter:

2.03 PLASTIC SIGN INSERTS (INTERIOR)

A. Melamine plastic laminate, approximately 1/8-inch thick, with contrasting

core color, non-static, fire-retardant, and self-extinguishing. Plastic laminate shall have a contrasting core color and shall be impervious to most acids, alkaline, alcohol, solvents, abrasives, and boiling water. Where 3 colors are desired (as for exit signage at elevators), the third color shall be painted in accordance with the signage manufacturer's recommendations.

B. Characters and borders shall be raised. Individual cutout letters and symbols which are applied to the sign plaque shall not be used.

C. Where a white or light-colored background (core color) is provided, the background surface shall be coated with white or clear graffiti resistant coating as approved by the signage manufacturer. The coating shall provide a finish which is resistant to pencils, pens, and felt tip markers.

D. Sign inserts shall be mounted with double-stick-VHB tape or adhesives.

2.04 FIBERGLASS SIGN INSERTS (EXTERIOR)

A. Fiberglass, non-corrosive, 3 ply laminate, approximately 3/16-inch to 1/4-inch thick with contrasting core color.

B. Characters and borders shall be raised. Individual cutout letters and symbols which are applied to the sign plaque shall not be used.

C. Where white or light-colored background (core color) is provided, the background surface shall be coated with white or clear graffiti resistant coating as approved by the signage manufacturer. The coating shall provide a finish which is resistant to pencils, pens, felt tip markers, and spray paint.

D. Sign insert shall be mounted with double-stick VHB tape or adhesives.

2.05 INTERNATIONAL SYMBOL OF ACCESSIBILITY (ISA)

Provide "International Symbol of Accessibility" in conformance with ADAAG Section 703.6 and Section 703.7 requirements and in locations shown on drawings. See DCAB Interpretive Opinions for further clarification.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General:

1. Installation of all signage shall be in strict accordance with manufacturer's printed instructions and accepted shop drawings. Installation shall be accomplished by experienced mechanics and in a workmanlike manner.

2. Locate sign units and accessories where indicated, using

mounting methods of the type described and in compliance with the manufacturer's instructions.

3. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance in accordance to ADAAG Section 703.4.

B. Wall Mounted Panel Signs: Attach panel sign and frames to wall surfaces using fasteners and inserts with double-stick tape or adhesives.

3.02 CLEANING AND PROTECTION

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

END OF SECTION

SECTION 10520 – FIRE EXTINGUISHERS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. Provide all fire extinguishers as shown on the drawings.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's descriptive literature and specifications.

C. Certificates of Compliances: Fire extinguishers shall bear the UL label. In lieu of such label, a written certificate from a nationally recognized testing agency adequately equipped and competent to perform such services may be submitted stating that the items have been tested and that the units conform to the requirements specified herein, including methods of testing of the specified agencies.

1.04 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.

B. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguishers.

C. Except as indicated otherwise, conform to NFPA 10, "Standard for Portable Fire Extinguishers", requirements for location and type portable fire extinguishers.

D. Furnish extinguishers with inspection tags and not less than 9 months remaining for reinspection on project acceptance date.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Materials delivered to the site shall be inspected for damage, unloaded, and stored with a minimum of handling. The storage spaces shall be dry locations with adequate ventilation, free from dust or water, and shall permit easy access for inspection and handling.

B. Handle manufactured materials as recommended by the manufacturer.

PART 2 – PRODUCTS

2.01 FIRE EXTINGUISHER

A. Multi-purpose, dry chemical type, compliant with UL 299, UL rated 2A-10B:C, 5-pound nominal capacity, in enameled steel container; for Class A, B, and C fires.

B. Provide with standard wall bracket where indicated for surface mounting.

C. Manufacturers: Provide fire extinguishers as manufactured by Larsen's Manufacturing Co., Potter-Roemer, JL Industries, Inc. or pre-approved equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install fire extinguisher in each location noted on drawings for fire extinguisher (FE).

B. Install units securely in place in accordance with manufacturer's recommended installation procedures.

C. Install in indicated locations and mounting heights unless otherwise required to comply with applicable regulations of governing authorities. Extinguishers in walks, halls, corridors, passageways, or aisles shall not protrude more than 4-inches in conformance with ADAAG Section 204 and Section 307

3.02 CLEAN UP

Clean surfaces as recommended by the manufacturer and restore damaged work to its original condition or replace with new.

END OF SECTION

SECTION 10800 - TOILET ACCESSORIES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001 – GENERAL REQUIREMENTS.

1.02 SUMMARY

A. The extent of each type of toilet accessory is shown on the drawings and herein specified.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Manufacturer's Data: For information only, submit copies of manufacturer's specifications and installation instructions for each toilet accessory.

C. Schedule: Submit a schedule listing types, quantities, and installation locations by room for each toilet accessory to be provided.

D. Samples: When requested, submit full-size samples of units to the University for review of finishes. Acceptable samples will be returned and may be used in the work. Compliance with all other requirements is the exclusive responsibility of the Contractor.

1.04 QUALITY ASSURANCE

A. The structural strength of all grab bars, and all fasteners and mounting devices shall meet or exceed the accessibility requirements of Americans with Disabilities Act Accessibility Guidelines (ADAAG) Section 609.8.

B. Products:

1. Provide products of the same manufacturer for each type of accessory unit and for units exposed in the same areas, wherever possible.

2. Coordinate with the University for acceptable designs and finishes.

3. Stamped names of labels on exposed faces of units will not be permitted, except where otherwise specified.

4. Provide locks where specified or standard with the manufacturer. One key shall fit all locks of one brand. Provide a minimum of 2 keys.

C. Accessibility: Mount accessories for accessible toilets in accordance with Americans with Disabilities Act Accessibility Guidelines (ADAAG) Sections 308.1, 309.1, 603.3, 603.4, 604.5, and 604.7 where either in an accessible stall or accessible by all.

D. Drawings may be general in nature. Accessories shown for one stall or room shall be repeated in similar stalls or rooms unless noted otherwise.

1.05 DELIVERY, STORAGE, AND HANDLING

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

B. Handle manufactured materials as recommended by the manufacturer.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Stainless Steel: AISI, Type 302/304. Provide satin finish, unless otherwise specified.

B. Galvanized Steel Mounting Devices: Hot-dip galvanized after fabrication ASTM A 123/A 123M.

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

A. For convenience and to establish standards of quality and design, the following list indicates items manufactured by Bobrick Washroom Equipment Co., Kimberly-Clark, Tork, Winco and Spartan Equivalent products of the following manufacturers will be accepted:

1. Bradley Corp., Washroom Accessories Division.

2. McKinney Parker Products Co.

3. Pre-approved equal

B. The products of other manufacturers are acceptable provided they meet or exceed the materials and construction requirements as specified.

C. Toilet Paper Holder (TPH): Kimberly-Clark Professional Cored JRT Bathroom Tissue Dispenser #09551, surface-mounted stainless steel with satin finish, multi-roll. Provide one per compartment as noted.

D. Toilet Seat Cover Dispenser (TSCD): Tork SCA-99 or Winco TSC-10.

E. Wall Mounted Soap Dispenser (SD): Spartan Life'n Foamy Foam Dispenser #975600.

F. Grab Bars (GB): B-5806 Series, with concealed mounting and snap flange covers, 1-1/4 inch outside diameter, extra heavy stainless steel grab bar, satin gripping finish surface. Anchor plate with vandal-proof set screws. Provide sizes indicated. Provide manufacturer's metal backer plate 2562 series as applicable and appropriate stainless steel mounting kits for substrate. Provide as shown on the drawings.

G. Paper Towel Dispenser (PTD): XLERATOReco Hand dryer, model XL-BW-ECO White Thermoset (BMC) cover. No heat.

H. Waste receptacle: University furnished and University installed.

I. Mirror: B-1556 Series, stainless steel 24 by 36-inches unless indicated otherwise.

PART 3 – EXECUTION

3.01 INSPECTION

A. Installer must examine the areas and conditions under which toilet accessories are to be installed. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Determine that all blocking and concealed backer plates have been installed to allow mounting of accessories.

3.02 INSTALLATION

A. Use concealed fastenings wherever possible.

B. Provide bolts, backer plates, and other necessary fasteners, and attach accessories securely to walls and partitions in locations as shown or directed.

C. Install concealed mounting devices and fasteners fabricated of the same material as the accessories or of galvanized steel.

D. Install exposed mounting devices and fasteners finished to match the accessories.

E. Provide theft-resistant fasteners for all accessory mountings.

F. Secure toilet room accessories to adjacent walls and partitions complying with the manufacturer's instructions for each item and each type of substrate construction.

3.03 CLEAN UP

Clean surfaces as recommended by the manufacturer and restore damaged

work to its original condition or replace with new.

END OF SECTION

SECTION 13281 – REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

PART 1 - GENERAL

1.01 SUMMARY

A. The work covered by this section includes the handling, removal and control of asbestos containing materials (ACM) including procedures and equipment required to protect workers, the environment and the general public from contact with airborne asbestos fibers. The work also includes the disposal of any ACM generated by the work.

B. For work described in this section, the Contractor shall furnish all labor, materials, equipment, tools and any other resources necessary to complete the work in accordance with regulatory requirements and project contract documents, using best available technology and industry standard methods and procedures.

C. The work includes the removal of ACM, prior to building renovation, as noted below. The Contractor is responsible for verifying quantities.

D. Asbestos was detected or assumed to be in concentrations exceeding one percent in the following materials listed below. If materials are found during the demolition which were not sampled, such materials should be assumed to be ACM until appropriate testing proves otherwise.

1. Sink Undercoat, Black on the bottom of the Greenhouse Sink/Counter, which was 6% chrysotile and measured approximately 15 square feet (SF).

E. Related Work Described Elsewhere:

1. Section 13282 – LEAD PAINT CONTROL MEASURES
2. Section 13285 – PCB BALLASTS
3. Section 13286 – MERCURY IN FLUORESCENT LIGHTS
4. Section 13288 – ASBESTOS TESTING AND MONITORING
5. Section 13289 – LEAD TESTING AND MONITORING

1.02 REQUIREMENTS

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to work practices, protection of workers, authorized visitors to the site, and property adjacent to the work.

B. All work shall be performed in strict accordance with all governing codes, rules, and regulations. Where conflicts occur the more stringent requirement shall apply.

C. Working hours shall be as required and approved by the State. The Contractor shall coordinate and schedule all work with the State.

D. Perform asbestos related work in accordance with the following:

1. Hawaii Administrative Rules (HAR) 12-145.1 Title 12, Department of Labor and Industrial Relations, Subtitle 8, Division of Occupational Safety and Health, Part 3, Construction Standards, Chapter 145.1, Asbestos
2. HAR 11-501 Title 11, Department of Health, Chapter 11-501, Asbestos Requirements
3. HAR 11-503 Title 11, Department of Health, Chapter 11-503, Fees for Asbestos Removal and Certification
4. HAR 11-504 Title 11, Department of Health, Chapter 11-504, Asbestos Abatement Certification
5. 40 Code of Federal Regulations (CFR) 61-SUBPART M National Emission Standard for Asbestos
6. 40 CFR 763 Asbestos Hazard Emergency Response Act

1.03 DEFINITIONS

A. Amended water means water to which surfactant (wetting agent) has been added to increase the ability of the liquid to penetrate ACM.

B. Asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that has been chemically treated and/or altered. For purposes of this standard, "asbestos" includes Presumed Asbestos Containing Material (PACM), as defined below.

C. Asbestos-containing material (ACM) means any material containing more than one percent asbestos.

D. Authorized person means any person authorized by the employer and required by work duties to be present in regulated areas.

E. Class I asbestos work means activities involving the removal of Thermal System Insulation (TSI) and surfacing ACM and PACM.

F. Class II asbestos work means activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.

G. Class III asbestos work means repair and maintenance operations, where "ACM", including TSI and surfacing ACM and PACM, is likely to be disturbed.

H. Class IV asbestos work means maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities.

I. Clean room means an uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.

J. Competent person means, in addition to the definition in 29 CFR 1926.32 (f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f) in addition, for Class I and Class II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor, or its equivalent and, for Class III and Class IV work, who is trained in a manner consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR 763.92 (a)(2).

K. Critical barrier means one or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area.

L. Decontamination area means an enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.

M. Demolition means the wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

N. Disturbance means activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount which can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which shall not exceed 60 inches in length and width.

O. Employee exposure means that exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.

P. Equipment room (change room) means a contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

Q. Fiber means a particulate form of asbestos, 5 micrometers or longer, with a length-to-diameter ratio of at least 3 to 1.

R. Friable asbestos-containing material (ACM), is defined by the Asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP), as any material containing more than one percent (1%) asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy (PLM), that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. These include sprayed-on or troweled-on fireproofing, acoustic ceiling material and ceiling tiles, linoleum backing, thermal system insulation, non-asphalt-

saturated roofing felts, asbestos-containing paper, and joint compound. ACM that has been rendered to a crumbled, pulverized, or powdered state, when dry, by crushing, sanding, sawing, shot-blasting, or other demolition or renovation techniques is friable, which include category I nonfriable asbestos containing material. ACM, in which the asbestos fibers are bound into a matrix that has been rendered to a crumbled, pulverized, or powdered state, when dry, by crushing, sanding, sawing, shotblasting, severe weathering, or other demolition or renovation techniques is friable, which include category II nonfriable ACM.

S. High-efficiency particulate air (HEPA) filter means a filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.

T. Industrial hygienist means a professional qualified by education, training, and experience to anticipate, recognize, evaluate and develop controls for occupational health hazards.

U. Intact means that the ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix.

V. Modification means a changed or altered procedure, material or component of a control system, which replaces a procedure, material or component of a required system.

W. Negative Exposure Assessment means a demonstration by the employer that employee exposure during an operation is expected to be consistently below the PELs.

X. Non-friable ACM is any material containing more than one percent (1%) asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy (PLM), that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. EPA also defines two categories of non-friable ACM, Category I and Category II non-friable ACM, which are described later in this guidance.

Y. Presumed Asbestos Containing Material means thermal system insulation and surfacing material found in buildings constructed no later than 1980.

Z. Project Designer means a person who has successfully completed the training requirements for an abatement project designer established by 40 U.S.C. Sec. 763.90(g).

AA. Regulated area means an area established by the employer to demarcate areas where Class I, II, and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos, exceed or there is a reasonable possibility they may exceed the permissible exposure limit.

BB. Regulated Asbestos-Containing Material (RACM) is (a) friable asbestos material, (b) Category I non-friable ACM that has become friable, (c) Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting or abrading, or (d) Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

CC. Removal means all operations where ACM and/or PACM is taken out or stripped from structures or substrates, and includes demolition operations.

DD. Renovation means the modifying of any existing structure, or portion thereof.

EE. Repair means overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates.

FF. Surfacing material means material that is sprayed, troweled-on or otherwise applied to surfaces (such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, and other purposes).

GG. Surfacing ACM means surfacing material which contains more than 1% asbestos.

HH. Thermal system insulation (TSI) means ACM applied to pipes, fittings, boilers, breeching, tanks, ducts or other structural components to prevent heat loss or gain.

II. Thermal system insulation ACM is thermal system insulation which contains more than 1% asbestos.

JJ. Independent Third Party Consultant is a qualified consultant, hired by the Contractor to perform duties as specified in this Section. The consultant shall provide personnel who possess current certification by the State of Hawaii Asbestos Certification program as Inspector, Project Designer, Contractor/Supervisor and Project Monitor disciplines as needed.

1.04 SUBMITTALS

A. Pre-Work Submittals:

1. Asbestos Removal Work Plan: Submit a detailed plan of the engineering controls, work practices and safety procedures to be used during removal of asbestos containing materials. The plan shall include but is not limited to site security, schedule, personal protective equipment, location of regulated work areas, equipment storage and staging areas, showers, change rooms, removal methods, work practices, interface with other trades, sequencing of asbestos removal work, disposal plan, materials/products to be used, locations of local exhaust units, and personal air sampling protocols. The work plan must be prepared by a State of Hawaii licensed Asbestos Project Designer.

2. Contractor's License: Submit the current Department of Commerce and Consumer Affairs C-19 license.

3. Project Supervisor Documentation: Submit the name and qualifications of the person(s) designated to act as the Contractor's Project Supervisor.

4. Worker's Certification/Licenses: Submit the names and certification documentation of the persons who will be working at the project.

B. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during abatement activities:

1. Asbestos worker and contractor/supervisor certification cards for each person employed in the removal, handling, or disturbance of asbestos.

2. Personal air monitoring results

3. Project documents (specifications and drawings)

4. Applicable regulations including HAR 11:501-504 and 29 CFR 1926.1101

5. Safety Data Sheets of supplies/chemicals used on the project

6. Approved Asbestos Removal Work Plan

7. Asbestos Survey Report

8. List of emergency telephone numbers

9. Project Supervisor Daily Log

10. Waste Disposal Documents

1.05 NOTIFICATIONS

A. The Contractor shall provide appropriate notifications of intent to commence asbestos abatement activities to the State of Hawaii Department of Health.

B. The Contractor shall maintain copies of notices, and provide proof of delivery and receipt.

C. The Contractor shall be responsible for maintaining current and accurate project filings with regulatory agencies for the duration of the project.

1.06 THIRD PARTY CONSULTANT

A. The Contractor shall engage and pay for the services of an Independent Third Party Consultant who shall serve as the representative in regard to the performance of the asbestos abatement work and provide direction as required throughout the entire abatement project period.

B. The Contractor is required to ensure cooperation of its personnel with the Independent Third Party Consultant for the air sampling and project monitoring functions described in this section. The Contractor shall comply with all direction given by the Independent Third Party Consultant's personnel during the course of the work.

C. The Independent Third Party Consultant shall staff the project with trained and certified person(s) to act on the State's behalf at the job site and help ensure that the asbestos abatement is completed per the requirements of all applicable regulations and this section. Personnel working for the Independent Third Party Consultant shall be designated as the Abatement Project Monitor (APM) and shall hold current certification from the State of Hawaii Asbestos Certification program as a Project Monitor.

1. The APM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any work unless the APM is on-site (except for inspection of barriers during non-working days).

2. The APM shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the project documents and all regulations. The APM shall have the authority to stop work when gross work practice deficiencies or unsafe practices are observed, or when ambient fiber concentrations outside the removal area exceed 0.01 fibers per cubic centimeter or background level.

3. The APM shall provide the following services:

   a. Inspection of the Contractor's work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and project specifications.

   b. Completion of project air sampling as required, including background and area air sampling. Personal air sampling will be the responsibility of the Contractor.

   c. Verify daily that all workers used in the performance of the work are certified.

   d. Monitor the progress of the Contractor's work, and report any deviations from the schedule to the State.

   e. Monitor, verify, and document waste load-out operations.

   f. Ensure that the Contractor is performing personal air monitoring daily, or until a Negative Exposure Assessment is verified, and that results are being returned and posted at the site as required.

   g. The APM shall maintain a log on site that documents project related actions, activities, and occurrences.

4. The following minimum inspections shall be conducted by the APM. Additional inspections shall be conducted as required by work conditions. Progression from one phase of work to the next by the Contractor is only permitted with the approval of the APM.

a. Pre-Abatement Inspection: The purpose of this inspection is to verify the integrity of each containment system prior to disturbance of any asbestos containing material. This inspection shall take place only after the work area is fully prepped for removal.

b. Work Inspection: The purpose of this inspection is to monitor the work practices and procedures employed during removal of ACM and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the APM during all preparation, removal, and cleaning activities.

c. Visual Clearance Inspection: The purpose of this inspection is to verify that all materials in the scope of work have been properly removed; no visible asbestos debris/residue remains; no pools of liquid or condensation remains; and all required cleanings are complete. This inspection shall be conducted before final air clearance testing.

d. Post-Clearance Inspection: The purpose of this inspection is to ensure the complete removal of ACM, including debris, from the work area after satisfactory final clearance sampling and removal of all isolation and critical barriers and equipment from the work area.

1.07 PROJECT SUPERVISOR

A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:

1. The Project Supervisor shall hold an AHERA certification as an Asbestos Contractor/Supervisor.

2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one year experience as a supervisor.

B. The Project Supervisor shall be responsible for the performance of the work and shall represent the Contractor in all respects at the project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

1.08 DELIVERY AND STORAGE

A. Store all materials at the job site in a suitable and designated area.

1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.

2. Protect materials from unintended contamination and theft.

3. Storage areas shall be kept clean and organized.

B. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos waste.

1.09 TEMPORARY UTILITIES

A. Shut down and lock out all electrical power to the asbestos work areas.

B. Provide temporary electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the asbestos work area.

C. Provide temporary lighting with "weatherproof" fixtures for all work areas.

D. Utilize domestic water service from the existing system.

PART 2 – PRODUCTS

2.01 MATERIALS

A. All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description, with Safety Data Sheets (SDS) as applicable.

B. No damaged or deteriorated materials shall be used. If material becomes contaminated the material shall be decontaminated or disposed of as asbestos-containing waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

C. Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating no less than six (6) mil thickness.

D. Polyethylene disposable bags shall be no less than six (6) mils thick.

E. A commercial grade duct tape (or equivalent) capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

F. Any ladders, planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable Federal, State and local regulations.

2.02 TOOLS AND EQUIPMENT

A. The Contractor shall provide tools and equipment that are suitable for asbestos related activities.

B. HEPA vacuums shall be leak proof to the filter and conform to American Industrial Hygiene Association (AIHA) Z9.2 and Underwriters Laboratory (UL) 586 standards.

C. The Contractor shall notify, in writing, the Owner of any rental equipment in use during work activities that the subject equipment is being used in an asbestos abatement project.

PART 3 - EXECUTION

3.01 GENERAL WORK PRACTICES

A. Install emergency exit signage and fire extinguishers throughout the work areas in accordance with OSHA construction standards.

B. Use the following engineering controls and work practices for all asbestos abatement operations, regardless of measured exposure levels:

1. Vacuum cleaners equipped with High Efficiency Particulate Air (HEPA) filters to collect all asbestos-containing dust and debris.
2. Wet methods to control exposures during asbestos removal and clean-up.
3. Prompt clean-up and disposal of asbestos-contaminated wastes and debris in leak-proof containers.

C. Do not use any of the following equipment or work practices during asbestos abatement operations, regardless of measured exposure levels:

1. High-speed abrasive disc saws not equipped with point-of-cut HEPA ventilation or HEPA filtered exhaust air enclosures.
2. Blowing with compressed air to remove asbestos-containing materials.
3. Dry sweeping, shoveling, or other dry methods to clean up asbestos-containing dust and debris.
4. Employee rotation as a means of reducing employee exposure to asbestos.

D. Protect adjacent areas, materials and surfaces from damage due to demolition operations, including but not necessarily limited to the following:

1. Water damage
2. Dirt, dust and debris
3. Abrasion
4. Cuts and scratches
5. Holes from fasteners for temporary barriers

3.02 RESPIRATORY PROTECTION

A. Select respiratory protection based on the requirements of 29 CFR 1926.1101.

B. HEPA respirator filters shall be approved by National Institute of Occupational Safety and Health (NIOSH) and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101.

C. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour work day.

D. Any authorized visitor, worker, or supervisor found in the work area not wearing the required respiratory protection shall be removed from the project site.

3.03 PROTECTIVE CLOTHING

A. Provide personnel with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.

B. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the work area.

3.04 SIGNS AND LABELS

A. Provide warning signs and barrier tapes at all approaches to asbestos work areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.

1. Provide danger signs in vertical format conforming to 29 CFR 1926.1101, minimum 20" x 14" displaying the following legend.

DANGER
ASBESTOS CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA

2. Provide 3" wide OSHA-approved barrier tape printed with black lettered, "DANGER ASBESTOS REMOVAL". Locate barrier tape across all corridors, entrances and access routes to asbestos work area.

B. Provide asbestos danger labels affixed to all asbestos materials, scrap, waste, debris and other products contaminated with asbestos.

1. Provide asbestos danger labels of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

2. Provide the following asbestos labels, of sufficient size to be clearly legible, for display on waste containers (bags or drums) which will be used to transport asbestos contaminated material in accordance with United States Department of Transportation 49 CFR Parts 171 and 172 (Note: Include "RQ" for friable asbestos waste only.)

RQ, (WASTE) ASBESTOS, 9, NA2212, PGIII

3. Generator identification information shall be affixed or otherwise marked to each waste container indicating the following printed in indelible ink:

Generator Name
Facility Name
Facility Address

3.05 AIR SAMPLING

A. Air samples shall be collected and analyzed by Phase Contrast Microscopy (PCM) according to NIOSH 7400 methods for background, personal, and area air sampling during asbestos removal or disturbance work.

B. Analysis of air samples shall be conducted by a laboratory with current registration by the Hawaii Department of Health for PCM analysis.

C. Background Air Sampling: The APM shall perform appropriate background air monitoring prior to the start of asbestos abatement work in each work area.

D. Personal Air Sampling:

1. The Contractor shall perform appropriate personal air monitoring in accordance with 29 CFR 1926.1101, every work shift in each work area during which abatement activities occur, unless an appropriate Negative Exposure Assessment determination has been made.

2. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.

E. Area Air Sampling:

1. The APM shall perform appropriate area air monitoring during all asbestos abatement operations.

2. If the area air sampling results during any phase of the abatement project indicate airborne fiber levels greater than 0.01 fibers per cubic centimeter or the established background level, outside the regulated work area, work shall stop immediately and corrective measures shall be initiated. The Contractor shall bear the burden of any and all costs incurred by this delay.

3.06 NON-FRIABLE ACM REMOVAL

A. Critical Barriers: Install critical barriers over each opening into the regulated area, except when the material is located on the exterior of the building. In such cases, establish a regulated area to prevent unauthorized access.

B. Protection of Surfaces and Objects: Protect all surfaces beneath all removal activity. Remove moveable objects from the work area, and cover fixed objects with impermeable drop cloths or plastic sheeting with edges securely sealed with tape. Pre-clean all covered surfaces with amended water and a HEPA vacuum.

C. Wetting of Surfaces: The ACM shall be thoroughly wetted prior to and during the removal process.

D. Intact Removal: The ACM should be removed as intact as possible.

E. Manual Methods: Manual methods shall be used. Mechanical chipping of the non-friable asbestos containing material is prohibited.

3.07 WORK AREA DECONTAMINATION AND CLEARANCE PROCEDURES

A. The Project Supervisor along with the APM shall inspect the entire work area for asbestos.

B. If any suspect asbestos dust or debris is found, repeat final cleaning operation, until the visual inspection is satisfactory to the APM.

C. After final visual clearance criteria have been achieved in the work areas, the APM will notify the Contractor to encapsulate all walls, floors, ceilings, other exposed surfaces, and decontamination facilities.

D. After abatement clearance is given by the APM, the Contractor may remove the containment, which shall be disposed of as ACM.

3.08 WASTE DISPOSAL

A. All waste will be transported and disposed of in compliance with DOT requirements and all applicable Federal, State and local regulations. Disposal must occur at an acceptable landfill accompanied by a waste manifest.

B. As soon as possible and no longer than thirty days after disposing of the waste, all completed waste manifests shall be submitted to the State.

END OF SECTION

SECTION 13282 – LEAD PAINT CONTROL MEASURES

PART 1 - GENERAL

1.01 SUMMARY

A. The work covered by this section includes the handling and control of lead-containing paints (LCP) and describes some of the procedures and equipment required to protect workers, the environment and the general public from contact with lead dust during construction activities.

B. Construction work is defined as work for construction, alteration and/or repair, including painting and decorating. It includes but is not limited to the following:

1. Demolition or salvage of structures where lead or materials containing lead are present;

2. Removal or encapsulation of materials containing lead;

3. New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead;

4. Lead contamination/emergency cleanup;

5. Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed, and

6. Maintenance operations associated with the construction activities described in this paragraph.

C. For work described in this section, the Contractor shall furnish all labor, materials, equipment, tools and any other resources necessary to complete the work in accordance with regulatory requirements and project contract documents, using best available technology and industry standard methods and procedures.

D. The work includes the disturbance, removal or demolition of materials, which are coated with LCP, during building renovation activities.

E. Lead was detected in the following materials listed below:

1. Off-White Over Gray Paint on Metal on Greenhouse I-Beams and Vertical Cylindrical Supports – (0.050 percent lead)

2. Cream Paint on Drywall, Metal and CMU on Uluwehi Building S Interior – (0.031 percent lead)

3. White Paint on Metal, Wood, and CMU on Uluwehi Building S Exterior – (0.025 percent lead)

F. All paint and or coatings that are found during the renovation/demolition activities shall be assumed to be LCP unless appropriate testing is conducted.

G. Related Work Described Elsewhere:

1. Section 13281 – REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS
2. Section 13285 – PCB BALLASTS
3. Section 13286 – MERCURY IN FLUORESCENT LIGHTS
4. Section 13288 – ASBESTOS TESTING AND MONITORING
5. Section 13289 – LEAD TESTING AND MONITORING

1.02 REQUIREMENTS

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of workers, authorized visitors to the site, persons, and property adjacent to the work.

B. All work shall be performed in strict accordance with all governing codes, rules, and regulations. Where conflicts occur the more stringent requirement shall apply.

C. Working hours shall be as required and approved by the State. The Contractor shall coordinate and schedule all work with the State.

D. Perform lead related work in accordance with the following:

1. Hawaii Administrative Rules (HAR) 12-148.1 Lead
2. Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1926.62 Lead in Construction

1.03 DEFINITIONS

A. Action Level means employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period.

B. Area Sampling means sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations but is not collected in the breathing zone of personnel (approximately 5 to 6 feet above the floor).

C. Competent Person (CP) refers to an individual who is trained in the recognition and control of lead hazards in accordance with current Federal, State, and local regulations and has the authority to take prompt corrective actions to control the lead hazard.

D. Contaminated Room refers to a room for removal of contaminated personal protective equipment (PPE).

E. Decontamination Shower Facility is a facility that encompasses a clean clothing storage room, and a contaminated clothing storage and disposal rooms, with a shower facility in between.

F. High Efficiency Particulate Arrestor (HEPA) Filter Equipment (HEPA) means filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated particulate. A high efficiency particulate filter demonstrates at least 99.97 percent efficiency against 0.3 micron or larger size particles.

G. Lead means metallic lead, inorganic lead compounds, and organic lead soaps. Excludes other forms of organic lead compounds.

H. Lead Control Area means a system of control methods to prevent the spread of lead dust, paint chips or debris to adjacent areas that may include temporary containment, floor or ground cover protection, physical boundaries, and warning signs to prevent unauthorized entry of personnel. HEPA filtered local exhaust equipment may be used as engineering controls to further reduce personnel exposures or building/outdoor environmental contamination.

I. Lead Permissible Exposure Limit (PEL) is fifty micrograms per cubic meter of air as an 8 hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than eight hours in a workday, the PEL shall be determined by the following formula: PEL (micrograms/cubic meter of air) = 400/No. hours worked per day

J. Lead Containing Paint (LCP) means any paint, which contains lead as determined by the testing laboratory using a valid test method. The requirements of this section does not apply if no detectable levels of lead are found using a quantitative method for analyzing paint using laboratory instruments with specified limits of detection (usually 0.01 percent). An X-Ray Fluorescence (XRF) instrument is not considered a valid test method.

K. Personal Sampling means sampling of airborne lead concentrations within the breathing zone of an employee to determine the 8 hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employees' work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and centered at the nose or mouth of an employee.

L. Physical Boundary means an area physically roped or partitioned off around lead control area to limit unauthorized entry of personnel.

1.04 SUBMITTALS

A. Pre-Work Submittals:

1. Lead Compliance Plan: Submit a detailed job-specific plan of the work procedures to be used in the disturbance of LCP. The plan shall include details of lead control areas, critical barriers, physical boundaries, location and details of decontamination facilities, viewing ports, and mechanical ventilation system (if any). Include a description of equipment and materials, work practices, controls and job responsibilities for each activity from which lead is emitted. Include in the plan, eating, drinking, smoking, hygiene facilities and sanitary procedures, interface of trades, sequencing of lead related

work, collected waste water and dust containing lead and debris, air sampling, respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that lead is not released outside of the lead control area. Include site preparation, cleanup and clearance procedures. Include occupational and environmental sampling, training and strategy, sampling and analysis strategy and methodology, frequency of sampling, duration of sampling, and qualifications of sampling personnel in the air-sampling portion of the plan. Include a description of arrangements made among contractors on multi-contractor worksites to inform affected employees and to clarify responsibilities to control exposures.

2. Lead Waste Management Plan: The Lead Waste Management Plan shall comply with applicable requirements of Federal, State, and local hazardous waste regulations, shall be signed by the Competent Person, and address the following:

    a. Identification and classification of wastes associated with the work.

    b. Estimated quantities of wastes to be generated and disposed of.

    c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location and a 24-hour point of contact.

    d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.

    e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.

    f. Spill prevention, containment, and cleanup contingency measures including a health and safety plan to be implemented in accordance with 29 CFR 1926.65.

    g. Work plan and schedule for waste containment, removal and disposal. Proper containment of the waste includes using acceptable waste containers (e.g., 55-gallon drums) as well as proper marking/labeling of the containers. Wastes shall be cleaned up and containerized daily.

    h. Unit cost for hazardous and non-hazardous lead waste disposal according to this plan.

3. Competent Person Documentation: Submit name of the individual who will act as the Contractor's Competent Person. Provide documented construction project-related experience with implementation of OSHA's Lead in Construction standard (29 CFR 1926.62) which shows ability to assess occupational and environmental exposure to lead, experience with the use of respirators, personal protective equipment and other exposure reduction methods to protect employee health.

4. Worker's Training: Submit a certificate for each worker and supervisor, signed and dated by the training provider, stating that the employee has received the required lead training specified in 29 CFR 1926.62.

B. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during construction activities as defined in this Section:

1. Personal air monitoring results
2. Project documents (specifications and drawings)
3. 29 CFR 1926.62
4. Safety Data Sheets of supplies/chemicals used on the project
5. Approved Lead Compliance Plan
6. Approved Lead Waste Plan
7. List of emergency telephone numbers
8. Waste Disposal Documents

1.05 THIRD PARTY CONSULTANT

A. The Contractor shall engage and pay for the services of an Independent Third Party Consultant who shall serve as the representative in regard to the performance of the lead work and provide direction as required throughout the entire demolition / renovation project period.

B. The Contractor is required to ensure cooperation of its personnel with the Independent Third Party Consultant for the air sampling and project monitoring functions described in this section. The Contractor shall comply with all direction given by the Independent Third Party Consultant's personnel during the course of the work.

C. The Independent Third Party Consultant shall staff the project with trained and certified person(s) to act on the State's behalf at the job site and help ensure that the lead work is completed per the requirements of all applicable regulations and this section.

1. The Independent Third Party Consultant shall provide the following services:

a. Inspection of the Contractor's work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and project specifications.

b. Personal air sampling will be the responsibility of the Contractor.

c. Verify daily that all workers used in the performance of the work are properly trained.

d. Monitor the progress of the Contractor's work, and report any deviations from the schedule to the State.

e. Monitor, verify, and document waste load-out operations.

f. Ensure that the Contractor is performing personal air monitoring daily, or until a Negative Exposure Assessment is verified, and that results are being returned and posted at the site as required.

g. The Independent Third Party Consultant shall maintain a log on site that documents project related actions, activities, and occurrences.

2. The following minimum inspections shall be conducted by the Independent Third Party Consultant. Additional inspections shall be conducted as required by work conditions. Progression from one phase of work to the next by the Contractor is only permitted with the approval of the Independent Third Party Consultant.

a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the work areas and to document these conditions.

b. Pre-Abatement Inspection: The purpose of this inspection is to verify the integrity of each barrier or containment system prior to disturbance of any LCP. This inspection shall take place only after the work area is fully prepped for removal.

c. Work Inspection: The purpose of this inspection is to monitor the work practices and procedures employed during removal of LCP and to monitor the continued integrity of the barrier or containment system. Inspections within the removal areas shall be conducted by the Independent Third Party Consultant during all preparation, removal, and cleaning activities.

d. Visual Clearance Inspection: The purpose of this inspection is to verify that all materials in the scope of work have been properly removed; no visible debris/residue remains; no pools of liquid or condensation remains; and all required cleanings are complete.

e. Post-Clearance Inspection:

1.06 CONTRACTOR RESPONSIBILITIES

A. The Contractor shall remove and stabilize any areas of deteriorated (e.g. loose and flakey) LCP prior to the start of demolition / renovation activities.

B. The Contractor shall designate a full-time Project Supervisor who shall meet the requirements of a "Competent Person" as defined by OSHA 1926.62 and shall have a minimum of one-year experience as a supervisor.

C. The Project Supervisor shall be responsible for the performance of the lead related work and shall represent the Contractor in all respects at the project site. The Supervisor shall be the primary point of contact for the Independent Third Party Consultant. Conduct sampling for lead in accordance with 29 CFR 1926.62 and as specified herein.

D. Collect personal air samples on employees who are anticipated to have the greatest risk of exposure. Air samples shall be collected on at least twenty-five percent of the work crew or a minimum of two employees; whichever is greater, during each work shift.

E. Submit results of air samples to the Independent Third Party Consultant within 72 hours after the air samples are taken.

F. The Contractor shall be responsible for all Toxicity Characteristic Leaching Procedure (TCLP) sampling and laboratory analysis to characterize waste streams prior to disposal.

1.07 DELIVERY AND STORAGE

A. Store all materials at the job site in a suitable and designated area.

1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.

2. Protect materials from unintended contamination and theft.

3. Storage areas shall be kept clean and organized.

B. Remove damaged or deteriorated materials from the job site.

1.08 TEMPORARY UTILITIES

A. Shut down and lock out all electrical power to the lead work areas.

B. Provide temporary electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the lead work area.

C. Provide temporary lighting with "weatherproof" fixtures for all work areas.

D. Utilize domestic water service from the existing system.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description, with Safety Data Sheets (SDS) as applicable.

B. No damaged or deteriorating materials shall be used. If material becomes contaminated the material shall be decontaminated or appropriately disposed of. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

C. Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating no less than six (6) mil thickness.

D. Polyethylene disposable bags shall be no less than six (6) mils thick.

E. A commercial grade duct tape (or equivalent) capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

F. Any ladders, planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable Federal, State and local regulations.

2.02 TOOLS AND EQUIPMENT

A. The Contractor shall provide tools and equipment that are suitable for lead related activities.

B. HEPA vacuums shall be leak proof to the filter and conform to American Industrial Hygiene Association (AIHA) Z9.2 and Underwriters Laboratory (UL) 586.

C. The Contractor shall notify, in writing, the Owner of any rental equipment in use during work activities that the subject equipment is being used in a LCP project.

PART 3 - EXECUTION

3.01 PREPARATION OF WORK AREAS

A. Physical Boundary: Provide physical boundaries around the lead control area by roping off the area designated in the work plan or providing curtains, portable partitions or other enclosures to ensure that lead will not escape outside of the lead control area.

B. Warning Signs: Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.

C. Decontamination Shower Facility: Provide clean and contaminated change rooms and shower facilities in accordance with 29 CFR 1926.62.

D. Eye Wash Station: Where eyes may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes shall be provided within the work area.

E. Personnel Protection: Personnel shall wear and use protective clothing and equipment as specified herein.

F. Prohibited Activities: Eating, smoking, or drinking or application of cosmetics is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been appropriately trained and provided with protective equipment.

3.02 WORK PRACTICES

A. Lead Work: Perform lead work in accordance with approved Lead Compliance Plan. Use procedures and equipment required to limit occupational exposure and environmental contamination with lead when the work is performed in accordance with 29 CFR 1926.62, and as specified herein. Dispose of all associated lead waste in compliance with Federal, State, and local requirements.

B. Removal of Material Containing Lead:

1. Manual or power sanding or grinding of lead surfaces or materials is not permitted unless tools are equipped with HEPA attachments or wet methods. The dry sanding or grinding of surfaces that contain lead is prohibited.

2. Select lead removal processes to minimize contamination of work areas outside the control area with lead-contaminated dust or other lead-contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this removal process in the Lead Compliance Plan.

3. The worksite preparation (barriers, containments or other methods) shall be job dependent and presented in the Lead Compliance Plan.

3.03 CLEANING

A. Maintain surfaces within the lead control area free of accumulations of dust and debris.

B. Restrict the spread of dust and debris; keep waste materials from being distributed over the work area.

C. Do not dry sweep or use pressurized air to clean up the area.

D. At the end of each shift and when the lead operation has been completed, clean the controlled area of visible contamination.

3.04 DISPOSAL

A. All material, whether hazardous or non-hazardous shall be disposed in accordance with all laws and provisions and all Federal, State or local regulations.

B. Contractor is responsible for any waste characterization testing and segregation of waste materials. Ensure all waste is properly characterized prior to disposal.

END OF SECTION

SECTION 13285 – PCB BALLASTS

PART 1 - GENERAL

1.01 SUMMARY

A. The work covered by this section includes the handling and control of materials that may contain polychlorinated biphenyls (PCB) and describes some of the procedures and equipment required to protect workers, the environment and the general public during construction activities.

B. Furnish all labor, materials, and equipment necessary to carry out the safe removal and disposal of PCB containing components compliance with all applicable laws and regulations prior to demolition. The work shall generally include:

1. Twenty-four light ballasts in the Greenhouse (5986A Uluwehi) unless the ballasts have “No PCB” labels.

2. Six light ballasts in Building S Restroom (5986B Uluwehi) unless the ballasts have “No PCB” labels.

3. Thirty-two light ballasts in Imiloa Room 123 unless the ballasts have “No PCB” labels.

C. The Contractor should verify all quantities and locations.

D. Related Work Described Elsewhere:

1. Section 13281 – REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

2. Section 13282 – LEAD PAINT CONTROL MEASURES

3. Section 13286 – MERCURY IN FLUORESCENT LIGHTS

4. Section 13288 – ASBESTOS TESTING AND MONITORING

5. Section 13289 – LEAD TESTING AND MONITORING

1.02 REQUIREMENTS

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to work practices, protection of workers, authorized visitors to the site, persons, and property adjacent to the work.

B. All work shall be performed in strict accordance with all governing codes, rules, and regulations. Where conflicts occur the more stringent requirement shall apply.

C. Working hours shall be as required and approved by the State. The Contractor shall coordinate and schedule all work with the State.

1.03 SUBMITTALS

A. Pre-Work Submittals:

1. PCB Removal Plan: Submit a detailed job-specific plan of the work procedures to be used in the removal and disposal of PCB containing materials. The plan shall include interface of trades, sequencing of PCB removal, disposal plan, respirators, protective equipment, and emergency procedures.

2. PCB Disposal Plan: The PCB Disposal Plan shall comply with applicable requirements of federal, state, and local PCB containing waste regulations and address:

a. Identification of PCB waste associated with the work.

b. Estimated quantities of waste to be generated and disposed.

c. Names and qualifications of each contractor that will be transporting, storing, treating, disposing of the waste. Furnish copies of EPA, state, and local PCB waste permit applications, permits, and EPA Identification numbers for the PCB and mercury disposal.

d. Names and qualifications (experience and training) of personnel who will be working on-site with PCB waste.

e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.

f. Spill prevention, containment, and cleanup contingency measures to be implemented.

g. Work plan and schedule for PCB waste containment, removal and disposal. Waste shall be containerized daily.

B. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during construction activities as defined in this Section:

1. Project documents (specifications and drawings)

2. Safety Data Sheets of supplies/chemicals used on the project

4. Approved PCB Removal Plan

5. Approved PCB Disposal Plan

6. List of emergency telephone numbers

7. Waste Disposal Documents

1.05 DELIVERY AND STORAGE

A. Store all materials at the job site in a suitable and designated area.

1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.

2. Protect materials from unintended contamination and theft.

3. Storage areas shall be kept clean and organized.

B. Remove damaged or deteriorated materials from the job site.

1.06 TEMPORARY UTILITIES

A. Shut down and lock out all electrical power to the work areas.

B. Provide temporary electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the work area.

C. Provide temporary lighting with "weatherproof" fixtures for all work areas.

D. Utilize domestic water service from State's existing system.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description, with Safety Data Sheets (SDS) as applicable.

B. No damaged or deteriorating materials shall be used. If material becomes contaminated the material shall be decontaminated or disposed of as PCB waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

C. Any ladders, planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable Federal, State and local regulations.

2.02 TOOLS AND EQUIPMENT

A. The Contractor shall provide tools and equipment that are suitable for PCB related activities.

B. The Contractor shall notify, in writing, the State of any rental equipment in use during work activities that the subject equipment is being used in a PCB project.

PART 3 - EXECUTION

3.01 PREPARATION OF WORK AREAS

A. Establish a PCB control area by roping off the area to prevent unauthorized entry of personnel. No one will be permitted in the PCB control area unless the person is provided with appropriate training and protective equipment. Food, drink and smoking materials are prohibited in the designated PCB control area.

B. Workers shall wear and use PPE upon entering the work area.

3.02 WORK PRACTICES

A. PCB Control Area Requirements: Establish a PCB control area by roping off the area or providing curtains, portable partitions or other enclosures.

B. Select PCB removal procedure to minimize contamination of work areas with PCB or other PCB-contaminated debris/waste. Handle PCB such that no skin contact occurs. PCB removal process shall be described in the work plan.

C. All light fixtures shall be de-energized prior to the light fixture removal.

D. Remove light ballasts intact. If the light fixture ballast is leaking and it is not possible or feasible to clean the light fixture, dispose of entire fixture as PCB contaminated material.

3.03 DISPOSAL

A. All material, whether hazardous or non-hazardous shall be disposed in accordance with all laws and provisions and all Federal, State or local regulations.

B. PCB disposal shall comply with requirements and procedures outlined in 40 Code of Federal Regulations (CFR) 761.

C. Submit the waste disposal manifest and receipts showing acceptance of the material by the approved waste disposal or recycling facility to the Third Party Consultant within 30 days after disposal.

END OF SECTION

SECTION 13286 – MERCURY CONTAINING COMPONENTS

PART 1 - GENERAL

1.01 SUMMARY

A. The work covered by this section includes the handling and control of components that may contain mercury and describes some of the procedures and equipment required to protect workers, the environment and the general public during construction activities.

B. Furnish all labor, materials, and equipment necessary to carry out the safe removal and disposal of mercury containing components in compliance with all applicable laws and regulations prior to demolition. The work shall generally include:

1. Twenty-four fluorescent light tubes and seven halogen bulbs in the Greenhouse (5986A Uluwehi)

2. Six fluorescent light tubes in Building S Restroom (5986B Uluwehi).

C. The Contractor should verify all quantities and locations.

D. Related Work Described Elsewhere:

1. Section 13281 – REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING MATERIALS (ACM)

2. Section 13282 – LEAD-PAINT CONTROL MEASURES

3. Section 13285 – PCB BALLASTS

4. Section 13288 – ASBESTOS TESTING AND MONITORING

5. Section 13289 – LEAD TESTING AND MONITORING

1.02 REQUIREMENTS

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to work practices, protection of workers, authorized visitors to the site, persons, and property adjacent to the work.

B. All work shall be performed in strict accordance with all governing codes, rules, and regulations. Where conflicts occur the more stringent requirement shall apply.

C. Working hours shall be as required and approved by the State. The Contractor shall coordinate and schedule all work with the State.

1.03 SUBMITTALS

A. Pre-Work Submittals:

1. Mercury Containing Components Removal Plan: Submit a detailed job-specific plan of the work procedures to be used in the removal and disposal of mercury containing materials. The plan shall include interface of trades, sequencing of mercury work, disposal plan, respirators, protective equipment, and emergency procedures.

2. Mercury Containing Components Disposal Plan: The Mercury Containing Components Disposal Plan shall comply with applicable requirements of federal, state, and local mercury containing waste regulations and address:

   a. Identification of mercury waste associated with the work.

   b. Estimated quantities of waste to be generated and disposed.

   c. Names and qualifications of each contractor that will be transporting, storing, treating, disposing of the waste. Furnish copies of EPA, state, and EPA Identification numbers for the mercury disposal.

   d. Names and qualifications (experience and training) of personnel who will be working on-site with mercury waste.

   e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.

   f. Spill prevention, containment, and cleanup contingency measures to be implemented.

   g. Work plan and schedule for mercury waste containment, removal and disposal. Waste shall be containerized daily.

B. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during construction activities as defined in this Section:

1. Project documents (specifications and drawings)

2. Safety Data Sheets of supplies/chemicals used on the project

3. Approved Mercury Removal Plan

4. Approved Mercury Disposal Plan

5. List of emergency telephone numbers

6. Waste Disposal Documents

1.05 DELIVERY AND STORAGE

A. Store all materials at the job site in a suitable and designated area.

1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.

2. Protect materials from unintended contamination and theft.

3. Storage areas shall be kept clean and organized.

B. Remove damaged or deteriorated materials from the job site.

1.06 TEMPORARY UTILITIES

A. Shut down and lock out all electrical power to the work areas.

B. Provide temporary electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the work area.

C. Provide temporary lighting with "weatherproof" fixtures for all work areas.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description, with Safety Data Sheets (MSDS) as applicable.

B. No damaged or deteriorating materials shall be used. If material becomes contaminated the material shall be decontaminated or disposed of as mercury waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

C. Any ladders, planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable Federal, State and local regulations.

2.02 TOOLS AND EQUIPMENT

A. The Contractor shall provide tools and equipment that are suitable for mercury related activities.

B. The Contractor shall notify, in writing, the Owner of any rental equipment in use during work activities that the subject equipment is being used in a mercury project.

PART 3 - EXECUTION

3.01 PREPARATION OF WORK AREAS

A. Establish a mercury control area by roping off the area to prevent unauthorized entry of personnel. No one will be permitted in the mercury control area unless the person is provided with appropriate training and protective equipment. Food, drink and smoking materials are prohibited in the designated mercury control area.

B. Workers shall wear and use appropriate PPE upon entering the work area.

3.02 WORK PRACTICES

A. Select mercury removal procedure to minimize contamination of work areas with mercury. Handle mercury such that no skin contact occurs. Mercury removal process shall be described in the work plan.

B. All light fixtures and thermostats shall be de-energized prior to the removal.

C. Remove mercury containing components, package and recycle as specified and in accordance regulatory requirements. Avoid breaking the components.

3.03 DISPOSAL

A. All material, whether hazardous or non-hazardous shall be disposed in accordance with all Federal, State or local regulations.

B. Submit the waste disposal manifest and receipts showing acceptance of the material by the approved waste disposal or recycling facility to the Third Party Consultant within 30 days after disposal.

END OF SECTION

SECTION 13288 - ASBESTOS TESTING AND MONITORING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Abatement Contractor’s Responsibilities for personnel monitoring and record keeping.

B. Project air monitoring and inspectional services for the purposes of:
   1. Verifying compliance with the specifications listed in Section 13281 – REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS (ACM).

   2. Ensuring that the State’s legally required documentation is collected.

   3. Providing engineering control during the project.

1.02 DEFINITIONS: Unless otherwise clear from the context, as used in this contract:

A. "ACM": asbestos containing materials.

B. "Air Monitoring Specialist": A qualified person who enters the work area to set up the air monitoring device and then collects the various air samples to be sent to the laboratory for analysis.

C. "Building Representative(s)": The person or persons designated by the users of the building to act on their behalf.

D. "Contractor": The construction firm engaged to remove, encapsulate and/or dispose of the ACM.

E. "Consultant": The firm contracted by the State to inspect the work of the Contractor during the removal, encapsulation and disposal of the ACM and is capable or has a subcontractor to perform air monitoring, sampling and testing before, during and after the asbestos removal and/or encapsulation.

F. “Engineering Controls”: Eliminate or reduce exposure to asbestos through the use or substitution of engineered machinery or equipment.

G. "Project Designer": The person or firm who prepared the plans and specifications to remove, encapsulate and dispose of the ACM. The Project Designer shall be certified by the State of Hawaii Department of Health as an Asbestos Project Designer.

H. "Project Monitor": A person hired by the State that is certified by the State of Hawaii Department of Health as an Asbestos Project Monitor.

1.03 COORDINATION

A. Coordinate with the Contractor's Independent Third Party Consultant for the testing/air monitoring requirements included in Section 13281 – REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIAL for testing/ air monitoring consultants or inspectors, and all applicable Federal, State and local regulations.

1.04 PRE-CONSTRUCTION CONFERENCE

A. Hold conference prior to construction and shall be conducted by the Contracting Officer assisted by the Contractor's Independent Third Party Consultant.
   1. Attendance: Present also shall be the Contractor, Contractor's Independent Third Party Consultant and/or the Contractor's Independent Third Party Consultant's Project Monitor, Building Representative(s). When the abatement Contractor is a subcontractor to a General Contractor, a representative of the General Contractor shall also attend.

   2. Agenda:
      a. Review final schedule for project.

      b. Verify legal requirements and special conditions.

      c. Verify compliance with pre-construction requirement.

      d. Obtain copies of all mandatory notifications.

      e. Inspect sample respiratory equipment and other abatement equipment.

      f. Review procedures and responsibilities.

      g. Clarify the scope of work and its best impact on the users of the building.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 CONTRACTOR'S RESPONSIBILITY

A. Testing and air monitoring will be supplied by the Contractor.

3.02 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall engage and pay for the services of an Independent Third Party Consultant who shall serve as the representative in regard to the performance of the asbestos air monitoring work and provide direction as required throughout the entire abatement project period.

B. The Contractor shall be responsible for providing the daily personal air monitoring and necessary records for all of the Contractor's employees for the duration of the project as required by OSHA (29 CFR 1926.1101), and all other applicable laws.

C. The Contractor shall obtain the OSHA required reports for personnel air monitoring as part of the contract.

D. The Contractor shall be responsible for daily personal air samples that shall be collected on at least 25% of the personnel performing removal work on similar tasks and for the duration of the project. Submit within 1 working day to the Contracting Officer.

E. The Contractor is solely responsible for protecting his workers, other personnel, and the public from any of his work activities at the work site and on State property regardless of the testing and monitoring conducted by the State.

F. Monitoring information developed by the Independent Third Party Consultant's activities shall be for the use of the Contracting Officer. The information will be available and offered to the Contractor when developed, but not thereafter, and shall not waive the Contractor's obligations stated elsewhere in this section.

G. Air monitoring and testing becomes necessary to follow up on work by the Contractor which is rejected as not conforming to the requirements will be supplied by the Contractor. However, the full cost of such additional monitoring and testing shall be borne by the Contractor and shall be deducted from the final contract payment.

H. Personal air monitoring that becomes part of the Independent Third Party Consultant's scope of work shall be accommodated by the Contractor.

3.03 AIR MONITORING AND INSPECTIONAL SERVICES

A. Duties of the Contractor's Independent Third Party Consultant:

1. Photographic Record of Project: Record the asbestos abatement project with representative photos. All photos shall become the property of the State and are to be accompanied by a detailed log.

2. Project Log: Maintain daily field reports detailing all key activities during abatement and make a summary of project activities to the project designer and the State project coordinator. Incorporate the contents of the daily field reports with other project data into a final project report.

3. Visual Inspection of all Containment Areas: Perform regular inspection of all containment areas. Conduct inspections during the actual work performance of the Contractor to document the work practices employed by the Contractor and prior to air testing in each area to verify that all materials scheduled for abatement were removed and the area was properly cleaned.

B. Air Monitoring: The Contractor's shall engage and pay for the services of an Independent Third Party Consultant. The Third Party Consultant's on-site Project Monitor shall perform the following activities associated with this portion of the project:

1. On-site environmental and personnel air monitoring as required by EPA, HDOH, OSHA, HIOSH, and the project specifications (See methodology below).

2. Laboratory analysis by PCM analysis using NIOSH 7400 method.

3. Monitoring of decontamination procedures at site entry/exit.

4. Monitoring of containment maintenance by visual and instrumental inspection.

5. Interface with project inspectors, building representatives, representatives of regulatory agencies, and project designers during site visits.

6. Ensure that proper respiratory protection is utilized by all persons at the project site.

7. Relay to the Contracting Officer any discrepancies in contractor's action with provisions of project specifications.

8. Act quickly in case of emergencies with appropriate response.

3.04 SAMPLING DESIGN

A. The following is a typical sampling design per containment area during the actual construction. The number of samples and volume quantities may vary, depending on each project's specifications.

1. Background Samples: Background baseline samples shall be taken prior to abatement to establish pre-abatement airborne fiber concentration levels. Three high volume continuous flow samples shall be taken per estimated containment area. All work area samples shall be analyzed by the NIOSH 7400 method. All personal samples shall be analyzed in accordance with OSHA 29 CFR 1926.1101. The reference TWA (time weighted average) shall be established one day prior to the masking and sealing operations.

2. Work Area Samples: Low volume samples of 480 liters each shall be taken in the work area. Ambient air samples shall be taken in the work area for comparison to barrier samples in an to ensure that containment systems are secure and that the persons entering the work area are wearing proper respiratory protection. If monitoring inside and outside the asbestos abatement work area shows airborne concentrations have reached the predetermined specified TWA, the consultant shall stop all work, notify the State immediately, have the contractor correct the condition(s) causing the increase and ensure that the contractor obtains the State's approval prior to restarting the removal work.

3. Barrier Samples: Monitoring outside the temporary barriers determines if leakage is occurring outside the work area due to loss of negative pressure or faulty seals. Two high volume samples shall be taken per eight-hour day per barrier.

4. Outside Environmental Samples: Each removal area shall be sealed so that airborne fibers cannot escape into occupied areas. Air is forcibly drawn from the removal area by a negative air machine, filtered and exhausted to the

outside environment. High volume samples shall be taken at the negative air unit exhaust to ensure compliance with the levels required by the project specifications and/or any applicable regulations. One sample per eight-hour day per containment area shall be taken.

5. Final Clearance Samples: After air in containment has been exchanged by High Efficiency Particulate Absolute (HEPA) filtration at least 72 times, (air clearance) samples shall be taken to determine if air is cleaned below the specified rate. If not, the area must be cleaned again, and a second set of clearance samples run. When the fiber count is below the specified level, a final set of samples shall be collected for analysis by transmission electron microscopy or phase contrast microscopy depending on the size of the abatement area. If these tests reveal that the air has been cleaned to the acceptable standards, the area may be opened for re-occupancy.

3.05 LABORATORY ANALYSIS

A. All air samples collected by the Contractor's Independent Third Party Consultant shall be analyzed by an AIHA certified laboratory for the analysis being requested. All laboratories shall be registered with the Hawaii Department of Health.

3.06 DAILY TESTING RECORDS

A. At the conclusion of every day's testing, the Contractor's Independent Third Party Consultant shall provide copies of all air monitoring records of each containment area to the State within 5 working days of collection.

END OF SECTION

SECTION 13289 - LEAD TESTING AND MONITORING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Abatement Contractor's Responsibilities for personnel monitoring and record keeping.

B. Project air monitoring and inspectional services for the purposes of:
   1. Verifying compliance with the specifications listed in Section 13282 – LEAD-PAINT CONTROL MEASURES (or equivalent section title).

   2. Ensuring that the State's legally required documentation is collected.

   3. Providing engineering controls during the project.

1.02 DEFINITIONS: Unless otherwise clear from the context, as used in this contract:

A. "Action Level (AL)": Employee exposure, without regard to the use of respirators, to an airborne concentration of lead of thirty micrograms per cubic meter of air (30 $\mu g/m^3$) calculated as an 8-hour time-weighted average (TWA).

B. "Building Representative(s)": The person or persons designated by the users of the building to act on their behalf.

C. "Contractor": The construction firm engaged to remove and dispose of the lead-containing materials.

D. "Consultant": The firm contracted by the State to inspect the work of the Contractor during the removal and disposal of the lead-containing materials and is capable or has a subcontractor to perform personal air monitoring, sampling and testing before,-during and after the lead removal. The consultant may be the construction manager or said construction manager may be a subcontractor to the consultant.

E. "Engineering Controls": Measures other than respiratory and other personal protection or administrative controls that are implemented at the worksite to contain, control, and/or otherwise reduce exposure to lead-contaminated dust and debris usually in the occupational health setting. The measures include process and product substitution, isolation, and ventilation. The term may be used in the occupational health setting in order to prevent workers' exposures to lead; it can also be used in other lead hazard control settings, such as preventing residents' exposure.

F. "Project Designer": The person or firm, certified by the DOH, State of Hawaii, who prepared the plans and specifications to remove and dispose of the lead-containing materials.

G. "Project Monitor": A person hired by the State who shall certify and document removal and clean-up of all lead-containing material and associated waste from the project site and perform visual clearances and testing.

1.03 COORDINATION

A. Coordinate with the Contractor's Independent Third Party Consultant for the testing and monitoring requirements included in Section 13282 – LEAD-PAINT CONTROL MEASURES for testing/ air monitoring consultants or Project Monitor, and all applicable Federal, State and local regulations.

1.04 PRE-CONSTRUCTION CONFERENCE

A. Hold conference prior to construction and shall be conducted by the Contracting Officer assisted by the Contractor's Independent Third Party Consultant.
   1. Attendance: Present also shall be the Contractor, Contractor's Independent Third Party Consultant and/or the Contractor's Independent Third Party Consultant's Project Monitor and Building Representative(s). When the abatement Contractor is a sub-contractor to a General Contractor, a representative of the General Contractor shall also attend.

   2. Agenda:
      a. Review final schedule for project.

      b. Verify legal requirements and special conditions.

      c. Verify compliance with pre-construction requirement.

      d. Obtain copies of all mandatory notifications.

      e. Inspect sample respiratory equipment and other abatement equipment.

      f. Review procedures and responsibilities.

      g. Clarify the scope of work and its best impact on the users of the building.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 CONTRACTOR'S RESPONSIBILITY

A. Testing and monitoring will be supplied by the Contractor.

3.02 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall engage and pay for the services of an Independent Third Party Consultant who shall serve as the representative in regard to the performance of the lead air monitoring work and provide direction as required throughout the entire abatement project period.

B. The Contractor shall be responsible for providing the daily personal air monitoring and necessary records for all of the Contractor's employees for the duration of the project as required by OSHA (29 CFR 1926.62), and all other applicable laws.

C. The Contractor shall obtain the OSHA required reports for personnel air monitoring as part of the contract.

D. The Contractor shall be responsible for daily personal air samples that shall be collected on at least 25% of the Contractor's personnel performing removal work on similar tasks and for the duration of the project. Submit within 5 working days to the Contracting Officer.

E. The Contractor is solely responsible for protecting his workers, other personnel, and the public from any of his work activities at the work site and on State property regardless of the testing and monitoring conducted by the State.

F. Monitoring information developed by the Independent Third Party Consultant's activities shall be for the use of the Contracting Officer. The information will be available and offered to the Contractor when developed, but not thereafter, and shall not waive the Contractor's obligations stated elsewhere in this section.

G. Air monitoring and testing which becomes necessary to follow up on the work by the Contractor which is rejected as not conforming to the requirements will be supplied by the Contractor. However, the full cost of such additional monitoring and testing shall be borne by the Contractor and shall be deducted from the final contract payment.

H. Personal air monitoring that becomes part of the Independent Third Party Consultant's scope of work shall be accommodated by the Contractor.

I. Prior to disposal of lead contaminated wastewater, one wastewater (as applicable) sample shall be collected by the Contractor, to determine whether it can be disposed of as non-hazardous waste or with an EPA approved hazardous waste disposal facility as hazardous waste. Contractor shall obtain and submit to the Contracting Officer, a permit to conduct such disposal into the sanitary sewer system prior to disposal. Disposal of all wastewater suspected of being contaminated with lead in the storm drain system is prohibited. Wastewater, no matter what its lead content, shall not be dumped on the ground. Contractor is ultimately responsible for and shall include in his bid the cost to properly dispose of all waste, hazardous or non-hazardous. Submit a copy of the permit to the Contracting Officer.

J. Perform the 8 Resource Conservation and Recovery Act (RCRA) Toxic Characteristic Leaching Procedure (TCLP) metals testing on all solid waste debris contaminated with lead (except for painted scrap metal), in accordance with 40 CFR Part 261 "Identification and Listing of Hazardous Waste". Painted metal debris shall be separated from the rest of the lead- contaminated waste and disposed of as scrap metal at a metal recycler (when disposed of as scrap metal, TCLP testing is not required). The 8 RCRA metals TCLP testing shall be used to determine whether waste is hazardous or non-hazardous prior to disposal. Dispose of lead-contaminated debris as hazardous waste if the waste is determined to be hazardous by the 8 RCRA metals TCLP testing. If the 8 RCRA metals TCLP testing indicates that the waste is non- hazardous, the Contractor shall dispose of the waste as non-hazardous, construction waste.

3.03 AIR MONITORING AND INSPECTIONAL SERVICES

A. Duties of the Contractor's Independent Third Party Consultant:
   1. Photographic Record of Project: Record the lead abatement project with representative photos to the Contracting Officer. All photos shall become the property of the State and are to be accompanied by a detailed log.

   2. Project Log: Maintain daily field reports detailing all key activities during abatement and make a submittal of summary project activities to the project designer and the Contracting Officer. Incorporate the contents of the daily field reports with other project data into a final project report.

   3. Visual Inspection of all Containment Areas: Perform regular inspection of all containment areas. Conduct inspections during the actual work performance of the Contractor to document the work practices employed by the Contractor and conduct visual clearances to verify that all materials scheduled for abatement were removed and the area was properly cleaned. Submit clearances to the Contracting Officer.

B. Air Monitoring: The Contractor's shall engage and pay for the services of an Independent Third Party Consultant. The Third Party Consultant's on-site Project Monitor shall perform the following activities associated with this portion of the project:
   1. On-site personnel air monitoring (if not provided by the Contractor) as required by OSHA and HIOSH, and the project specifications (See methodology below).

   2. Laboratory analysis for lead-in-air using NIOSH 7082 or OSHA 105 method.

   3. Monitoring of decontamination procedures at site entry/exit.

   4. Monitoring of containment maintenance by visual and instrumental inspection.

   5. Interface with project inspectors, building representatives, representatives of regulatory agencies, and project designers during site visits.

   6. Ensure that proper respiratory protection is utilized by all persons at the project site.

   7. Relay to the Contracting Officer any discrepancies in Contractor's action with provisions of project specifications.

   8. Act quickly in case of emergencies with appropriate response.

3.04 LABORATORY ANALYSIS

A. All personal air samples collected by the Contractor's Independent Third Party Consultant shall be analyzed by an AIHA certified laboratory for the analysis being requested. All laboratories shall be registered with the Hawaii Department of Health.

3.05 DAILY TESTING RECORDS

A. At the conclusion of every day's testing the Contractor's Independent Third Party Consultant shall provide copies of all testing and monitoring records to the State within 5 working days of collection.

END OF SECTION

SECTION 13851 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

Furnish all labor, tools, equipment, materials, and accessories required to provide a complete, addressable, electrically supervised, closed circuit fire alarm system as specified herein and as shown on the plans.

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS

SECTION 16100 - ELECTRICAL WORK: Fire alarm system raceways.

1.04 PAYMENT PROCEDURES

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

1.05 SCOPE

A. System Description: This work includes designing and modifying the existing hardwired, programmable Edwards System Technology (EST) fire alarm system at the Uluwehi Building. The system shall include all wiring, raceways, outlet and mounting boxes, and all other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described. The system layout on the drawings is conceptual.

B. Equipment, materials, installation, workmanship, inspection, and testing shall be in strict accordance with the required and advisory provisions of NFPA 72 except as modified herein.

C. Existing Fire Alarm Equipment: Existing fire alarm equipment shall be maintained fully operational until the new equipment has been tested and accepted. As new equipment is installed, it shall be tagged “NOT IN SERVICE” until the new equipment is accepted. Once the new system is completed, tested, and accepted by the University it shall be placed in service. All new equipment shall have tags removed and the existing equipment shall be tagged “NOT IN SERVICE” until removed from the building.

D. Equipment Removal: After acceptance of the work by the University, all existing equipment not connected to the new system shall be removed, all unused exposed conduit shall be removed, and all damaged surfaces shall be restored.

1.06 APPLICABLE PUBLICATIONS

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

A. Local ordinances and regulations of the City and County of Honolulu.

B. National Fire Protection Association (NFPA):

NFPA 1	(2012) Uniform Fire Code
NFPA 70	(2014) National Electrical Code
NFPA 72	(2010) National Fire Alarm Code

C. Applicable fire alarm system manufacturer instructions for the equipment and materials supplied for the project.

1.07 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Partial submittals will not be acceptable. Annotate descriptive data to show the specific model, type, and size of each item the Contractor proposes to furnish. Do not commence work until all submittals have been reviewed and approved. Review and acceptance of shop drawings by University shall not relieve the Contractor of responsibility to provide for a complete and proper installation.

1. Manufacturer's Product Data:

a. Manual fire alarm pull stations.

b. Fire alarm notification appliances.

c. Fire alarm device backboxes.

2. Shop (Working) Drawings:

a. Riser Wiring Diagrams: Drawings shall be job-specific. "Typical" or "generic" drawings are not acceptable. The diagrams shall include but not be limited to the following:

1) Locations of All System's Elements: Indicate all devices, junction boxes, and pass-through devices and entities where the cables and conductors can be accessed by personnel. Indicate the number of devices provided.

2) Labeling of All Elements: All devices, junction boxes, etc. shall be labeled by functional designations, locations and numbers such as building alphabet, room function and room number.

3) Fire Alarm Wiring and Color Codes: All cable and conductor color codes, the wire marking system and marker designation as specified herein shall be shown.

3. Design Data:

a. Standby battery capacity calculations shall list the type of devices and modules, quantities, unit amperage draw for standby and alarm conditions, total amperage draw and battery amp/hour rating.

b. Provide detailed voltage drop calculations for all notification appliance circuits modified by the project.

c. Provide data for each circuit modified by the project to indicate that there is at least 20 percent spare capacity.

4. Equipment and/or Modular Systems Wiring Diagram: Wiring diagrams showing all equipment (control panel and annunciator in separate panel) modules, components and key internal cabinet wiring that should be accessed for tests and maintenance. Drawings shall include but not be limited to the following:

a. Input and Output Circuits Labeling: Label the input and output circuits by circuit designations specified herein.

b. Internal - External Circuits Interface Information: Only information that interfaces with external circuits and internal equipment wiring need be shown. All external wiring and circuits shall be shown in the riser diagram and the Contractor furnished Point-To-Point Wiring Diagrams.

1) Changes in or deletion of the modular system wiring diagrams shall not require changes to the riser diagrams and the Contractor furnished Point-To-Point Wiring Diagrams and vice versa except for the panel deletion or change.

5. Operations and Maintenance Manual: Provide in accordance with SECTION 01700 - CONTRACT CLOSEOUT and as follows:

   a. The manual may be provided in several volumes if so approved by the University.

   b. All drawings shall be folded to letter size by individual sheets so they can be retained in the manual.

   c. The manual shall contain the following:

      1) Manufacturer's Printed Equipment/System Operations and Maintenance Manual, and Device Brochures:

         a) Start-up, operating, preventative maintenance, adjustment and troubleshooting procedures, and parts list.

         b) System Control Diagrams.

         c) Internal equipment wiring diagrams.

      2) Manufacturer's Representatives: The names, addresses and phone numbers of the fire alarm system manufacturer, the nearest manufacturer's representative, and the nearest supplier of the manufacturer's equipment and parts.

      3) Fire Alarm System Test Results: Provide completed test data sheets with the recorded measured data obtained during pre-final testing in the designated spaces and a printout of the equipment program. The test plan shall be developed in accordance with NFPA 72, Chapter 7. Submit the following information.

         a) Test information applicable for the project.

         b) Standard attendance signature sheets.

6. As-Built Drawings: Submit in accordance with SECTION 01700 - CONTRACT CLOSEOUT. Upon completion and before final acceptance of the work, submit complete set of as-built drawings of the system for record purposes. Drawings shall include all components and circuit diagrams complete with conductor color codes.

7. Qualifications of the fire alarm system installer and technician as stipulated in item entitled "QUALITY ASSURANCE" hereinbelow.

8. Guaranty and Certificate: Submit guaranty as stipulated in item entitled “GUARANTY AND CERTIFICATE” hereinbelow.

9. Written notification of all tests and test results as specified in item entitled “TESTING” hereinbelow.

1.08 QUALITY ASSURANCE

A. Qualification of Installer: Installation shall be accomplished by an Electrical Contractor with a minimum of 5 years’ experience in the installation of fire alarm systems in the State of Hawaii. The services of a technician provided by the control equipment manufacturer shall be provided to supervise installation, adjustments, and tests of the system. Prior to installation, submit data for approval by the University showing that the Contractor has successfully installed addressable, programmable analog intelligent interior fire alarm systems of the same type as specified herein, or that the Contractor has a firm contractual agreement with a subcontractor having such required experience. Include the names and locations of at least 2 installations where the Contractor or the subcontractor referred to above, has installed such systems. Indicate the type and design of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months. Submit names and phone numbers of points of contact at each site.

B. Qualifications of System Technician: Installation drawings, shop drawings, and “as-built” drawings shall be prepared by, or under the supervision of, a qualified technician. Qualified technician shall be an individual who is experienced with the types of work specified herein, and is currently certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level-III certification in Fire Alarm Systems program. Contractor shall submit data showing the name and certification of the technician at or prior to submittal of drawings.

C. Regulatory Requirements: Devices and equipment for fire alarm service shall be listed by Underwriters Laboratories, Inc. or approved by the Factory Mutual System or listed by other nationally recognized testing laboratories.

D. Requirements for Fire Protection Service: Equipment and material shall have been tested by Underwriters Laboratories, Inc. and listed in UL FPED or approved by Factory Mutual and listed in FM P7825. Where the terms “listed” or “approved” appear in this specification, they shall mean listed in UL FPED or FM P7825. The omission of these terms under the description of any item of equipment described shall not be construed as waiving this requirement.

E. Standard Products: Materials and equipment shall be standard new products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory

use for at least one year prior to bid opening. Select material from one manufacturer, where possible, and not a combination of manufacturers, for any particular classification of materials.

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

1.09 GUARANTY AND CERTIFICATE

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

B. The one-year guaranty shall start at the end of 30 consecutive days of trouble-free operation after certification by the Fire Department and acceptance by the University, whichever date is the latest.

PART 2 - PRODUCTS

2.01 MANUFACTURER QUALIFICATIONS

All components of the modified system shall be provided by a single manufacturer, fully compatible with the existing Edwards System Technology EST-3 fire alarm system, shall be of current design and shall be in regular and recurrent production. Provide design, materials and devices for a protected premises fire alarm system, complete, conforming to NFPA 72, except as otherwise or additionally specified herein.

2.02 SYSTEM DESIGN

A. Fire alarm system modifications shall utilize the existing initiating and notification appliance circuits available at the existing fire alarm control panel. Provide Class B, Style B initiating device circuits and Class B, Style Y notification appliance circuits.

B. Emergency Power Supply:

1. Provide for system operation in the event of primary power source failure.

2. System batteries shall have sufficient capacity to operate the system under supervisory and trouble conditions, including audible trouble signal devices for 24 hours and audible and visual alarm signaling devices under alarm conditions for an additional five minutes. Modify or provide additional battery capacity as required to support modifications to the existing fire alarm system.

C. System Wiring:

1. Wiring within Cabinets, Enclosures, Boxes, Junction Boxes, and Fittings: Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure, or cabinet. Conductors which are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting, or junction box shall be connected to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make connections with approved pressure type terminal blocks, which are securely mounted. The use of wire nuts or similar devices shall be prohibited.

2. Alarm Wiring: Conductors shall be Type THHN/THWN. Type TW is not permitted. Signaling line circuits and initiating device circuit field wiring shall be copper, No. 16 AWG size conductors at a minimum. Wire size shall be sufficient to prevent voltage drop problems. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage. Shielded wiring shall be utilized where recommended by the manufacturer. For shielded wiring, the shield shall be grounded at only one point, which shall be in or adjacent to the FACP. Color coding is required for circuits and shall be maintained throughout the circuit.

D. Manual Pull Stations: Provide metal or plastic, semi-flush mounted, double action, hardwired pull stations which are not subject to operation by jarring or vibration. Stations shall be equipped with screw terminals for each conductor. Stations which require the replacement of any portion of the device after activation are not permitted. Stations shall be finished in fire-engine red with molded raised lettered operating instructions of contrasting color. The use of a key or wrench shall be required to reset the station. Where the device is surface mounted, provide manufacturer's surface mounting backbox or device skirt.

E. Notification Appliances:

1. Visual Alarm Signals: Provide semi-flush mounted strobe light visual alarm signals which operate on a supervised 24-volt DC circuit. The strobe lens shall comply with UL 1971 and conform to the Americans with Disabilities Act. The light pattern shall be disbursed so that it is visible above and below the strobe and from a 90-degree angle on both sides of the strobe. The strobe flash output shall be a minimum of 15 candela and shall be field-selectable for 15, 30, 75 and 110 candela, based on the UL 1971 test. The strobe shall have a xenon flash tube. Visible appliances shall be part of a combination audio-visual assembly where indicated. Where the device is surface mounted, provide manufacturer's surface mounting backbox or device skirt.

2. Fire Alarm Horns: Provide semi-flush mounted electronic multi-tone horns that produce a three-pulse temporal pattern, suitable for use on a supervised 24-volt DC circuit. Horns shall have a rating of 90 dBA at 10 feet when tested in accordance with UL 464. Where the device is surface mounted, provide manufacturer's surface mounting backbox or device skirt.

3. Provide weatherproof notification appliances and backboxes where specified.

PART 3 - EXECUTION

3.01 EXAMINATION OF THE DRAWINGS AND SPECIFICATIONS

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

3.02 EXAMINATION OF SITE CONDITIONS

A. Audio/visual devices and other equipment and devices shall be installed in the locations and heights shown on the drawings and/or as specified herein.

B. The location of the equipment and devices shown on the plans are approximate. Before installing, the Contractor shall study adjacent construction, verify all dimensions and sizes of equipment at the job site and perform installation in what he considers the most logical manner.

1. Any changes from the locations shown on the drawings must be approved by the University and shown on the "field-posted as-built" drawings.

2. Any device may be relocated within 10 feet before installation at the direction of University without additional charge to University.

3.03 INSTALLATION

A. Protect dissimilar metals with approved fittings and treatment.

B. All metallic conduits and boxes shall be grounded with a green wire ground conductor.

C. Equipment Installation: Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with NFPA 70, NFPA 72, and as modified herein.

1. Manual Pull Stations: Locate manual stations where shown on the drawings. Mount stations so that their operating handles are four feet above the finished floor in accordance with Americans with Disability Act Accessibility Guidelines.

2. Notification Appliances: Locate notification appliances where shown on the drawings. Unless otherwise indicated, bottom of wall mounted visual assemblies shall be mounted on walls 80 inches minimum above the finished floor in accordance with Americans with Disability Act Accessibility Guidelines.

D. Cables and Conductors:

1. Conductors shall not be installed in the same conduits, ducts, junction boxes, etc. with non-fire alarm circuits. 120-volt AC fire alarm circuit conductors shall not be in the same cable nor installed with cables and other conductors in the same conduits, ducts, enclosures, junction boxes, etc. with 24-volt DC fire alarm circuits.

2. Conductors shall be installed in continuous lengths. Splices shall be made in above ground junction boxes by terminating wires with wirenut connections.

3. Cable pulling tensions shall not exceed manufacturer's recommended pulling tensions.

4. Wire-Nut Connectors: Permitted for connections in above grade locations only, in junction boxes and equipment and to devices that are not available or manufactured with screw-type connections.

5. Multi-conductor cable green, white, and gray colors shall not be used.

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

3.04 TESTING

A. Disconnection and Removal of Existing System:

1. The existing fire alarm system shall remain in operation at all times during the modifications to the system. The Contractor shall take precautions to avoid any accidental activation of the existing fire alarm system. When making modifications to the existing systems, the Contractor shall minimize the time the existing system is out of service. Prior to any impairment of the existing system the Contractor shall notify the State and County Fire Department. No impairment shall exceed 4 hours. The Contractor shall establish a fire watch to monitor the impaired area until the entire fire alarm

system is returned to full operation. The Contractor shall schedule outages 14 days in advance.

2. Disconnect and remove the existing fire alarm systems where indicated and elsewhere in the specification.

3. Properly dispose of fire alarm outlet and junction boxes, wiring, conduit, supports, and other such items.

B. Testing of the Fire Alarm System:

1. The Contractor and Authorized Fire Alarm Contractor shall conduct an operational test of the existing fire alarm system prior to any work or modifications to the existing fire alarm system. Test shall be witnessed by the University.

2. Arrange with the University for a pre-final fire alarm system test and inspection. The test and inspection shall demonstrate that all Contractor-installed fire alarm system equipment, devices cables and conductors are operating acceptably and have been installed in accordance with this specification.

a. Accordingly, the test demonstrates that the system is ready for a final test of the overall fire alarm system.

b. Representatives at the Pre-Final Test shall include the Contractor, fire alarm system manufacturer's representative, User, and University. Representatives at the Final test shall include all the foregoing representatives and the County Fire Department Inspector.

3. Preliminary Test Results:

a. Include the control panel and initiating and indicating devices, a unique identifier for each device with an indication of test results, and signature of the factory-trained technician of the control panel manufacturer and equipment installer.

b. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the University and test results recorded for use at the final acceptance test.

c. Conduct preliminary tests to ensure that all devices and circuits are functioning properly. Tests shall meet the requirements of paragraph entitled "Minimum System Tests" of this section. After preliminary testing is complete, provide a letter certifying that the installation is complete and

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

4. Formal Acceptance Testing: Notify the University in writing when the system is ready for final acceptance testing. Submit request for test at least 7 calendar days prior to the test date. A final acceptance test will not be scheduled until the O&M Manuals are submitted and the following are provided at the job site:

   a. Marked-up red line drawings of the system as actually installed.

   b. Minimum System Tests: Test the system in accordance with the procedures outlined in NFPA 72. The required tests are as follows:

      1) Verify the absence of unwanted voltages between circuit conductors and ground. The tests shall be accomplished at the preliminary test with results available at the final system test.

      2) Test each indicating devices and circuit for proper operation and response at the control unit.

      3) Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturer's operating and maintenance manual.

      4) Determine that the system is operable under trouble conditions as specified.

      5) Test the battery charger and batteries.

      6) Visually inspect all wiring.

      7) Verify that red-line drawings are accurate.

      8) Measure the current in circuits to assure that there is the calculated spare capacity for the circuits.

      9) Measure voltage readings for circuits to assure that voltage drop is within the calculated limits.

      10) Measure the voltage drip at the most remote appliance on each notification appliance circuit.

c. Audio Tests:

1) Provide test equipment and conduct audio test for the fire alarm system in and around the building and in areas where audio alarm devices have been reinstalled.

2) Audio measurements shall be made in offices and other rooms (e.g. classrooms, restrooms) with the doors in the closed position.

3) An audio test plan and proposed test equipment shall be submitted for review and approval with the test plans submittal in accordance with NFPA 72.

4) The measured data shall be recorded on data sheets provided by the Contractor and shall be part of the test plan submission and records.

5) At the request of the University, the Contractor shall provide proof of instrument calibration and date of calibration.

6) Contractor shall be responsible for notifying the County Building and Fire Department of formal acceptance testing.

C. Concealed Work: Concealed work re-opened and re-closed at random during the formal inspection as requested by the University shall be done at no additional cost to the State.

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

END OF SECTION

DIVISION 15 - MECHANICAL

SECTION 15010 - MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001-GENERAL REQUIREMENTS.

1.02 SUMMARY

A. This Section supplements all sections of this division and shall apply to all phases of work specified, shown on the drawings, or required to provide for complete installation of mechanical systems for this project. The intent of this specification is to provide a complete mechanical system which includes all documents which are a part of the contract.

B. Existing Conditions: Existing conditions shown on the plans are based on record drawings and supplemented by visual observations. However, actual conditions may vary. Existing conditions that are concealed belowgrade, behind walls and above inaccessible ceilings have not been verified. The Contractor shall be responsible for verifying existing conditions before starting work. The Contractor shall provide at no extra cost to the State reasonable adjustments to the work to accommodate variations in actual conditions. The Contractor shall notify and coordinate with the University any major deviations from the plans prior to installation.

1.03 QUALITY ASSURANCE

A. General Requirements:

1. All electrical Work performed under this Division shall be installed by competent craftsmen, skilled in the trade involved, and shall be installed in conformance with the National Electrical Code (NEC) and applicable local codes.

2. Installation of all items shall be performed in strict accordance with the latest codes and regulations set forth by State, Local and Federal authorities to do the work.

3. The mechanical plans are essentially diagrammatic, showing locations of pipes, ducts and equipment. Where locations are not dimensioned, they are approximate. Contractor shall study the job conditions and make installation in the most logical manner.

4. The drawings and specifications are intended to cover the complete installation of systems to function as described. The omission of

reference to any necessary item of labor or material shall not relieve the Contractor from providing such labor or material. Drawings do not attempt to show exact details of piping and ductwork. Provide offsets as necessary to avoid local obstructions or interferences with other trades.

B. Requirements of Regulatory Agencies: All Work shall meet the requirements of the latest local codes and ordinances, except adhere to the Contract documents when more strict requirements are specified.

C. Source Quality Control: All materials shall, so far as possible, be subjected to standard tests by the manufacturer before shipment.

D. Nameplates:

1. Manufacturer's Nameplate: Each item of equipment shall have a permanently mounted nameplate bearing the manufacturer's name, address, model number, and serial number.

2. Contractor's Nameplate: Each piece of mechanical equipment shall have a contractor furnished engraved black laminated plastic type nameplate with white lettering, showing the Equipment Tag and the date of installation (month and year). In addition, there shall be a contractor furnished nameplate on the electrical disconnect switch for each piece of mechanical equipment, showing the electrical panel and breaker from which the unit is powered. Nameplates shall be 0.125" thick, minimum 1" high with minimum 3/8" tall block lettering, fastened to the equipment with screws.

1.04 SUBMITTALS

A. Shop Drawings and Product Data: Submit in accordance with SECTION 01300 - SUBMITTAL PROCEDURES. Unless otherwise specified, submit 6 copies of shop drawings and product data for review and approval prior to start of work. No work shall commence until product data and shop drawings have been reviewed and accepted by the University.

1. Product data shall be submitted as a complete bound volume, including cover sheet and table of contents listing catalog model numbers for each product. Indicate each product being submitted, including specification section and paragraph number to which it pertains. Deviations and substitutions from specified products shall be identified. Product data shall include catalog cuts, diagrams, drawings, and other descriptive data as may be required by the University for all materials and equipment. The submittal of product data shall be done at one time. Partial submittals and submittals of loose pages will be returned without review.

2. Shop Drawings shall be prepared by the Contractor for all phases of the work. Shop Drawings shall show complete installation, including all piping, ductwork, fixtures, equipment installation, supports and

foundations. The contractor shall study the contract drawings and verify conditions at the jobsite before preparing the shop drawings. The shop drawings shall reflect all necessary adjustments in the work required to make the installation. Photocopies of the contract drawings will not be accepted as shop drawings. Electronic cad files of the contract drawings will not be available to the contractor. No work shall commence until product data and shop drawings have been approved and accepted by the University. Any deviations from the shop drawings shall require prior approval and acceptance by the University.

B. Record Drawings: The Contractor shall keep at the jobsite a complete, neat and accurate record of all approved deviations from the contractor 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. At the completion of the job, the Contractor shall submit field-posted as-built drawings showing the actual installation, in accordance with SECTION 01700 - CONTRACT CLOSE OUT.

C. Operation and Maintenance Manual: Operation and maintenance manuals for all equipment.

D. Maintenance Service Contract.

E. Guaranty: Contractor's one-year guaranty on the complete installation.

1.05 OPERATING INSTRUCTIONS

After all tests and adjustments have been made and the maintenance manual has been completed and given to the State, furnish one or more full-time qualified personnel as necessary to put the mechanical Work in continuous operation for a period of not less than one day, during which time the designated personnel's only purpose shall be to give complete operating and maintenance instructions to the operating personnel selected by the University, and furnish all service necessary for the proper operation and protection of the mechanical Work. Fuel, power, and other supplies required during this period will be furnished by the State.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Electrical:

1. All motors, starters, or any other electrical components furnished or installed under the Mechanical Division shall be in complete compliance with DIVISION 16 - ELECTRICAL.

2. Unless otherwise specified, all electric motors, provided under this Division shall be 60 hz. All motors shall be single phase or 3-phase as

indicated on the drawings. Motor starters and controllers shall be furnished under the Mechanical Division, as shown on the drawings, or as specified herein. If motors or equipment as furnished vary in horsepower and/or characteristics from those specified, coordinate the change with the Electrical Contractor, at no additional cost to the State.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Cooperate with all other Contractors in furnishing material and information for correct location, in proper sequence, of all sleeves, inserts, foundations, wiring, etc.

B. All piping connections to equipment shall be made with unions or flanges to permit dismantling. Flanges and unions shall also be installed in the piping systems to permit disassembly consistent with good installation practice and as required for removal of connected equipment from place of installation.

C. All belt drives, flexible couplings, and other exposed rotating or reciprocating parts shall be covered with OSHA approved safety covers. Covers shall be permanent type and easily removable.

D. All motors and bearing shall be covered with watertight and dustproof covers during construction period.

E. Interference: Wherever piping runs on ceilings, arrange the run of piping in such a manner that it does not interfere with grilles, light outlets or light fixtures.

F. Valves: Valves shall be provided on all piping wherever shown or specified using adapters where required. All removable or replaceable equipment shall be valved.

G. Openings in Pipes: All openings in pipes shall be kept closed during progress of the work.

H. Lubrication: Provide all lubrication for operation of all equipment until substantial completion of Project.

3.02 ADJUSTMENT AND CLEANING

A. Safety Devices: Thoroughly check all safety devices to assure proper operation and protection.

B. Service:
   1. Perform service on all mechanical work until the date of substantial completion including oiling and greasing, adjustments, cleaning, packing

of seals, and other items as recommended by equipment manufacturer in the maintenance manual hereinbefore specified.

2. Air filters:
   a. Do not operate air moving equipment having air filters unless temporary filters are in place to protect the mechanical Work.

   b. Clean or replace these temporary filters before final test and balance Work is begun as necessary for accurate readings. After completing the testing and balancing Work, replace temporary filters with new filter media as specified.

3. Put system in full operating condition before substantial completion of the project.

4. Strainers.
   a. Remove, clean and reinstall each strainer screen as specified below after systems have been flushed.

      1) Clean each strainer after all adjustments have been made a system has operated a minimum of 24 hours, but before final test and balancing operation is started.

      2) Clean each strainer again, after final test and balancing operation and before substantial completion of the Project.

5. Purge all air from water systems after each servicing.

C. Tests and Adjustments: Upon completion of the installation and before substantial completion of the Project, the Contractor shall make all necessary tests and adjustments to place the system in a Working condition. Systems shall be balanced as specified in SECTION 15800 - AIR CONDITIONING.. The general operating tests shall cover a period of not less than 12 hours after completion of final testing and balancing and shall demonstrate that the entire equipment is functioning in accordance with the Specifications. Furnish all instruments, test equipment, and competent personnel that are required for the tests.

3.03 SYSTEM ACCEPTANCE

Put all air conditioning equipment into operation and provide all necessary testing and adjusting services to ensure that the systems are operating normally. Inspect each system for abnormal noise, rattles, vibrations, sweating, dripping and other conditions, and correct each deficiency.

3.04 SERVICES DURING AND AFTER START-UP

A. The Contractor shall make available trained technicians to respond to trouble calls from the University after the systems have been installed and put into

operation. These services shall extend throughout the project warranty period. The contractor shall respond within 2 working hours (7:30 am to 4:00 pm, Monday through Friday except State holidays) after being notified by the University. The contractor shall make repairs and adjustments to controllers, sensors and equipment as necessary to eliminate the reported problem. Replace defective items where repairs and adjustments are not feasible. Provide temporary mitigation to satisfy user complaints, such as manually opening or closing controllers, adjusting diffusers, and similar measures to allow the users to continue their work. These services shall be provided at no additional cost to the State, including inadvertent "false alarms" in which the reported problem cannot be duplicated or verified.

B. Where directed by the University to assist in trouble-shooting problems, provide temporary, visual air flow indicators on specific ceiling air diffusers to show on/off conditions and air flow magnitude. Such indicators shall consist of tape, ribbons, light weight strips of paper or similar items that respond to fluctuations in air flow. Remove these air flow indicators after resolutions of problems and before the end of the project warranty period.

3.05 ONE YEAR GUARANTEE AND MAINTENANCE SERVICE CONTRACT

A. In addition to the Guaranty on materials and workmanship, the Installer shall submit to the University seven (7) copies of the Maintenance Service Contract, counter signed by the Contractor, that will validate the Guaranty.

B. The Guarantee and maintenance service shall extend for a period of one (1) year commencing after 30 consecutive days of trouble-free operation after the Project Acceptance Date or the "equipment acceptance date", if earlier than the Project Acceptance Date, and shall include all labor, materials, equipment and parts necessary to service the complete system, in accordance with the attached Schedule of Maintenance Service, so as to assure proper operation and function of the system. The Contractor shall also maintain the system during the period defined by the Project Acceptance Date (or equipment acceptance date) and the end of the 30 consecutive days of trouble free operation. All costs for the periodic maintenance, including emergency calls, shall be borne by the Contractor. This maintenance period and the Guaranty period shall run concurrently (same start and end dates).

Trouble-free operation is defined as a non-disabling condition or a non-recurring failure or disruption and the following:

1. The system shall be free of all discrepancies, contamination and debris which required correction in excess to those described for the monthly service which is included in the Schedule of Maintenance.

2. The system is maintaining operational conditions and other parameters as measured during acceptance tests.

C. The Installer shall include a listing of the following items along with the Maintenance Service Contract:

1. Name of the servicing contractor.

2. Air conditioning system acceptance date.

3. Service contract expiration date.

4. Monthly inspection schedule for the maintenance period.

5. Itemized listing of the equipment covered under the service contract, including a description of the equipment identified, its model and serial number(s) and manufacturer's name(s).

D. The Maintenance Service Contract shall be submitted along with the Operations and Maintenance Manual and the system Test and Balance Report on/or before the Project Acceptance Date.

3.06 OPERATIONAL AND MAINTENANCE MANUAL

A. Submit the Operating and Maintenance Manual on all equipment and the system as a whole to the University as required in SECTION 01700 - CONTRACT CLOSEOUT. The manual shall identify project name and number, contractor, consultant, date and all equipment provided. It shall include the equipment manufacturer's name, model and serial number, tag no., capacity, quantity of units, their location and area (room) served and shall include the manufacturer's operation and maintenance manuals including control and wiring diagrams and source of service and replacement parts. When standard manufacturer brochures are used, adequately indicate (highlight, arrow, etc.) the project related information and delete (X or cross-out) the non-applicable information.

3.07 SCHEDULE OF MAINTENANCE SERVICE

A. All service performed by the Contractor shall include applicable items listed but shall not be limited to the following maintenance tasks:

Air Conditioning System Equipment:

Monthly Service:

1. Clean and clear all drip pans and flush all related condensate drain lines with nitrogen. (Contractor my be liable for water damage due to clogged drains.) Install pan tablets if necessary to control algae.

2. Change all disposable air filters at least once a month.

3. Wash permanent type filters with an approved detergent and spray coat with a approved filter treatment solution. Replace deteriorated permanent type filters which cannot be cleaned.

4. Lubricate and oil all fan and motor bearings and connections of dampers and vanes.

5. Check all drives for wear; adjust belt tension. Replace belts as required.

6. Operate equipment to check for proper operation, unusual noise and vibration; adjust or repair all equipment and controls as required; clean-up all equipment.

7. Check time clock for proper operation and time settings.

8. Check compressor oil level and refrigerant sight glass; add oil as needed and change filter/drier if moisture indicated.

9. Check refrigerant system for leaks, unusual noise and vibration and record suction, discharge and oil pressures in maintenance log book and correct and report all deficiencies.

10. Certify performance of monthly services and that all discrepancies are reported and corrected.

Annual Service:

1. Adjust alignment of bearings and sheaves; lubricate fan and motor bearings. Replace worn or noisy bearings or sheaves.

2. Clean cooling coils of dirt accumulation using nitrogen, high pressure air/water, steam or chemical coil cleaner solution.

3. Check pressure and temperature differential across cooling coils and log readings.

4. Clean supply and return air grilles, registers and diffusers and fresh air intake grilles and dampers and repair or replace deteriorated bird screens.

5. Clean all fan wheels and interior and exterior of equipment housings.

6. Secure all loose housing, seal leaks and touch-up paint after cleaning all rust.

7. Check and calibrate all electric temperature controls.

8. Check compressor coupling alignment; lubricate or replace noisy bearings.

9. Clean condenser coils of dirt accumulation using nitrogen, high pressure air/water, steam or chemical coil cleaner solution.

10. Test compressor crankcase oil and replace if contaminated or submit oil test results. Clean or replace strainer and oil filter, if any.

11. Test and check system response at various cooling load conditions for proper operation, record settings, adjust as required. Re-calibrate all safeties, capacity, and temperature controls to proper settings.

12. Check and clean all unit housing (inside and outside and components), seal leaks and remove rust from exterior components and touch-up paint.

13. Megger (electrical test to measure wire insulation resistance, i.e. condition) compressor motor and submit report and recommendation; check starter, relays and control contacts and electrical connections for tightness and clean as required.

14. Certify performance of annual service and correct and report all discrepancies.

B. Work Schedule: All maintenance work shall be performed between the hours of 7:30 am and 4:00 pm, on normal working days, Monday through Friday, excluding State Holidays.

C. Trouble Calls: Emergency service and repairs required between regular service calls shall be rendered within 24 hours after the Contractor is notified, non-work days excluded.

D. Maintenance Report/Checklist: The Contractor shall prepare and maintain a maintenance service report/checklist which shall include the following:

1. Date maintenance service was performed.

2. The name of the mechanic who performed said maintenance.

3. The type and cost (labor, materials, parts and equipment) of repair work performed on the unit, if any.

4. Documents and other data pertaining to the maintenance performed.

It will be the responsibility of the Contractor to maintain the report/checklist by recording the above noted data after each scheduled maintenance and emergency repairs, and have the checklist available for inspection at the building site. The report shall be sufficiently detailed to properly reflect the past maintenance history of the equipment. Reports shall be certified by a representative of the facility being served and shall be submitted to the University at the completion of the service contract.

E. Cleanup and Work Practices: The Contractor shall keep the job site free of debris, litter, discarded parts, etc. and shall clean all oil drippings during the daily progress of work. The Contractor shall remove all tools, parts and equipment from the service areas upon completion of the work. The Contractor shall exercise caution during the progress of his maintenance and repair work to prevent damage to the ceilings, roofing and other building structure. The Contractor shall restore all damages, caused by his negligence, to its original condition at his own expense.

END OF SECTION

SECTION 15400 - PLUMBING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001-GENERAL REQUIREMENTS.

1.02 SUMMARY

Provide all labor, materials, equipment, services and related work to complete all plumbing work as shown on the drawings and as specified.

1.03 RELATED DOCUMENTS

A. SECTION 15010 - MECHANICAL GENERAL REQUIREMENTS shall apply to this section.

B. Plumbing fixtures designated as Accessible shall be furnished and installed in accordance with the document “2010 ADA Standards for Accessible Design", including the 2004 ADAAG requirements found in Chapter 6 - Plumbing Elements and Facilities. Water Closets shall comply with Section 604 - Water Closets and Toilet Compartments. Urinals shall comply with Section 605 - Urinals. Lavatories shall comply with Section 606 - Lavatories and Sinks. The contractor is expected to be familiar with these standards and shall be required to comply with them.

1.04 QUALITY ASSURANCE

A. All work shall be done in accordance with the 2012 edition of the Uniform Plumbing Code and applicable ordinances of the City and County of Honolulu.

B. Obtain and pay all fees, permits, licences, assessments, connection charges, and inspections required for this work.

1.05 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTAL PROCEDURES.

B. Shop Drawings.

C. Product Data:

1. Pipe and Pipe Fittings.

2. Plumbing Fixtures

D. Field Posted As-Built Drawings.

E. Test Report.

F. Certificate of Chlorination.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

All materials and equipment shall be new and of the best quality available in their respective kinds, free from all defects and shall be of the make and types specified or approved equal. The Contractor shall be responsible for inspecting all products prior to installation and ensure it meets manufacturer's specifications and the requirements herein.

2.02 MATERIALS

A. Sanitary Waste and Vent Piping:

1. Buried Piping: Plastic acrylonitrile-butadiene-styrene (ABS) Type Drainage Waste and Vent (DWV) Piping, complying with ASTM D2661.

2. Aboveground Piping: Plastic acrylonitrile-butadiene-styrene (ABS) Type Drainage Waste and Vent (DWV) Piping, complying with ASTM D2661.

3. Floor Cleanouts: Zurn ZN-1400-SZ-VP dura-coated cast iron cleanout with square, nickel bronze top and vandal proof screws, or equal by Smith or Josam.

4. Floor Drains: Zurn ZN-415S-VP dura-coated cast iron body floor drain with 6" x 6" square nickel bronze 5" strainer, vandal proof secured top, trap primer connection, or equal by Smith or Josam.

B. Domestic Water Piping:

1. Copper tubing, ASTM B88, Type L for above ground piping and Type K for buried piping, with ANSI B16.18 or B16.22 solder joint fittings. Provide ASTM B32 95-5 tin-antimony solder. Where permitted by code, fittings may be the pressed joint type with an elastomeric o-ring, installed in accordance with their listing and formed with the tool recommended by the manufacturer.

2. Exposed piping in finished areas shall be chromium plated brass pipe to the shut off or stop valve of each fixture.

3. Valves: Bronze body pressure rated ball valves, MSS SP-110, Class 125, with threaded or solder end connections.

4. Water Hammer Arresters: Commercial-type water hammer arresters shall be located as generally indicated, with precise location and sizing to be

in accordance with PDI WH 201. Commercial-type water hammer arresters shall conform to ASSE 1010.

5. Trap Primer Valves: Trap primer valves shall conform to ASSE 1018, designed to automatically discharge a small quantity of water to the floor drain trap. Valves shall activate with a 10 PSIG pressure drop between 30-150 PSIG and shall be UPC/IAPMO listed.

6. Hose Bibbs: Rough brass, 3/4" with non-removable vacuum breaker, hose thread outlet, Arrowhead 351-BFP-LK or equal, with square head service cock immediately upstream.

2.03 FIXTURES

A. Brand names where used are given to indicate style and quality. Similar and equivalent fixtures by other reputable manufacturers will be acceptable, subject to the pre-approval of the University and subject to the requirements of these specifications. In general, fixtures and fittings complying with ASME A112.19 will be acceptable, subject to the requirements of these specifications.

B. General: Provide chrome plated stops and supplies for each fixture.

C. All fixtures designated as accessible shall comply with the latest ADAAG requirements as described above in paragraph 1.02.B, and shall be provided with protective padding on exposed drain, trap and water supply piping. Padding shall be finished with a vinyl covering, ivory color. Flush valves and trip levers for accessible fixtures shall operate with not more than 5 lbf pressure. Water closet and urinal valve operators and trip levers shall be mounted on the wide side of the fixture stall. Flush valves shall be mounted below wall mounted grab bars.

D. Water Closets, Floor Mounted, Flush Valve Type, Accessible: Kohler K-96057 vitreous china siphon jet elongated toilet, 1.6 gallons/flush, 16-1/2" high, with 1-1/2" top spud; Sloan Royal 111 flush valve, 1.6 gallons/flush, with vacuum breaker, bumper on valve, screwdriver stop and lever handle; solid plastic open front seat without cover with self-sustaining check hinge; china bolt caps; wax gasket. Fixture shall comply with ADA requirements for adults, Section 604. Note: The specified water closet has a mounting height of 17-5/8" when used with a standard 1" high seat. Acceptable alternate water closets shall have finished mounting heights between 17" and 18" when used with a standard 1" seat. Mounting heights above 18" are not acceptable.

E. Water Closets, Floor Mounted, Flush Valve Type, Regular: Kohler K-96053 vitreous china siphon jet elongated toilet, 1.6 gallons/flush, 15-1/4" high, with 1-1/2" top spud; Sloan Royal 111 flush valve, 1.6 gallons/flush, with vacuum breaker, bumper on valve, screwdriver stop and lever handle; solid plastic open front seat without cover with self-sustaining check hinge; china bolt caps; wax gasket.

F. Lavatories, Wall Hung, Accessible: Kohler K-2031 wall hung vitreous china lavatory, 20-3/4" x 18-1/4", single hole drilling, ADAAG compliant, drilled for concealed arm carrier; Chicago No. 700 single lavatory fitting with No. 317 ADA compliant wrist blade lever handle and E12VP vandal resistant 2.2 gpm aerator. Provide perforated grid strainer with offset tailpiece; chrome plated p-trap, outlet and wall plate. Provide tailpiece, drain and water supply safety covers to meet ADAAG requirements, ivory color. Provide adjustable floor mounted lavatory carrier for lavatories mounted on drywall partitions.

G. Lavatories, Wall Hung, Regular: As specified above for Accessible Lavatories, with standard tailpiece and without safety covers on exposed piping.

H. Counter Sink, Accessible: Elkay LRAD-3321 double compartment 18 gauge stainless sink with 6.5" deep bowls, drain opening offset to the rear of the bowl, and with faucet ledge, 1 faucet hole, sound deadened, self-rimming; LK-25RT perforated grid strainers with shut-off lever arms; Chicago No. 350-VPAABCP single hole faucet with ADA compliant lever handle, 5" gooseneck swing spout and vandal resistant 2.2 gpm aerator, chrome plated solid brass construction; chrome plated brass tail pieces, continuous waste, p-trap, outlet and wall plate. Provide tailpiece, drain and water supply safety covers, white. Fixture shall comply with ADA requirements, Section 606.

PART 3 - EXECUTION

3.01 INSTALLATION AND WORKMANSHIP

A. All workmanship shall be of the highest standard. Vertical piping lines shall be plumb and lines that are grouped shall be parallel and as direct as possible. Exposed pipe, where indicated, shall be run parallel with walls.

B. The installation shall comply with the local plumbing code.

C. All materials, fixtures and equipment shall be installed in accordance with the manufacturer's instructions.

3.02 PIPE INSTALLATION

A. Sanitary piping shall slope not less than 1/4" per foot of horizontal run.

B. Vent pipes shall be graded to expel water.

C. Drain pipes shall be run with easy bends and long radius turns. Offsets shall be made at an angle of 45-degrees or less except where cleanouts are provided for shorter turns.

D. Vent pipes shall extend through the roof full size. Extend vents above roof minimum 12 inches or as required by code. Unless otherwise indicated, vVents through roof shall be flashed and counterflashed using 4 pounds per

square foot sheet lead flashing extending a minimum of 10 inches in all directions from the pipe. Counterflashing shall be turned down inside the top of pipe and overlap lower flashing by 4 inches.

E. All copper water piping joints shall be 95-5 tin-antimony soldered, except where pressed type fittings are used. Pressed type fittings shall be installed in accordance with the manufacturer's instructions.

F. All piping shall be inspected inside and out before installation and no obstructions shall be allowed. Pipe ends shall be taper reamed to full I.D. and all burrs removed.

G. Escutcheons: Shall be installed around all exposed pipe passing through a finished floor, wall or ceiling. Escutcheons shall be of sufficient outside diameter to cover the sleeve opening and shall fit snugly around the pipe.

H. Anchor piping in building with approved clamps or adjustable hangers spaced in accordance with the Plumbing Code. Straps for copper tubing shall be copper or brass, or copper plated. Where copper contacts ferrous material, wrap with two layers of plastic tape.

I. Provide warning and identification tape above buried piping. Warning tape shall be polyethylene plastic tape, approximately 3" wide, with warning and identification of service imprinted in bold black lettering. The tape, color and printing shall be permanent and unaffected by the soil.

J. Pipe Hangers (Supports): Provide MSS SP-58 and MSS SP-69, Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to concrete with Type 18 insert or drilled expansion anchor.

3.03 PLUMBING FIXTURES

A. Furnish, install and properly connect all plumbing fixtures and fittings and/or trims herein specified, in accordance with applicable codes and manufacturer's instructions.

B. Provide air chambers in the water branch piping to each fixture, consisting of full sized, capped pipes extending 12" above the fixture drain.

C. Setting of all fixtures shall be done in an approved workmanlike manner. Joints between fixtures and wall shall be neatly caulked.

3.04 TESTING AND INSPECTION

A. Sanitary and Water Piping: Test in accordance with the Plumbing Code.

B. Chlorination of System: New water piping shall be sterilized with chlorine in accordance with the Plumbing Code before acceptance of the work. Dosage of chlorine shall be not less than 50 ppm. After a contact period of not less than twenty four hours the system shall be flushed with clean water until the

residual chlorine content is not greater than 0.2 ppm. All valves in the lines being sterilized shall be opened and closed several times during the contact period. A certificate shall be furnished evidencing proper performance of sterilizations.

C. Contractor shall furnish all equipment for tests and any required retests and pay for all cost of repairing any damage for such tests. Contractor shall adjust systems until they are accepted.

END OF SECTION

SECTION 15800 - AIR CONDITIONING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001-GENERAL REQUIREMENTS.

1.02 SUMMARY

Provide all labor, materials, equipment services and related work to complete the air conditioning work shown on the drawings and as specified.

1.03 RELATED DOCUMENTS

SECTION 15010 - MECHANICAL GENERAL REQUIREMENTS shall apply to this section.

1.04 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTAL PROCEDURES.

B. Product Data:

1. Air conditioning equipment.

2. Supply and Exhaust fans.

3. Refrigerant Piping and Accessories.

4. Pipe insulation.

5. Ductwork.

6. Controls.

C. Shop Drawings and Diagrams:

1. Air conditioning shop drawings.

2. Control wiring diagrams.

D. Reports: Test and Balance Report.

E. O & M Manual: Air conditioning equipment.

F. Field Posted As-Built Drawings.

G. Manufacturer's Guaranty or Warranty: Minimum 5-year written warranty for the compressor and minimum 3-year written warranty for the condenser coils. The Surety shall not be held liable beyond 2 years from the project acceptance date. The warranty period shall commence from the project acceptance date.

1.05 REFERENCE STANDARDS

A. National Fire Protection Association (NFPA):
NFPA No. 90-A, "Air Conditioning and Ventilating Systems."

B. Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Standards:
HVAC Duct Manual in these specifications shall mean the SMACNA standard "HVAC Duct Construction Standards, Metal and Flexible, Third Edition, 2005."

C. International Code Council, Inc. Publications:
International Energy Conservation Code (IECC), 2015 Edition.

1.06 SPECIAL REQUIREMENTS

A. Equipment provided for this project shall be procured by the Contractor through the manufacturers' authorized sales representatives and distribution agencies located in the State of Hawaii. Submittals shall indicate the names and addresses of the agencies from which the equipment is being procured. Equipment to be considered for bid purposes must be of a manufacturer that has locally stocked spare parts, a local representative, and support of a service organization reasonably convenient to the site of installation which has serviced manufacturer's unit of comparable type, size and capacity as specified. The manufacturer must have other units of comparable type, size and capacity installed and operating satisfactorily in the State of Hawaii for a minimum of two years prior to bid opening. The contractor shall provide a list of locations in Hawaii with addresses and telephone when requested by the University.

B. Windward Community College has a campus wide Building Automation System (BAS). The new air conditioning system controls shall be connected to and shall be compatible with the existing BAS.

1. All new air conditioning equipment and control devices shall be connected a central controller furnished by the air conditioning equipment manufacturer. The new central controller shall be connected to the existing BAS in such a manner that will allow the University to monitor and control the new air conditioning equipment, including adjustment of setpoints. The central controller shall be capable of stand-alone operation in the event of failure of the existing BAS.

2. The existing BAS is a Johnson Controls (JCI) system. The contractor shall retain the services of a qualified control system specialist that is factory authorized to work on and modify similar JCI systems. All costs and payments associated with work provided by the JCI system specialist shall be included in the Contract.

3. The JCI system specialist shall update the software at the main system work station to conform to the new control systems shown. Provide a new graphics page for the new air conditioning system. Modify the existing software to delete all references to existing air conditioning equipment indicated to be removed. The Contractor and the control system specialist shall provide all materials, labor and equipment to investigate the details of the existing BAS and to ensure that the new control system is fully integrated into the existing BAS. The level of design for the new air conditioning system controls shall be not less than the level of design in the BAS for the existing air conditioning systems on campus.

PART 2 - PRODUCTS

2.01 VARIABLE REFRIGERANT FLOW AIR CONDITIONING SYSTEMS

A. General: System shall consist of a variable flow refrigerant design, with multiple indoor fan coil units connected to a single air cooled condensing unit. The system shall be designed for cooling only, and shall be capable of individual unit temperature control at each fan coil unit. The system shall be provided complete with all equipment, accessories and controls needed for a complete, operational system. The system shall operate on R-410A refrigerant.

B. The system shall be a regularly cataloged and manufactured product by an experienced manufacturer of the intended type of system. The system shall be furnished and installed by authorized personnel of the manufacturer, in strict accordance with the manufacturer's instructions. The installing contractor shall submit evidence of qualifications, such as having received training from the manufacturer of the equipment being furnished.

C. Scroll Type Air Cooled Condensing Units:
   1. Unit casing shall be fabricated of galvanized steel panels, bonderized and finished with the manufacturer's standard baked enamel finish.

   2. Condenser coil shall consist of copper tubes with aluminum fins, designed for the system operating pressures. Coils shall be protected by metal guards.

   3. Units shall have one or more inverter driven, variable speed hermetic scroll compressors. Compressor controls shall be provided to modulate

capacity. Compressors shall be equipped with internal thermal overload protection, and shall be mounted on vibration isolators.

4. Units shall be complete with all factory mounted internal controls and accessories, including high pressure switch, over-current protection, oil separator, suction accumulator, and microprocessor controller. The control circuit between the condensing unit and the fan coil units shall be a 2 conductor, non-polar twisted pair shielded cable. Provide factory installed phase and voltage monitor with automatic reset in each unit.

5. Corrosion Protection: Provide a special corrosion protection system on the condenser coil and unit casing, as specified in Paragraph 2.04 - CORROSION PROTECTION SYSTEM.

D. Ceiling Cassette Fan Coil Units: Ceiling cassette type fan coil units, with integral supply and return grille and built-in temperature controls. Units shall be designed for suspended ceiling application and shall be factory assembled, wired and tested. Units shall be complete with all necessary wiring, piping and controls, including an electronic modulating linear expansion device, control circuit board, 3-speed fan motor and motorized vanes in the supply outlets. Fans shall be direct drive, statically and dynamically balanced with permanent lubricated bearings. Units shall be furnished with the manufacturer's standard cleanable filter. Coil shall be copper tube with aluminum fins. Coil housing shall include a corrosion resistant condensate drain pan and an integral condensate lift pump. Unit shall have a self-diagnostic function, 3 minute time delay, auto restart after power failure and a test run switch. Provide a UV-C germicidal emitter inside each fan coil unit, as specified in Paragraph 2.05 - UV-C GERMICIDAL LAMPS.

E. System Controls: System controls shall be furnished by the air conditioning equipment manufacturer, and shall provide the functions indicated on the drawings. Controls shall include a central controller with capability of being connected to the campus Building Automation System.

1. The system central controller shall include a built-in touch screen interface device. The controller shall be capable of providing the indicated control functions without the use of separate computer.

2. Individual fan coil unit controllers shall be direct wired, microprocessor based wall mounted control units. Controls shall include automatic restart after power failure, adjustable temperature setpoint, fan only operation to provide continuous air circulation when no cooling is required, 3-speed fan control and a time delay to prevent compressor restart in less than 2 minutes. Controllers shall include 24 hour and 7 day weekly timer functions. Controllers shall be provided by the equipment manufacturer.

F. Manufacturer: Units shall be the make and model indicated, or approved equal units as manufactured by Mitsubishi, Daikin, Fujitsu, LG or equal. All proposed units, including the indicated make and model, shall be subject to these specifications and subject to the approval of the University through submittal review. The contractor shall be responsible for design changes to the mechanical, electrical and support systems required to accommodate alternate makes and models of equipment.

2.02 OUTSIDE AIR FANS

In-line centrifugal duct fans, belt drive, built in thermal overload protection, with internal vibration isolators, galvanized steel housing, hinged access panels, statically and dynamically balances forward curved galvanized fan wheel, Fans shall be UL listed, AMCA certified and bear the AMCA seal. Provide angular filter rack with permanent, washable aluminum mesh filters.

2.03 TOILET EXHAUST FANS

Ceiling mounted exhaust fans as indicated, centrifugal direct drive type, heavy gauge galvanized steel housing lined with acoustical insulation; outlet collar with backdraft damper; integral high-impact non-yellowing polystyrene ceiling grille; internal plug-in type disconnect; motor mounted on vibration isolators, forward curved centrifugal fan wheel dynamically balanced. Fans shall bear the AMCA Certified Ratings program AMCA Sound and Air Performance seal and shall be UL listed. Manufacturer: Greenheck, Penn-Barry, Cook, or approved equal, subject to the approval through submittal review.

2.04 CORROSION PROTECTION SYSTEM

A. Where specified, provide a special corrosion protection system on the equipment. The system shall consist of the following:

1. Finned tube coils shall be protected with the Blygold Polual coating system, or the Thermoguard coating system.

2. Unit casing shall be protected with the Ameron PSX-700 Polysiloxane coating system, or the Thermoguard coating system.

3. Coating systems shall carry a three year written warranty. The surety shall not be liable beyond 2 years of the project acceptance date.

B. Finned tube coils: The coating system shall carry a three year written coil replacement warranty. The coating shall be applied by a qualified and experienced applicator, under the supervision of the equipment manufacturer.

C. Equipment casing: Coating shall be applied in strict accordance with coating manufacturer's recommendations. After the coating has totally cured, the equipment shall be assembled using care not to damage the coating during

assembly. Fasteners shall be stainless steel with bonderized rubber washer attached. Any touch up required shall be performed in accordance with the manufacturer's recommendations. The coating shall be performed by a qualified and experienced applicator, under the supervision of the equipment manufacturer.

2.05 UV-C GERMICIDAL LAMPS

A. Where specified, provide UV-C germicidal lamps and fixtures inside the equipment, designed to inhibit the growth of mold and mildew on the cooling coil and in the condensate drain pan.

B. Requirements:

1. UV-C emitters and fixtures shall be designed for use inside an HVAC system. Individual lamp output shall be measured in an ASME nozzled test apparatus using a 45 F airstream moving at not less than 400 fpm. Lamp output at 253.7 nm shall not be less than 10 mW/cm2 per inch of arc length measured at a distance of one meter.

2. UV-C power supplies shall be a high efficiency electronic type which are matched to the emitters and are capable of producing the specified output intensity with an input power no more than 80 watts.

3. UV-C fixtures shall be wired to a weatherproof SPDT disconnect switch mounted on the unit, adjacent to the internal access panel. Fixtures shall be wired for 120 v/1 ph requiring a minimum circuit ampacity of 15 amps. UV-C lamps shall ship separately for field installation to minimize the chance for bulb damage. Emitters shall be capable of 24 hour operation, regardless if fan motor is on or off.

4. Emitters and fixtures shall be installed in sufficient quantity and arranged so as to provide an equal distribution of UV-C energy on the coil and drain pan.

5. The minimum UV-C energy striking the leading edge of the coil pan shall be not less than 820 mW/cm2 at the closest point and through placement, not less than 60% of that value at the farthest point. Equal amounts shall strike the drain pan, either directly or indirectly through reflection.

6. Emitters and fixtures shall be installed such that UV-C energy strikes all surfaces of the coil, drain pan, and the available line of sight airstream.

7. Emitters shall be wired to a single, case mounted, weatherproof on/off switch with permanent, laminated plastic sign reading “DANGER - UV LIGHT INSIDE - TURN OFF PRIOR TO OPENING OR SERVICING UNIT”. Internal door switches will not be considered acceptable alternates to the specified on/off switch.

2.06 MATERIALS

A. Outside Air Ductwork: Galvanized steel sheet metal ductwork, conforming to ASTM A 924 and ASTM A 653, Designation G90. Ductwork construction shall, as a minimum, conform to NFPA Standard 90-A and the above referenced HVAC Duct Manual. Ducts shall be constructed of un-lined galvanized steel unless otherwise specified or shown on the drawings.

B. Outside Air Ceiling Diffusers: Diffusers shall be square, louvered face type, square neck, aluminum construction, removable core, pattern as indicated, opposed blade volume damper adjustable from face, off-white baked enamel finish, surface mount.

C. Volume Dampers: Volume dampers shall be provided where shown on drawings. Dampers shall be opposed blade type with locking quadrant operators. Provide extended length operators on insulated ducts so that the operator is outside the insulation

D. Refrigerant Piping:
   1. Sizes shown on plans are outside diameter. Pipe sizes shall be confirmed by the air conditioning equipment manufacturer before installing. Pipe sizes shall be as directed by the air conditioning equipment manufacturer.

   2. Piping shall be copper tube, ASTM B88, Type L, or ASTM B280. Soft annealed tubing shall be used where bending is required. Otherwise, hard drawn shall be used. Bending is permitted on sizes not larger than 1-3/8 inches.

   3. Fittings: Wrought copper or forged brass sweat fittings, ANSI B16.22 AND ASTM B75.

   4. Solder: Silver solder conforming to AWS A5.8, melting point not less than 1100 degrees.

   5. Liquid Line Filter-Drier: The liquid line filter drier shall be the solid desiccant sealed type. Flow rate capacity shall be within the maximum allowable pressure drop, and safety shall conform to the requirements of ARI Standard 710. Drier body shall be of brass or steel and shall be provided with means for holding the desiccant securely in place and distributing the liquid refrigerant evenly throughout the desiccant. Driers shall be capable of withstanding a pressure of 350 psi.

   6. Moisture and Liquid Indicators: The moisture and liquid indicators in the liquid line of refrigerant systems shall contain indicating material that will indicate moisture by varying degrees of color change, based on 100 degrees F and a moisture content in the range of 45 to 180 particles per million. Indicators shall be a brass or bronze or heavily copper plated steel fitting with the indicator material located under a bulls-eye.

Indicators shall be capable of withstanding a test pressure of 350 psig without damage.

E. Condensate Drain Piping: Schedule 40 PVC pipe with solvent cement fittings and joints.

F. Pipe Insulation: Flexible Elastomeric Cellular insulation conforming to ASTM C534, Grade 1, Type I, with contact adhesive as recommended by the insulation manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ductwork fabrication and installation shall comply with the HVAC Duct Manual.

B. Air Devices: Air devices shall be installed in accordance with manufacturer's instructions.

C. Refrigerant Piping:

1. Piping: Unless otherwise specified, pipe and fitting installation shall conform to requirements of ASHRAE Standard 15 and ANSI B31.5. Pipe shall be cut accurately to measurement established at the jobsite and worked into place without springing or forcing. Pipes shall be cut square, shall have burrs, removed by reaming, and shall be so installed as to permit free expansion and contraction. Filings, dust, or dirt shall be wiped from interior of pipe before connections are made. Changes in direction shall be made with fittings except where bending is permitted. Piping shall be installed with sufficient pitch to insure adequate oil drainage. Open ends of refrigerant lines or equipment shall be capped or plugged during installation to keep moisture, dirt or other foreign material out of the system.

2. Joints: Joints in copper tubing shall be brazed with silver solder. Surplus brazing material shall be removed at all joints in lines not insulated. Tubing shall be protected against oxidation during brazing by using nitrogen in the tubes.

3. Insulation: Insulate all suction piping with flexible elastomeric cellular pipe insulation. Insulation shall be continuous through support brackets. Slip insulation over piping before fabrication to minimum use of cut insulation. All insulation joints shall be sealed with a joint sealing adhesive, as recommended by the insulation manufacturer, to maintain the integrity of the vapor barrier.

4. Testing and Charging Refrigerant Piping: Charge the system in accordance with the equipment manufacturer's instructions.

5. Pipe Enclosures: Exposed split system refrigerant and condensate drain piping on the exterior of the building shall be enclosed with a pre-fabricated PVC pipe enclosure system manufactured specifically for the intended application, Inaba-Denko or equal. Provide fittings and end caps to completely enclose the piping and to prevent bird and vermin access.

D. Condensate Drain Piping: Slope piping to drain, minimum 1/4 inch per foot. Connect to fan coil unit in accordance with the equipment manufacturer's instructions.

E. Controls:

1. Submit complete control diagrams, including diagrammatic layouts of the automatic control systems specified herein.

2. Install all control devices in accordance with the manufacturer's instructions and in accordance with the approved shop drawings. Mount wall mounted devices at 48" above the floor.

3. Electric Wiring. All control wiring shall be furnished under this section of the Specification, and shall comply with the requirements of the prevailing electrical code of the City and County of Honolulu and the National Electrical Code. Control wiring operating at more than 30 volts, or fed from a listed Class 1 transformer/power supply, shall comply with the requirements for power wiring. Control wiring operating at less than 30 volts and fed from a listed Class 2 or Class 3 transformer/power supply shall be defined as low voltage. Low voltage control wiring shall be insulated copper no. 16 AWG or larger, type THHN/THWN. Low voltage electronic circuits carrying less than 0.5 amperes may be multi-conductor cables, minimum 18 AWG solid copper wire, insulated. All control wiring shall be color coded. All control wiring shall be run in conduit.

F. Equipment:

1. Equipment shall be installed in accordance with the manufacturer's instructions, and as indicated. When required for proper installation, the manufacturer shall provide on-site installation supervision.

2. Provide adequate maintenance space for required servicing and access to the equipment internals. Arrange piping and other items so as to not block access doors.

3. Provide adequate supports and foundations for the equipment as indicated or specified.

4. Ceiling cassette fan coil units shall be supported from the building structure. The weight of the units shall not bear on the suspended ceiling system.

5. Neoprene pads shall be composite pads, with 0.25-inch thick elastomer top and bottom layers, molded to contain a pattern with nonslip characteristics in all horizontal directions. Elastomer loading must not exceed 40 pounds per square inch (psi). Minimum overall thickness must be 1 inch. Maximum deflections up to 0.25-inch are allowed.

3.02 START-UP

A. Before energizing the equipment, ensure that the system installation is essentially complete and that all safety and operating controls are functioning.

B. Start-up of the equipment shall be in accordance with the manufacturer's instructions. The manufacturer shall provide a trained technician to supervise the initial start-up.

C. Make adjustments to the belts, pulleys, supports and accessories during start-up and during the warranty period to minimize vibration and noise generated by the new equipment.

3.03 TESTING, ADJUSTING AND BALANCING

A. Procure the services of an independent air balance and testing agency to balance, adjust and test the air moving equipment. The independent air balance agency shall provide proof of having successfully completed at least five projects of similar size and scope and shall comply with all standards as set forth by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB). The agency shall submit evidence of certification by the AABC or NEBB: AABC registration number and expiration date of current certification, or NEBB certification number and expiration date of current certification. All reports shall be on approved forms from the respective certifying organization.

B. Submit a written test and balance report on the completed system, in accordance with Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) standards. Record the following data on each system:

1. Fan coil unit make and model.
2. Condensing unit make and model.
3. Fan coil unit motor voltage, phase, cycles and full load amps.
4. Fan coil unit entering and leaving air temperatures.
5. Compressor nameplate and actual operating running load amps.
6. Condensing unit suction and liquid line pressures.
7. Condensing unit entering and leaving air temperatures.

8. Outside air fan motor voltage and full load amps.
9. Outside air fan cfm at the supply register.

3.04 SYSTEM ACCEPTANCE

Put all air conditioning equipment into operation and provide all necessary testing and adjusting services to ensure that the systems are operating normally. Inspect each system for abnormal noise, rattles, vibrations, sweating, dripping and other conditions, and correct each deficiency.

3.05 OPERATING INSTRUCTIONS

After all tests and adjustments have been made and the maintenance manual has been completed and given to the University, furnish one or more full-time qualified personnel as necessary to put the system in continuous operation for a period of not less than one day, during which time the designated personnel's only purpose shall be to give complete operating and maintenance instructions to the operating personnel selected by the Contracting Officer, and furnish all service necessary for the proper operation and protection of the mechanical Work. Fuel, power, and other supplies required during this period will be furnished by the University.

END OF SECTION

DIVISION 16 - ELECTRICAL

SECTION 16011 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

A. This section specifies the general electrical requirements for all labor, materials, equipment, and services provided under DIVISION 16 - ELECTRICAL.

B. Related Work Described Elsewhere:

1. DIVISION 2 - SITE CONSTRUCTION.

2. SECTION 13851 - FIRE ALARM SYSTEM.

3. DIVISION 15 - MECHANICAL.

1.03 WORK INCLUDED

A. The Contractor under this Division shall provide all labor, materials, equipment, supervision and services required for the construction of the electrical systems. The finished installations shall be complete, operable and shall include all work specified herein and shown on the Drawings.

B. The work shall include complete testing of all equipment and wiring at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment. All systems shall be properly adjusted and in working order at the time of final acceptance.

C. All concrete, steel reinforcement, miscellaneous metal-work, earthwork, painting, and grouting shall conform to the applicable requirements of the detailed equipment specifications as prescribed in appropriate sections.

D. It is the intent of these Specifications and other Contract Documents to require an installation complete in every detail. Consequently, the Contractor will be responsible for minor details or for any special construction which may be found necessary to properly furnish, install, adjust, test, and place in successful and continuous operation, the entire electrical system and the cost of same shall be included in the contract price.

1.04 DESCRIPTION OF WORK

A. Work specified in this Division shall include, but not be limited to the following:

1. Underground electrical and telecommunications infrastructure.

2. Secondary electrical distribution system including panelboards, overcurrent protection devices, and feeders.

3. Complete electrical system wiring including branch circuits, receptacles, outlets and control devices.

4. Interior lighting system, including lighting controls.

5. Power wiring for electrically-operated equipment and appliances.

6. Emergency generator, automatic transfer switch, and control system.

7. Building telecommunication cabling systems.

8. Access control system infrastructure and cabling.

9. Include in the bid and pay for the permits, plan review fees, inspection fees and deliver the certificate of final inspection to University.

10. Testing.

B. Electrical wiring system shall have sufficient capacity to accommodate all equipment, appliances and other electrical loads as specified herein and shown on the drawings and as required per National Electrical Code and other applicable codes, standards and requirements plus spare capacity to accommodate any planned future facilities and additions and minimum 25 percent spare capacity for future growth.

1.05 REFERENCES

A. Comply with local ordinances; National Electrical Code; National Electrical Safety Code; applicable regulations of the National Board of Fire Underwriters; specifications of ANSI, NEMA, UL, IES, and IPCEA; and regulations of the City and County of Honolulu.

B. In the event of conflict between pertinent codes and regulations, and the requirements of the referenced standards, or those indicated in Specifications and on drawings, the provisions of the more stringent shall govern.

1.06 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Certificates:

1. Submit written certification that electrical systems are complete and operational as stipulated in item entitled “DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEMS” hereinbelow.

2. Submit certificate of final inspection and acceptance as stipulated in item entitled “INSPECTION” hereinbelow.

C. Test records.

D. Warranty: Submit warranty as stipulated in item entitled “WARRANTY” hereinbelow.

E. As-Built Drawings: Submit in accordance with SECTION 01700 - CONTRACT CLOSEOUT.

1.07 QUALITY ASSURANCE

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

B. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where 2 or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

C. Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

D. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70.

1.08 PERMITS

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

1.09 COORDINATION

A. Refer to all project Drawings and to all Sections of the project Specifications. Coordinate and fit all work accordingly so that all electrical outlets and equipment will be properly located and readily accessible. The Drawings indicate the relation of wiring and connections and must not be scaled for exact locations.

B. Verify all construction dimensions at the project and make changes necessary to conform to the building as constructed. Work improperly installed due to lack of construction verification shall be corrected at the Contractor's expense.

C. Work shall be scheduled to avoid delays, interferences, and unnecessary work. If any conflicts occur, necessitating departures from the Drawings and Specifications, details of departures and reasons therefore shall be submitted immediately for consideration by the University.

1.10 DELIVERY, HANDLING AND STORAGE

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

B. Use means necessary to protect the materials of this section before, during and after installation; to protect the installed work and materials of all other trades; and to protect the original structure, work and materials of the State.

C. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the University and at no additional cost to the University.

1.11 DRAWINGS AND SPECIFICATIONS

A. Electrical system drawings are diagrammatic and symbolic. Locations of outlets, devices, raceways, apparatus, etc., shown are approximate and shall be installed with the required maintenance and code clearances and to avoid conflict with other systems and trades. Visit site and verify lineal footages required and check scales and dimensions shown on architectural drawings prior to bidding to verify locations, routing and lineal footages of electrical work required for inclusion into bid. Study the project drawings and specifications, and make installation in most logical manner for eye appeal and coordination with other systems and trades. Unless

dimensioned or noted otherwise, orderly configuration and visual composition are fully intended.

B. Include additional components and wiring which are not shown or specified herein but are required for proper control and operation to provide for a complete and operable system within intent indicated on the drawings and specifications.

C. Study the project drawings and specifications prior to bidding and provide additional wiring including apparatus and devices for equipment furnished by others without additional cost.

D. Relocate devices, apparatus and associated wiring including raceways, from locations shown, without additional cost, for code compliance and to avoid conflict with other systems or trades, structures, utilities and when directed before installation.

E. Equipment ratings or wire sizes that are missing or shown in error shall have adequate capacity to serve the required and future loads plus minimum 25 percent spare capacity, and be in compliance with NEC.

F. Verify voltages and other ratings of energy conversion, transformation and electrical utilization equipment prior to placing order with factory. Input voltages of equipment shall match serving utility or system voltage available.

1.12 POSTED OPERATING INSTRUCTIONS

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

1. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

2. Start up, proper adjustment, operating, lubrication, and shutdown procedures.

3. Safety precautions.

4. The procedure in the event of equipment failure.

5. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

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

when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.13 MANUFACTURER'S NAMEPLATE

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

1.14 WARRANTY

A. Installation shall be complete in every detail as specified and ready for use. Unless otherwise indicated, any items supplied by Contractor developing defects of design, construction, or quality within one year of final acceptance by the University shall be replaced by such new materials, apparatus or parts to make such defective portion of the complete system conform to the true intent and meaning of the Drawings and Specifications at no additional cost to the State.

B. LED luminaire manufacturer's warranty shall be a stipulated in SECTION 16510 - INTERIOR LIGHTING.

C. The warranty shall be countersigned by the General Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS AND WORKMANSHIP

A. All materials shall conform to the latest issue of all applicable standards as established by NEMA, NFPA, ANSI, IEEE, IES, ASTM and Underwriters' Laboratories, and shall bear the manufacturer's name and trade name and when available, the Underwriters' Label.

B. Neat appearances in the finished work will be required. Only experienced electrical workers shall be employed for the electrical installation.

C. All work not installed and completed in accordance with the latest rules and regulations of the NEC, OSHA and all local ordinances shall be removed and reinstalled correctly at the Contractor's expense.

PART 3 - EXECUTION

3.01 GENERAL

A. Install all electrical materials and equipment in accordance with manufacturer's recommendations and as accepted by the University for the seismic zone classification at the project site in accordance with the Building Code.

B. Cut, break, drill and patch as required, to install electrical system. Repair any surface damaged or marred by notching, drilling or any other process necessary for installation of electrical work. Patch any damaged surfaces to match the existing surface.

C. All wiring and overcurrent devices for equipment furnished by other trades are sized for a contemplated equipment size. If equipment other than contemplated and indicated on the plan is provided, the Contractor shall be responsible for providing the required wiring, switches, and overcurrent devices at no cost to the University. The Contractor shall submit the proposed revisions to the electrical design to the University for acceptance.

D. The Electrical Contractor shall coordinate his work with other trades to avoid conflicts with civil, mechanical, structural, and architectural elements of this project.

3.02 JOBSITE CONDITIONS

A. These specifications are accompanied by construction drawings including building and site plans of all trades showing locations of all outlets, switches, service runs, feeder runs, devices, and other electrical equipment. The locations are approximate and before installing, study adjacent architectural details and make installation in most logical manner. Any device may be relocated within 10 feet before installation at the direction of the University without additional cost to the State.

B. Before installing, verify all dimensions and sizes of equipment.

C. Verify that electrical system may be installed in strict accordance with the original design, the Drawings and Specifications and the manufacturer's recommendations.

D. In the event of discrepancy, immediately notify the University. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.03 CONNECTIONS TO EQUIPMENT PROVIDED BY OTHER TRADES

A. Electrical Contractor shall provide conduit, wiring and all electrical connections from building wiring to motors for ventilation, air conditioning, and other equipment, including all switches, motor protection devices, as specified by other trades.

B. Electrical Contractor shall ascertain from other trades furnishing motor-driven equipment, the exact size and type of all motors, the exact locations of such equipment and the proper point where electrical connections should be brought through the floors or walls, as the case may be. Locations shown are diagrammatic only; correct locations shall be the full responsibility of the Electrical Contractor.

C. Examine Civil, Mechanical, Architectural, Structural, and other Drawings and Specifications for information concerning motors and control apparatus and diagrams.

D. Install individually mounted starters furnished for motors under other Divisions. Provide and install safety switches as necessary for each such motor.

E. All control devices and control wiring shall be provided as described in the installation manuals of equipment and/or the Drawings and Specifications of other trades and disciplines.

3.04 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in SECTION 09900 - PAINTING.

3.05 DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEMS

A. Submit written certification that electrical systems are complete and operational. Submit certification with Contractor's request for final review.

B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Provide labor, apparatus and equipment for systems' demonstration. The various tests shall be under the direction and supervision of the University.

C. The Contractor shall provide all test equipment, materials, labor, and temporary power hook-ups to perform start-up and all tests as required, to obtain final field acceptance from the State. All tests shall be conducted in the presence of the University or his representative. All test procedures shall conform to this specification and applicable standards. (ANSI, IEEE, NEMA, OSHA, NFPA, NETA, etc.)

D. The Contractor shall be responsible for all tests and test record. Testing shall be performed by and under the immediate supervision of the Contractor. Test record shall be kept for each piece of equipment. Copies shall be furnished to the University for review and/or acceptance.

E. A visual inspection of all electrical equipment, to check for foreign material, tightness or wiring and connection, proper grounding, matching nameplate charts with specification, etc., shall be made prior to actual testing.

F. After demonstration of systems, submit to the University 6 sets of keys for electrical equipment locks.

3.06 INSPECTION

Arrange for periodic inspection by the local authorities and deliver the certificate of final inspection to the University.

END OF SECTION

SECTION 16100 - ELECTRICAL WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

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

1.03 RELATED WORK

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

1.04 APPLICABLE PUBLICATIONS

The publications cited within this specification form a part of this specification to the extent referenced. Unless otherwise indicated, the most recent edition of the publication with current revisions and amendments will be enforced.

1.05 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Product Data:

1. Panelboards.
2. Overcurrent protection devices.
3. Safety switches.
4. Wireways.
5. Junction boxes larger than 6 inches in any dimension.
6. Wiring devices and device plates.
7. Remote power monitoring unit.

C. Shop Drawings: Submit shop drawings showing feeder raceway layouts on plan in not less than 1/8" = 1'-0" scale. Raceway routing shall be coordinated with architectural, structural and mechanical systems and other trades. Submit shop drawings showing plans and elevations of electrical equipment rooms.

D. Field Test Reports: Submit the following test results for approval in report form as stipulated in item “FIELD QUALITY CONTROL” hereinbelow:

1. 600-volt wiring test.

2. Grounding system test.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials shall be new and those items listed by the Underwriters’ Laboratories shall bear “UL” label of approval.

B. Brand names, manufacturer’s names and catalog numbers indicate standard of design and quality required. Acceptable manufacturers for electrical apparatus include General Electric, Square D, Siemens, and Eaton. All apparatus supplied shall bear the name of the approved manufacturer on its nameplates.

C. Electrical equipment and luminaires shall be supplied through the manufacturer’s designated representative by a local distributor.

D. Proof of compliance shall be furnished when shop drawings are submitted.

E. Where 2 or more similar type items are furnished, all shall be of the same manufacture, e.g., safety switches shall be of the same manufacturer unless otherwise noted.

F. Where electrical apparatus is to be installed outdoors, NEMA 4X stainless steel housings shall be provided, unless noted otherwise.

2.02 RACEWAYS

A. Rigid Steel Conduit: Rigid steel, zinc-coated inside and outside, for use with threaded fittings. ANSI C80.1.

B. Electrical Metal Tubing (EMT): Thin walled steel tubing, zinc-coated. ANSI C80.3.

C. Flexible Metal Conduit: Flexible steel conduit; zinc-coated inside and outside, smooth inside walls, liquid-tight with factory fittings for liquid-tight installation. Provide bushings with bonding jumper lugs for flexible conduit in excess of 6 feet in length. UL 360.

D. Rigid Nonmetallic Conduit: Polyvinyl chloride, Schedule 40.

E. Fittings for Metal Conduit and EMT: UL 514B. Ferrous fittings shall be cadmium- or zinc-coated in accordance with UL 514B.

1. Rigid Metal Conduit: Threaded-type. Split couplings unacceptable.

2. EMT: Steel compression type.

F. Fittings for Rigid Nonmetallic Conduit: NEMA TC 3 for PVC and UL 514B.

2.03 OUTLET BOXES AND COVERS

A. Outlet and Small Junction Boxes: Nominal 4 inches square, 2 1/8 inches minimum depth exclusive of plaster ring, pressed steel, galvanized for corrosion protection. Boxes for telecommunications outlets shall be a nominal 4 11/16-inch square by 2 1/8-inch deep, exclusive of plaster ring. Surface mounted boxes and boxes exposed to the weather shall be cast aluminum, type FD, prime painted and enamel finished with neoprene gasketed covers, threaded hubs for conduit connections and stainless-steel screws.

B. Extension Rings for Outlet Boxes: Pressed steel, zinc-coated for corrosion protection.

2.04 JUNCTION BOXES, WIREWAYS AND PULL BOXES

Boxes Larger Than 4 Inches Square and Wireways: Fabricated from NEC grade steel, zinc-coated for corrosion protection, prime painted and finished to match adjacent architectural elements. For exterior and wet locations, boxes and wireways shall be NEMA 4X, stainless steel with matching neoprene gasketed covers, threaded hubs for conduit connections and stainless-steel screws.

2.05 CONDUCTORS

A. Solid or stranded copper, sizes according to American Wire Gauge, as shown on Drawings and #12 AWG minimum unless otherwise indicated. Stranded conductors only for #8 AWG and larger. All wiring shall be color coded.

B. Branch Circuits: Type THWN.

C. Conductors Larger Than #8 AWG: Type XHHW.

D. Conductors for Equipment Connection: Stranded flexible type.

E. Fire Alarm Conductors: As specified in SECTION 13851 - FIRE ALARM SYSTEM.

F. Telecommunications Cable: As specified in SECTION 16710 - BUILDING TELECOMMUNICATION SYSTEM.

G. Cabling: Not acceptable.

H. Color Coding: Provide for service, feeder, branch, control, and signaling circuit conductors. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutrals shall be white with a different colored (not green) stripe for each. Color of ungrounded conductors in different voltage systems shall be as follows:

1. 208/120 Volt, 3-Phase:

a. Phase A - black.

b. Phase B - red.

c. Phase C - blue.

2.06 SPLICES AND TERMINATION COMPONENTS

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

2.07 WIRING DEVICES

A. General: Ratings and NEMA arrangement types as indicated. Drawings show minimum application ratings, specification describes nominal ratings.

B. Duplex Convenience Receptacles: White unless otherwise indicated, 20A, 125V, specification grade, grounding type, unless otherwise noted.

C. Other Receptacles: Specification grade, ratings and NEMA configurations as indicated. Provide twist lock receptacles where indicated.

D. Ground Fault Circuit Interrupters: Receptacle type similar to duplex convenience receptacle except 20A and UL listed per UL 943 with 6 milliampere ground fault sensing circuit with test and reset buttons.

2.08 DEVICE PLATES

A. Stainless steel Type 302, gangs as required for flush mounted devices. Cast aluminum covers with stainless steel screws for surface mounted devices.

B. For Exterior Use: Weatherproof flip-open cover, high-grain non-metallic, plastic or fiberglass, with cable opening and neoprene gaskets for plug-in equipment in outdoor or wet applications when receptacle is in use per NEC 406.8. Color to match adjacent finish. Cover shall be pad-lockable and capable of closing with a plug cap connected to the receptacle.

2.09 PANELBOARDS

A. Mounting, voltage rating, main bus capacity, breaker complement and lugs as specified on drawings, complete with housing, door, trim, lock and typewritten circuit directory. Provide ground bus for all panels.

B. Panelboards shall have copper bussing with bolt-on, molded case circuit breakers. Provide one-inch-per-pole breakers, half-size breakers not allowed. Circuit breaker complement short circuit ratings shall be fully rated. Use of series rated equipment will not be permitted. Toggle positions "ON", "OFF" and "TRIPPED" engraved or embossed on body and visible without removing enclosure cover. Provide shunt trip breakers where indicated.

C. All locks shall be common-key type. Furnish 6 sets of keys to the University.

D. Panel housing and entire circuit breaker complement shall be of the same manufacture.

2.10 CIRCUIT BREAKERS AND SAFETY SWITCHES

A. Circuit breakers, unless otherwise shown, shall be molded case, toggle mechanism operated, with no-fuse ambient-compensated thermal-magnetic overload automatic trip units for overcurrent and short-circuit protection, and contacts rated to interrupt short-circuit currents as specified on Drawings. Multi-pole breakers shall have single, common operating handle for all poles. Toggle positions "ON", "OFF" and "TRIPPED" and breaker rating engraved or embossed on body and visible without removing enclosure cover.

B. Safety switches shall be heavy-duty grade, horsepower rated and sized as indicated or as to match branch circuit overcurrent device rating.

C. Enclosures for separately enclosed breakers and safety switches to be NEMA 1 for interior locations, and NEMA 4X, stainless steel for exterior locations.

2.11 REMOTE POWER MONITORING UNIT

A. Environmental monitoring unit with cellular modem communications, cloud-base monitoring and data logging system with capability to monitor temperature, humidity, power failure and other environmental conditions. Monitoring unit shall be equipped with the following features:

1. Alarm notification via email, text messages or voice phone calls.

2. Twelve sensor inputs to monitor environment conditions.

3. Minimum 8-hour battery backup.

4. Relay outputs capable of automatic or manual control.

5. Cloud-based user interface for programming, data storage and alarm delivery.

6. Weatherproof, NEMA 4X housing.

7. Operating Voltage: 12-24 DC with 12VDC plug-in power supply.

8. 3G or 4G cellular modem for use on Verizon or AT&T service.

9. Sensaphone Sentinel series or pre-approved equivalent.

B. Provide plug-in, power outage monitoring sensor for a minimum of three (3), 120-volt, 20 ampere branch circuits. Sensor shall be equipped with a NEMA 5-15P plug cap and 15-foot long cord connection to the power monitoring unit. Sensaphone #FGD-0054 or pre-approved equivalent.

2.12 GROUNDING AND BONDING EQUIPMENT

Ground Rods: UL 467. Ground rods shall be copper-clad steel, with minimum diameter of 3/4 inch and minimum length of 10 feet.

2.13 MANUFACTURER'S NAMEPLATE

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

2.14 WARNING SIGNS

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

2.15 DUCT SEAL

Pliable, non-toxic material used for application around conductors in raceway and in empty conduits to minimize moisture and rodent/insect infiltration. Must be re-enterable material allowing for removal/reapplication after initial installation. Non-drying, non-cracking, non-corrosive material that will not adversely affect raceway and conductors. Provide duct seal at all duct entries in handholes, apparatus, and risers to prevent water infiltration via duct system.

2.16 HARDWARE, SUPPORTS, BACKING, ETC.

A. Provide all hardware, supports, backing and other accessories necessary to install electrical equipment. Wood materials shall be treated against termites, iron or steel materials shall be galvanized for corrosion protection, and non-ferrous materials shall be brass or bronze.

B. Bolts, nuts, washers, and screws used for exterior use shall be high quality stainless steel or brass.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Electrical installations, including weatherproof and hazardous locations and ducts, plenums and other air-handling spaces, shall conform to requirements of NFPA 70 and IEEE C2 and to requirements specified herein.

B. Underground Service: Underground service conductors and associated conduit shall be continuous from service entrance equipment to outdoor power system connection.

C. Service Entrance Identification: Service entrance disconnect devices, switches, and enclosures shall be labeled and identified as such.

1. Labels: Wherever work results in service entrance disconnect devices in more than one enclosure, as permitted by NFPA 70, each enclosure, new and existing, shall be labeled as one of several enclosures containing service entrance disconnect devices. Label, at minimum, shall indicate number of service disconnect devices housed by enclosure and shall indicate total number of enclosures that contain service disconnect devices. Provide laminated plastic labels conforming to item “IDENTIFICATION” hereinbelow. Use lettering of at least 0.25 inch in height, and engrave on black-on-white matte finish. Service entrance disconnect devices in more than one enclosure, shall be provided only as permitted by NFPA 70.

D. Conductors:

1. Provide insulated conductors installed in rigid steel conduit, rigid nonmetallic conduit, or EMT, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Utilize non-wax type lubricants for pulling, chemically neutral to insulation and sheath. Mechanical means for pulling to be tongue-limiting type and not be used for #2 AWG wires and smaller. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways.

Conduit which penetrates fire-rated walls or fire-rated partitions shall be firestopped.

2. Install pull wires in empty conduits. Pull wire shall be plastic having minimum 200-pound force tensile strength. Leave minimum 36 inches of slack at each end of pull wire.

3. No-solder pressure connectors or crimp connections for #8 AWG and larger wires. Remove all sharp points that can pierce tape. Reinsulate according to wire manufacturer's directions. Make splices within boxes in accessible locations.

4. Clean all raceways, boxes, and enclosures before pulling wires and cables. Form neatly in enclosures for minimum of cross-overs.

E. Conduit Installation:

1. Unless indicated otherwise, conceal within finished walls and ceilings. Keep conduit minimum 6 inches away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

2. Use conduits with approved coupling and connectors. All cuts square, using saw. Ream the ends. Bends made with approved tools. Reject flattened or crushed conduit. No running thread. Bushing and 2 locknuts at connection to boxes and enclosures.

3. All raceways shall be blown and swabbed after installation to remove any water then immediately sealed to prevent water infiltration during construction. Raceways must remain sealed except when pulling conductors. If water is discovered during the warranty period the Contractor shall remove water from raceways and associated boxes at no additional cost to the State.

4. Exposed conduit runs to be parallel and/or perpendicular to architectural and structural elements. Galvanized rigid steel conduit up to 7 feet above finished interior floor and under open-sided covered lanais and walkways. EMT permitted for exposed installation indoors above 7 feet.

5. Minimum conduit diameter shall be 3/4-inch trade size except that 1/2-inch conduit will be permitted for branch circuit (non-signal) raceways with a maximum of 2 current carrying conductors #10 AWG and smaller.

6. Restrictions Applicable to EMT:

a. Do not install underground.

b. Do not encase in concrete, mortar, grout, or other cementitious materials.

c. Do not use in areas subject to severe physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT.

d. Provide factory-made transitions between rigid conduit and EMT. Use only compression type, concrete tight couplings.

e. Do not use outdoors, including under open-sided covered lanais, walkways or other similar locations.

7. Restrictions Applicable to Nonmetallic Conduit:

a. PVC Schedule 40:

1) Do not use in areas where subject to severe physical damage, including but not limited to, mechanical equipment rooms, electrical equipment rooms, and other such areas.

2) Do not use in penetrating fire-rated walls or partitions, or fire-rated floors.

3) Non-metallic conduits only permitted for exterior ductlines and beneath grade slab at building; within retaining walls in contact with earth up to the first outlet box or conduit coupling above the height of earth being retained; and within walls anchored to grade slab and not in contact with earth up to height of first outlet box or conduit coupling. Exposed installation of non-metallic conduit not permitted.

8. Restrictions Applicable to Flexible Conduit: Provide flexible steel conduit between 3 and 6 feet in length for equipment subject to vibration, noise transmission, or movement; and for motors. Flexible conduit not allowed for all other installations. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size shall be 1/2-inch diameter. Provide liquid-tight flexible conduit in wet and damp locations for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.

9. Underground Conduit Other Than Service Entrance: Schedule 40 PVC. Convert nonmetallic conduit to steel conduit before rising through floor slab. Plastic coating shall extend minimum 6 inches above floor.

10. Conduit through Floor Slabs: Where conduits rise through concrete slabs, curved portion of bends shall not be visible above finished slab.

11. Stub-Ups: Provide conduits stubbed up through concrete floor for connection to free-standing equipment with adjustable top or coupling threaded inside for plugs, set flush with finished floor. Extend conductors to equipment in rigid steel conduit, except that flexible metal conduit may be used 6 inches above floor. Where no equipment connections are made, install screwdriver-operated threaded flush plugs in conduit end.

12. Conduit Support: Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Load applied to fasteners shall not exceed one-fourth proof test load. Fasteners attached to concrete ceiling shall be vibration resistant and shock-resistant. Holes cut to depth of more than 1 1/2 inches in reinforced concrete beams or to depth of more than 3/4-inch in concrete joints shall not cut main reinforcing bars. Fill unused holes. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Conduit and box systems shall be supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Installation shall be coordinated with above-ceiling mechanical systems to assure maximum accessibility to all systems. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations. For conduits greater than 2 1/2 inches inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

13. Directional Changes in Conduit Runs: Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

14. Locknuts and Bushings: Fasten conduits to sheet metal boxes and cabinets with 2 locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be

brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70. Provide threaded, weatherproof hubs for all raceway connections to boxes and enclosures exposed to the weather.

F. Boxes, Outlets, and Supports:

1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature; fixtures shall be readily removable for access to boxes unless ceiling access panels are provided.

2. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of ceiling supports. Fasten boxes and supports with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24 inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

3. Install boxes serving opposite sides of walls a minimum of 6 inches apart to minimize noise transmission.

G. Conductor Identification: Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, color coding shall be by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, color coding shall be by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves. Identify control circuit terminations in accordance with manufacturer's recommendations.

H. Covers and Device Plates: Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of 1/16 inch. Use of sectional-type device plates not permitted. Provide gasket for plates installed in wet locations.

I. Electrical Penetrations: Opening around electrical penetrations (such as conduit penetrations of flush mounted equipment enclosures or junction boxes) through fire resistance-rated walls, partitions, floors, or ceilings shall be sealed to maintain fire resistive integrity.

J. Grounding and Bonding: Provide in accordance with NFPA 70. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, and neutral conductor of wiring systems. Make ground connection at main service equipment, and extend grounding conductor to point of entrance of metallic water service. Make connection to water pipe by suitable ground clamp or lug connection to plugged tee. If flanged pipes are encountered, make connection with lug bolted to street side of flanged connection. Supplement metallic water service grounding system with additional made electrode in compliance with NFPA 70. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.

1. Ground connections to equipment, raceways, motors, grounding type receptacles and other metallic parts directly exposed to ungrounded conductors by insulated conductors, No. 12 minimum, AWG copper, N.E.C. Type TW, green insulation, or continuous approved metal raceways unless indicated otherwise. Provide insulated ground wires to all receptacles, panels and transformers.

2. All grounding wire runs where exposed and within building in raceways. Run equipment ground wires together with circuit conductors.

3. Resistance: Maximum resistance-to-ground of grounding system shall not exceed 25 ohms under dry conditions. Where resistance obtained exceeds 25 ohms, contact University for further instructions.

K. Equipment Connections: Provide power wiring for the connection of motors and control equipment under this section of the specification. Except as otherwise specifically noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section of the specifications but shall be provided under the section specifying the associated equipment.

3.02 IDENTIFICATION

A. All panelboards, safety switches, overcurrent protection devices, enclosures and junction boxes with dimensions of 6 inches and larger shall be provided with plastic plate identifying itself and its use.

B. Plastic plate shall be laminated black and white, engraved 1/4-inch high lettering to expose black layer. Plate shall be riveted to the cover and located directly below device handle, or top side of door.

C. CAUTION SIGNS shall be provided as required by Ordinances and/or by OSHA.

3.03 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in SECTION 09900 - PAINTING.

3.04 FIELD QUALITY CONTROL

A. Furnish test equipment and personnel and submit written copies of test results. Give the Universiity 10 working days' notice prior to each test.

1. Devices Subject to Manual Operation: Each device subject to manual operation shall be operated at least 5 times, demonstrating satisfactory operation each time.

2. 600-Volt Wiring Test: Test wiring rated 600-volt and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 250,000 ohms. Submit results to the University.

3. Inspect conduit system for completeness, loose couplings and proper support.

4. Ground-Fault Receptacle Test: Test ground-fault receptacles with a "load" (such as a plug-in light) to verify that the "line" and "load" leads are not reversed.

5. Grounding System Test: Test grounding system to ensure continuity and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to University, and indicate location of rods as well as resistance and soil conditions at time measurements were made.

END OF SECTION

SECTION 16208 - ENGINE GENERATORS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

This Section includes, but is not limited, to the following items:

A. Diesel engine-generator set including but not limited to exhaust system, cooling system, fuel system, starting system, and the generator control/alarm systems.

B. Testing and maintenance requirements.

1.03 RELATED WORK

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

B. SECTION 16100 - ELECTRICAL WORK applies to this section with additions and modifications specified herein.

C. SECTION 16262 - AUTOMATIC TRANSFER SWITCH applies to this section with additions and modifications specified herein.

1.04 APPLICABLE PUBLICATIONS

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

1.05 INTENT

A. This specification describes the equipment required. It does not cover all phases of manufacture or assembly. The Contractor shall assume the responsibility for providing well-integrated units of high quality.

B. Equipment, materials, installation, and workmanship shall be in accordance with the required and advisory provisions of NEPA. Materials not normally furnished by the manufacturer of the equipment shall be provided in accordance with other sections of DIVISION 16 - ELECTRICAL unless otherwise noted.

1.06 STANDARDS AND CODES

A. The equipment covered by this specification shall be designed, tested and assembled in accordance with the applicable standards of ANSI, IEEE and NEMA, as minimum requirements for all items.

B. The equipment shall comply with NEC, OSHA and all pertinent Federal, State and Local Codes, regulations and ordinances, including UL approval if required.

1.07 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Equipment Data:

1. Provide complete specifications of all proposed equipment including fuel consumption data, outline drawings showing approximate dimensions, weights and complete performance data.

2. A statement is required that the equipment to be furnished will be in accordance with this specification. Any exceptions must be listed in detail.

C. Shop Drawings:

1. Equipment List.

2. General arrangements and mounting details, including location and size of all connections and foundation requirements.

3. Drawings and/or catalog cuts showing complete layouts, details, dimensions, weights, and installation instructions of sets and accessories, including lubrication-oil cooler, radiator, exhaust silencer, transfer pump, turbo-charger, fuel oil storage tank, etc.

4. Schematic and wiring diagrams of all power, control, filtering, monitoring, metering and any other circuiting.

5. Outlines, front view, sections of control panel and main circuit breaker.

6. Battery, chargers, and connection diagrams.

7. Fuel oil, lube oil, cooling water piping and wiring diagram.

8. Concrete pad recommendation, layout, and stub-up locations of electrical fuel systems.

9. Factory sound test results and manufacturer certification to demonstrate compliance with sound pressure requirements.

10. Certification of compliance with EPA emission specifications.

11. Manufacturer-certified vibration isolation system.

12. Electrical drawings showing routing and fitting locations.

D. Terminal block and lug numbers for all external connections shall be same as shown on the elementary diagrams and shall be identified in a manner to distinguish them from internal interconnecting points.

E. Shop drawings shall have sufficient information so that they may be considered for approval without reference to detail drawings. No shop drawings will be considered for approval which, in the opinion of the University, is contingent upon approval of other features for approval if such features are not incorporated into the shop drawings. If changes or corrections are necessary, resubmit the corrected shop drawings using the same procedures as the original submission. It is understood that the approval of the Contractor's shop drawings, whether general or detailed, is a general approval relating only to their sufficiency and compliance with the intention of the design and shall not excuse or constitute an acceptance of errors, discrepancies, or omissions, or waiver of detailed requirements.

F. Operating Instructions: Submit operating instructions as stipulated in item entitled “OPERATION AND MAINTENANCE MANUALS” hereinbelow.

G. Warranty: Submit warranty as stipulated in item entitled “WARRANTY” hereinbelow.

1.08 OPERATION AND MAINTENANCE MANUALS

A. Submit in accordance with SECTION 01700 - CONTRACT CLOSEOUT. The manual shall include the following:

1. Operating instructions and maintenance procedures for all components.

2. Recommended spare parts list containing information of components, manufacturer's name and catalog number and price.

3. Approved and certified shop drawings.

4. Certified test log of engine-generator data taken during Check Out and Acceptance Testing.

1.09 MATERIAL

A. All materials and parts comprising the units herein specified shall be new and unused, of current manufacture, and of the highest grade, free from all defects or imperfections affecting performance. Workmanship shall be of the highest grade, in accordance with modern practice.

B. The unit shall be the product of a firm regularly engaged in the manufacture of engines and generators and shall meet the requirements of the specifications set forth herein. It must be of a standard model in regular production at the manufacturer's place of business.

1.10 PARTS AND SERVICE

A. The diesel electric generator set shall be such that it can be properly maintained and serviced without the necessity of the User carrying expensive part stocks, or being subjected to the inconvenience of long periods of interrupted services due to lack of available parts.

B. The vendor shall specify nearest location of permanent parts depots in the State of Hawaii from which the parts may be obtained in necessary quantities at any time during the day or night. The engine supplier shall have complete parts and factory authorized service facilities on Oahu with 24-hour trouble call.

1.11 WARRANTY

A. The Contractor shall warranty all equipment which he provides for a period of one year from the date of final project acceptance.

B. The Contractor shall promptly correct any deficiencies in the equipment provided which occur during the warranty period at the site at no additional cost. This shall include all costs for material and labor for all such corrective work.

PART 2 - PRODUCTS

2.01 DIESEL ENGINE-GENERATOR SET

A. The engine-generator system shall be complete factory assembled, installed, wired, tested, conforming with the National Electrical Code.

B. Engine-generator set shall be certified to Tier 4 Stationary Emergency Certified exhaust emission levels in accordance with U.S. EPA emissions standards and regulations.

C. Engine shall be capable of starting as a fully compression-ignition engine on No. 2 diesel fuel at any condition within 0 degrees F to 120 degrees F at sea level. The engine shall accelerate to rated speed and accept full

load within 10 seconds maximum. Diesel engines requiring premium fuel will not be considered.

D. Rating:

1. Engine-generator set shall be capable of producing the indicated kilowatts of standby power at 0.8 lagging power factor of 3-phase, the 208/120 service voltage, 60 Hertz AC continuously (24 hours a day) without adverse effects when operating at 1800 rpm under any ambient conditions from 0 degrees F to 120 degrees F at sea level.

2. Rating of the diesel generator set shall be based on operating of the set at rated generator RPM when equipped with all necessary operating accessories such as air cleaners, radiator pumps, radiator fans, lubricating oil pump, fuel transfer pump, fuel injection pump, jacket water pump, governor, AC generator and exciter.

E. Performance:

1. Frequency: Upon completion or removal of full-rated load in one step, set shall recover to stabilized speed within 5 seconds after full rated load is applied in one step and the frequency shall vary by not more than 5 percent (3 Hertz).

2. Upon completion of full-rated load in one step, the voltage shall vary by not more than 30 percent and shall recover to within the steady-state modulation band within seconds.

F. Control Characteristics:

1. Engine-generator set shall be capable of manual or automatic operation. The engine control circuits shall be designed for 24 volts DC. Selector switch (test-manual-off-auto) shall be provided for the system.

2. Manual Operation: Placing of the selector switch of set from the "OFF" to the "MANUAL" position shall cause the set to start and accelerate to governed speed. Moving the selector switch of the set to the "OFF" position shall cause the starting circuits to open and the set to shut down.

3. Automatic Operation: With the selector switches in the "AUTO" position, set shall start upon the closure of a pair of electrical contacts provided for that purpose. The set shall be actuated through such contacts and will have load transferred to it by an automatic transfer control switching scheme. Upon re-energization of the normal source, load will be removed from the set by the automatic transfer control switching scheme. Engine shall be stopped automatically after a 5-minute cool-down unloaded running time.

2.02 MALFUNCTION AND ALARM

A. Engine: Running of the engine-generator set shall be protected by the following malfunction circuitry:

1. Low Oil Pressure: Should the lube oil pressure of the engine fall below a preset limit, the same actions shall occur.

2. High Cooling-Water Temperature: Should the jacket water temperature of engine rise above preset double limits, the following shall occur. As the water temperature rises above the first limit, an audible alarm shall be sounded. A temperature rise above the second limit shall result in the shutdown of the set.

2.03 STARTING SYSTEM

A. Engine-cranking motor shall be powered by a 12-volt, heavy duty, storage battery having sufficient capacity to crank the engine at constant firing speed in minimum room temperature of 0 degrees F for a minimum of 4 cranking attempts.

B. The battery set shall be provided with all intercell connections and connecting cables to the charger and generator.

C. Battery charger shall be solid-state and provide fully automatic and self-adjusting charging to the generator battery system.

D. Battery Alarms: Battery installation shall have warning lamp display for low battery charge.

2.04 CONTROL PANEL

A. Local Control Panel: The local control panel shall be provided in a generator set mounted enclosure with continuous hinged door and lock. Use of analog or digital metering acceptable. Control panel shall contain, but not be limited to the following:

1. AC voltmeter.

2. AC Ammeter.

3. Frequency meter.

4. Frequency meter.

5. Voltage regulator.

6. Runtime meter.

7. Idle control switch.

8. Warning lamp display.

9. Ignition switch.

10. Emergency stop switch.

11. AC output circuit breaker.

2.05 GENERATOR

A. Generator shall be a rotating-field, 3-phase, 4-wire synchronous machine with the indicated continuous rated with kilowatt rating noted on Drawings, at 0.8 lagging power factor, with 208/120 volts wye connected, 4-wire system, 60 hertz AC, when operating at rated speed, and shall be of the single ball-bearing drip-proof, self-ventilated, protected type. The generator insulation system shall be totally encapsulated with Class "F" insulation. Temperature rise shall not exceed NEMA standard. Engine and generator combination shall be mounted on a common structural steel base.

B. The exciter shall be of the brushless type with automatic voltage regulation.

C. Acceptable Manufacturers: Multiquip, Cummins, Generac or pre-approved equivalent.

2.06 ENGINE

A. Engine shall have a vertical configuration, 4-cycle, liquid cooled.

B. The engine shall be provided with all flexible connections of the size, length, and type recommended by the engine manufacturer. Connections shall be provided by fuel intake, fuel return, cooling water outlet, cooling water inlet, radiator, and exhaust.

C. Acceptable Manufacturers: Kubota, Cummins, Generac or pre-approved equivalent.

2.07 SOUND ATTENUATED ENCLOSURE

The complete diesel engine generator set, including generator control panel, engine starting batteries and fuel oil tank, shall be enclosed in a factory assembled, sound attenuated enclosure mounted on the fuel tank base.

A. A weather resistant, sound attenuated lockable steel enclosure with electrostatically applied powder coated baked polyester paint. The enclosure shall have a resulting sound level of 64 dba at 23 feet with the genset running under full load. It shall consist of a roof, side walls, and end walls. Fasteners shall be stainless steel.

B. Provide key-lockable access doors and externally mounted emergency stop button.

C. Refer to the Drawings for dimensional requirements.

2.08 FUEL SYSTEM

Fuel Base Tank: Provide a double wall steel, base fuel tank constructed to meet all local codes and requirements. A fuel tank base capacity for a minimum 6-hour generator run time at full load shall be provided as an integral part of the enclosure. A locking fill cap and mechanical reading fuel level gauge shall be provided. Interior tank surfaces shall be coated with a solvent based thin-film rust preventative.

2.09 COOLING SYSTEM

Engine shall be furnished with a cooling system having sufficient capacity for cooling the engine when it is delivering full-rated load in an ambient temperature not to exceed 120 degrees F.

2.10 EXHAUST SYSTEM

Verification of the ability to meet emission specifications shall be made available from the engine manufacturer.

2.11 SAFETY CONTROLS, GAUGES, AND ALARMS

A. The engine shall be equipped with automatic safety controls which will shut down the engine in the event of low lubrication oil pressure, high water temperature, overcranking and overspeed.

B. The engine shall be equipped with an automatic safety control which shall actuate a visible alarm in the event of approached low oil pressure, high water temperature and low battery charge.

2.12 SHOP INSTALLATION

Contractor shall furnish all necessary labor, material, and equipment required for complete installation and integration, including, but not limited to, the following:

A. Diesel Generator: Install the diesel generator to set with base spring-type vibration isolator and neoprene acoustical pads, leveling devices, vertical and horizontal limit stops, approved by the set manufacturer.

B. Generator Starting System: Install the battery and battery charger in accordance with battery and charger vendor's instruction manual. Provide all wiring for the entire starting system including engine starting cable between the battery system and diesel-generator per engine starting requirement. All cables shall be copper.

C. Local Control Panel: Panel shall be installed, wired, and tested at equipment supplier's shop. Interconnections to equipment/ devices inside the enclosure shall enter the cabinet from the top of the cabinet. Outgoing power/control wirings to branch circuit panelboard, ATS, etc. shall enter the control cabinet from the bottom.

D. Identification: All wire shall be clearly tagged with wire markers to indicate its origin and the circuit it feeds. Tags on the panels shall be of 1/16-inch thick by 3/4-inch wide, by 3 inches long with contrasting engraved lettering. Signal and control wiring shall be identified by means of labels, which shall indicate the panel letter and circuit number from where it originates. Provide a one-inch by 3-inch (minimum) engraved Bakelite designation plate for all panels. All plates and labels shall be black with white lettering unless indicated otherwise. Provide engraved Bakelite designation plates for all separately mounted breakers, control relays, pilot light meters, etc. in control panels. Plates are to conform to the above requirements and indicate the equipment served. Bakelite designation plates shall be fastened to the aforementioned equipment with oval head brass machine screws. The minimum letter size shall be 1/4-inch high.

2.13 PAINT AND SPARES

The manufacturer's standard practice of (2 coats) shop priming and painting shall be used. All equipment shall be free from rust, scale, manufacturing residue and foreign material prior to painting. One gallon of touch-up paint shall be provided.

2.14 SUPPORTS AND MISCELLANEOUS

The complete assembled engine-generator set will be field installed on a concrete equipment pad. Anchor bolts and templates for the assembly shall be furnished by the vendor 2 weeks after drawing approval. Disassembly of generator, engine, skid base, and radiator will be permitted to facilitate installation.

PART 3 - EXECUTION

3.01 INSTALLATION

Installation shall conform to the applicable requirements of IEEE C2, NFPA 30, NFPA 37, and NFPA 70.

3.02 START-UP SERVICE

A. Contractor shall include in his bid the service of the vendor’s system/service engineer who fully understands the entire assembly/integration of the system, to assist in final piping/wiring checkout and to perform load and operational tests.

B. The bid shall include one complete day of service plus all out-of-pocket expenses. In the case of an unsatisfactory test result, vendor shall provide all parts and labor to repair the system and to continue the start-up and test

procedure until the systems operation proved meeting the specification at no extra cost to the project.

3.03 PREREQUISITES FOR CHECK OUT AND ACCEPTANCE TESTING

A. Completion of the following requirements is mandatory prior to scheduling for acceptance tests for the engine-generator set and auxiliary equipment.

B. Preliminary Operations: The vendor's system/service engineer shall conduct manufacturer recommended start-up procedures and tests to verify that the engine-generator set and auxiliary equipment are ready for functional acceptance tests. Give the University 10 working days advance notice that preliminary operations will be conducted. After preliminary operation has been successfully conducted, the vendor's system/service engineer will notify the University in writing stating the engine-generator set and auxiliary equipment are ready for acceptance tests.

C. Checkout and Acceptance Test Procedure: Test procedure shall be prepared by the vendor's system/service engineer specifically for the engine-generator set and auxiliary equipment. The test agenda shall cover the requirements specified in item entitled "CHECK OUT AND ACCEPTANCE TESTING" hereinbelow. The test procedure shall indicate in detail how tests are to be conducted. A statement of the tests that are to be performed without indicating how the tests are to be performed is not acceptable. Indicate what work is planned on each workday and identify the calendar dates of the planned workdays. Specify what additional technical support personnel is needed, such as factory representatives for major equipment. Specify on which testing workday each technical support personnel is needed. Data recording forms to be used to document test results are to be submitted with the proposed test procedure. A list of test equipment and instruments shall also be included in the test procedure.

D. Test Equipment: Test equipment and instruments shall be on hand prior to scheduling field tests or, subject to University approval, evidence shall be provided to show that arrangements have been made to have the necessary equipment and instruments on site prior to field testing.

E. Coordinate check out and acceptance tests with the requirements of SECTION 16262 - AUTOMATIC TRANSFER SWITCH.

3.04 CHECK OUT AND ACCEPTANCE TESTING

A. The equipment included in this specification shall be tested and assembled in accordance with the rules of the ANSI, IEEE, and NEMA when applicable. Tests shall simulate typical operating conditions.

B. An on-site test hereby specified, for the generator set and associated subsystem shall be conducted in the presence of the University or his representative. Written notice shall be given to University at least 10 working days in advance of testing.

C. Certified test log of engine-generator set showing the following data taken at and within specified parameters.

1. Operate generator continuously under 100 percent load for 2 hours.

2. Voltage and frequency readings taken during test to be permanently recorded by chart recorded or light beam oscillograph of sufficient response and resolution to verify generator output characteristics specified.

3. Time lag from normal power failure to operation at rated voltage and frequency with no load and 100 percent load.

4. Half Hourly Log: Fuel consumption and water temperatures.

5. Statement indicating accessories and auxiliaries used, ambient temperature, elevation and location.

D. A complete operational test shall be made including generator, fuel system, cooling system, protection and alarming system, etc. All interlocks and protective features shall be checked out.

E. If the system fails to meet the tests specified, then any additional tests required shall be made at no expense to the State.

F. Contractor shall provide loadbank with power factor adjustment capability, fuel, and required accessories and instruments, and other consumable products for all tests at no additional cost to the State.

G. Base fuel tank shall be completely filled, at the Contractor's cost, upon completion of all on-site testing.

3.05 TRAINING COURSE

A. The Contractor shall conduct an on-site training course for operating staff and maintenance personnel as designated by the State.

B. The training period shall consist of a total of 4 hours of normal working time.

C. The training session shall start after the system is functionally completed but prior to final acceptance tests.

D. Training shall concentrate on operation, maintenance, and troubleshooting procedures of the installed system.

END OF SECTION

SECTION 16262 - AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

Provide automatic transfer switch for standby power distribution system.

1.03 RELATED WORK

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

B. SECTION 16100 - ELECTRICAL WORK applies to this section with additions and modifications as specified herein.

C. SECTION 16208 - ENGINE GENERATOR applies to this section with additions and modifications as specified herein.

1.04 STANDARDS AND CODES

A. The equipment covered by this specification shall be designed, tested and assembled in accordance with the applicable standards of ASTM, ANSI, IEEE and NEMA, as minimum requirements for all items.

B. The equipment shall comply with NEC, OSHA and all pertinent Federal and Local Codes, regulations and ordinances, including UL approval.

1.05 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Submit catalog data for the automatic transfer switch. Provide complete product specifications of all equipment including outline drawings showing approximate dimensions, weights and complete performance data.

C. Shop Drawings:

1. System configuration with single-line/three-line diagram showing all components, detailed layouts of all metering, alarm and mimic panels.

2. Front elevation, sections showing equipment and buswork, relays, fuses, etc. and cable lug quantities, sizes and location, and any information required for complete identification and location.

3. Floor plan showing materials, sizes, anchoring, location of power and control conduit entries above and below.

4. Performance characteristics including time-current curves for all overcurrent protective devices such as fuses, overload relays, etc.

5. Schematic and wiring diagrams of all power, control, monitoring, and any other circuits.

6. Wiring diagrams showing interconnections among automatic transfer switch, utility power, generator, etc.

D. Terminal block and lug numbers for all external connections shall be the same as shown on the elementary diagrams and shall be identified in a manner to distinguish them from internal interconnecting points.

E. Operating Instructions: Submit operating instructions as stipulated in item entitled “OPERATING INSTRUCTIONS” hereinbelow.

F. Warranty: Submit warranty as stipulated in item entitled “WARRANTY” hereinbelow.

G. Maintenance Service Contract: Submit maintenance service contract as stipulated in item entitled “MAINTENANCE SERVICE CONTRACT” hereinbelow.

1.06 OPERATING INSTRUCTIONS

A. Submit in accordance with SECTION 01700 - CONTRACT CLOSEOUT. The instruction book shall include the following:

1. Operating instructions and maintenance procedures for all components.

2. Recommended spare parts list containing information of components, manufacturer’s name and catalog number.

3. Approved and certified shop drawings.

4. Test results.

B. Four sets of instruction books shall accompany the equipment.

1.07 PROTECTION

All material, equipment and component parts shall be adequately protected to prevent corrosion or entry of foreign matter during shipment, during storage in an unheated indoor dusty atmosphere and damage during shipment. The Contractor shall make good at his own expense, all damage due to improper preparation and/or storage of equipment and component parts.

1.08 WARRANTY

A. The Contractor shall warranty all equipment which he furnishes for a period of one year from the date of successfully completed final acceptance testing of the standby power system, including generator equipment.

B. The Contractor shall promptly correct any deficiencies in the equipment he furnished which occur during the warranty period at the site at no additional cost to the State. This shall include all costs for material and labor.

1.09 MAINTENANCE SERVICE CONTRACT

A. The Contractor shall provide extended testing and maintenance services for the engine generator system for a period of one year from the date of final project acceptance.

B. The Contractor shall include all material, equipment and labor costs for performing maintenance work in his Bid.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND MATERIALS

A. The switches and all major items of auxiliary equipment shall be manufactured in the U.S. by manufacturers currently engaged in the production of such equipment. The unit shall be factory assembled, and tested by the manufacturer and shipped to the job site by his authorized dealer having a parts and service facility in the area. ASCO, Russelectric, Caterpillar, or pre-approved equivalent. Circuit breaker switches are not acceptable.

B. All materials, equipment, and parts comprising the units specified herein, shall be new and unused, of current manufacture and of highest grade.

C. All automatic transfer switches (ATS) in the project shall be the product of one manufacturer and be completely factory assembled and tested as a single unit. ATS shall be mounted in a front accessible only enclosure. The interconnections between the switches shall be bussed or cabled by the manufacturer so that the Contractor will be required to make only the power connections to complete the installation.

2.02 RATING

The automatic transfer switch shall be rated for continuous duty at the indicated amperes, 3-poles, for normal and standby power source of the 208 volt, 3-phase, 4-wire, 60 Hertz with minimum withstand current rating and continuous current rating as indicated.

2.03 AUTOMATIC TRANSFER SWITCH

A. The ATS shall detect a power failure automatically and trigger controls to start an engine generator set. When generator reaches proper voltage and frequency, the switch then transfers loads from normal power to generator. When the normal source is ready to supply power again, the ATS senses it and retransfers the load back to the normal source and triggers the control to shut down the engine generator.

B. ATS shall include, but is not limited to the following features:

1. Selective normal switch mounted on enclosure door to select either source to be considered as the normal

2. Mechanically held, electrically operated.

3. Adjustable time delay (0-30 minutes) on re-transfer, preset at 5 minutes.

4. Auxiliary contacts (N.C. and N.O.) for engine start.

5. Close differential relays and transfer control relay to measure normal source voltage. Set to drop out at 83-85 percent, pick-up at 92-95 percent frequency.

6. Emergency source voltage and frequency sensing relay, set to pick-up at 90 percent voltage, 95 percent frequency.

7. Auxiliary contacts at ATS failure for remote indication.

8. Test switch to simulate power failure.

9. Unload running time relay for emergency generator cool-down, adjustable from 0-5 minutes, factory set at 5 minutes.

10. Auxiliary contacts of normal and emergency position for remote indication and control interfaces with other systems.

11. Status display, including switch position indication and source availability indication, mounted on front of switch enclosure

PART 3 - EXECUTION

3.01 INSTALLATION

Installation shall conform to the requirements of the NFPA 70 and manufacturer's recommendations.

3.02 PREREQUISITES FOR FUNCTIONAL ACCEPTANCE TESTING

A. Completion of the following requirements is mandatory prior to scheduling functional acceptance tests for the automatic transfer switch.

B. Performance of Acceptance Checks and Tests: Complete as specified in paragraph entitled "Acceptance Checks and Tests" hereinbelow.

C. Test Equipment: All test equipment and instruments shall be on hand prior to scheduling field tests, or subject to University's approval, evidence shall be provided to show that arrangements have been made to have the necessary equipment and instruments on site prior to field testing.

3.03 FIELD QUALITY CONTROL

A. Give University 10 working day advance notice of dates and times scheduled for tests which require the presence of the University. The contractor shall provide labor, equipment, apparatus, including test load, and consumables required for the specified tests. Calibration of all measuring devices and indicating devices shall be certified. Perform the following field tests in accordance with the manufacturer's recommendations.

B. Functional Acceptance Tests: Shall include simulating power failure and demonstrating the following operations for each automatic transfer switch. Contractor shall show by demonstration in service that the automatic transfer switches are in good operating condition, and function not less than 5 times.

1. Coordinate acceptance tests with the requirements of SECTION 16208 - ENGINE GENERATORS.

2. Perform Automatic Transfer Tests:

a. Simulate loss of normal/preferred power.

b. Return to normal/preferred power.

c. Simulate loss of emergency power.

d. Simulate all forms of single-phase conditions.

3. Verify correct operational and timing of the following functions:

a. Normal source voltage-sensing relays.

b. Engine start sequence.

c. Time delay upon transfer.

d. Alternate source voltage-sensing relays.

e. Automatic transfer operation.

f. Interlocks and limit switch function.

g. Time delay and retransfer upon normal power restoration.

3.04 TRAINING COURSE

A. The Contractor shall conduct an on-site training course for operating staff and maintenance personnel as designated by the University.

B. The training period shall consist of a total of 4 hours of normal working time.

C. Training shall concentrate on operation, maintenance, and troubleshooting procedures of the installed system.

END OF SECTION

SECTION 16301 - UNDERGROUND ELECTRICAL WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

This section includes, but is not limited to, the underground secondary electrical and telecommunications infrastructure system consisting of ductlines and conductors.

1.03 RELATED WORK

A. DIVISION 2 - SITE CONSTRUCTION.

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

C. SECTION 16710 - BUILDING TELECOMMUNICATIONS CABLING SYSTEM.

1.04 APPLICABLE PUBLICATIONS

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

1.05 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Manufacturer's Data: Warning Tape.

C. Test reports as required in item entitled "FIELD QUALITY CONTROL" hereinbelow.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

Materials and equipment shall conform to the respective specifications and standards and to the specifications herein. Electrical ratings shall be as indicated.

A. Conduit, Ducts, and Fittings:

1. Plastic Duct or Concrete Encasement: UL 651, Schedule 40.

2. Conduit Sealing Compound: Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials. Inflatable bladders may be used as an option.

3. Fittings:

a. PVC Conduit Fittings: UL 514B, UL 651.

b. PVC Duct Fittings: NEMA TC 9.

2.02 LOW VOLTAGE INSULATED CONDUCTORS AND CABLES

A. Insulated conductors shall be rated 600 volts and conform to the requirements of NFPA 70, including listing requirements. Wires and cables manufactured more than 24 months prior to date of delivery to the site shall not be accepted.

B. Conductor Types: Cable and duct sizes indicated are for copper conductors unless otherwise noted. Conductors No. 10 AWG and smaller shall be solid copper. Conductors No. 8 AWG and larger shall be stranded copper. All conductors shall be copper.

C. Conductor Material: Unless specified or indicated otherwise or required by NFPA 70, wires in conduit, shall be 600-volt, Type XHHW or RHW-USE conforming to UL 44. Copper conductors shall be annealed copper complying with ASTM B3 and ASTM B8.

D. In Duct: Cables shall be single-conductor cable.

E. Cable Marking:

1. Insulated conductors shall have the date of manufacture and other identification imprinted on the outer surface of each cable at regular intervals throughout the cable length.

2. ach cable shall be identified by means of a fiber, laminated plastic, or non-ferrous metal tags, or accepted equivalent, in each handhole, junction box, and each terminal. Each tag shall contain the following information; cable type, conductor size, circuit number, circuit voltage, cable destination and phase identification.

3. Conductors shall be color coded. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Conductor identification shall be by color-coded insulated conductors, plastic-coated self-sticking printed markers, colored nylon cable ties and plates, heat shrink type sleeves, or colored electrical tape. Control circuit terminations shall be properly identified. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutrals shall be white with a different colored (not green) stripe for each. Color of ungrounded conductors in different voltage systems shall be as follows:

   a. 208/120 Volt, 3-Phase:

      1) Phase A - black.

      2) Phase B - red.

      3) Phase C - blue.

2.03 LOW VOLTAGE WIRE CONNECTORS AND TERMINALS

UL 486A-486B. Shall provide a uniform compression over the entire conductor contact surface. Use solderless terminal lugs on stranded conductors.

2.04 LOW VOLTAGE SPLICES

A. Provide splices in conductors with a compression connector on the conductor and by insulating and waterproofing using one of the following methods which are suitable for continuous submersion in water and comply with ANSI C119.1.

B. Heat Shrinkable Splice: Provide heat shrinkable splice insulation by means of a thermoplastic adhesive sealant material which shall be applied in accordance with the manufacturer's written instructions.

C. Cold Shrink Rubber Splice: Provide a cold-shrink rubber splice which consists of EPDM rubber tube which has been factory stretched onto a spiraled core which is removed during splice installation. The installation shall not require heat or flame, or any additional materials such as covering or adhesive. It shall be designed for use with inline compression type connectors, or indoor, outdoor, direct-burial or submerged locations.

2.05 TAPE

Insulating Tape: UL 510, plastic insulating tape, capable of performing in a continuous temperature environment of 80 degrees C.

2.06 PULLSTRING

Shall be plastic or flat pull line having a minimum tensile strength of 200 pounds.

2.07 GROUNDING AND BONDING

Grounding Conductors: Stranded-bare copper conductors shall conform to ASTM B8, Class B, soft-drawn unless otherwise indicated. Solid-bare copper conductors shall conform to ASTM B1 for sizes No. 8 and smaller. Insulated conductors shall be of the same material as phase conductors and green color-coded, except that conductors shall be rated no more than 600 volts. Aluminum is not acceptable.

2.08 CAST-IN-PLACE CONCRETE

Provide concrete in accordance with SECTION 03300 - CAST-IN-PLACE CONCRETE. Provide concrete for encasement of underground ducts with 3000 psi minimum 28-day compressive strength.

2.09 CABLE TAGS IN HANDHOLES

A. Provide tags for each power cable located in handholes. The tags shall be polyethylene. Do not provide handwritten letters. The first position on the power cable tag shall denote the voltage. The second through sixth positions on the tag shall identify the circuit.

B. Polyethylene Cable Tags: Provide tags of polyethylene that have an average tensile strength of 3250 pounds per square inch; and that are 0.08-inch thick (minimum), non-corrosive non-conductive; resistive to acids, alkalis, organic solvents, and salt water; and distortion resistant to 170 degrees F. Provide 0.05 inch (minimum) thick black polyethylene tag holder. Provide a one-piece nylon, self-locking tie at each end of the cable tag. Ties shall have a minimum loop tensile strength of 175 pounds. The cable tags shall have black block letters, numbers, and symbols one inch high on a yellow background. Letters, numbers, and symbols shall not fall off or change positions regardless of the cable tags' orientation.

2.10 WARNING TAPE

Preprinted polyethylene tape, 4 mil thick, detectable foil-backed red color, 3-inch minimum width, imprinted with “CAUTION BURIED ELECTRICAL LINE BELOW.”

2.11 DUCT SEAL

Pliable, non-toxic material used for application around conductors in raceway and in empty conduits to minimize moisture and rodent/insect infiltration. Must be re-enterable material allowing for removal/reapplication after initial installation. Non-drying, non-cracking, non-corrosive material that will not adversely affect raceway and conductors. Provide duct seal at all duct entries in handhole, manholes, apparatus and risers to prevent water infiltration via duct system.

PART 3 - EXECUTION

3.01 INSTALLATION

Install equipment and devices in accordance with the manufacturer's published instructions and with the requirements and recommendations of NFPA 70 and IEEE C2 as applicable.

3.02 CABLE INSPECTION

Prior to installation, each cable reel shall be inspected for correct storage positions, signs of physical damage, and broken end seals. If end seal is broken, moisture shall be removed from cable prior to installation in accordance with the cable manufacturer's recommendations.

3.03 UNDERGROUND CONDUIT AND DUCT SYSTEMS

A. Depths to top of the conduit shall be in accordance with NFPA 70. Run conduit in straight lines except where a change of direction is necessary. Numbers and sizes of ducts shall be as indicated. Ducts shall have a continuous slope downward toward underground structures and away from buildings, laid with a minimum slope of 3 inches per 100 feet. Depending on the contour of the finished grade, the high-point may be at a terminal, a handhole, or between handholes. Short-radius 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3-inch diameter, and 36 inches for ducts 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate in structures.

B. Treatment: Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

C. Conduit Cleaning: As each conduit run is completed, for conduit sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs. For conduit sizes less than 3 inches, draw a stiff bristle brush

through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs.

D. Multiple Conduits: Separate multiple conduits by a minimum distance of 2 inches, except that light and power conduits shall be separated from control, signal, and telephone conduits by a minimum distance of 3 inches. Stagger the joints of the conduits by rows (horizontally) and layers (vertically) to strengthen the conduit assembly. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assembly shall consist of base spacers, intermediate spacers, ties, and locking device on top to provide a completely enclosed and locked-in conduit assembly. Install spacers per manufacturer's instructions, but provide a minimum of 2 spacer assemblies per 10 feet of conduit assembly.

E. Conduit Plugs and Pull Rope: New conduit indicated as being unused or empty shall be provided with plugs on each end. Plugs shall contain a weephole or screen to allow water drainage. Provide a plastic pull rope having 3 feet of slack at each end of unused or empty conduits.

F. Duct Encased in Concrete: Construct underground duct lines of individual conduits encased in concrete. Do not mix different kinds of conduit in any one duct bank. Concrete encasement surrounding the bank shall be rectangular in cross-section and shall provide at least 3 inches of concrete cover for ducts. Separate conduits by a minimum concrete thickness of 2 inches, except separate light and power conduits from control, signal, and telecommunications conduits by a minimum concrete thickness of 3 inches. Before pouring concrete, anchor duct bank assemblies to prevent the assemblies from floating during concrete pouring. Anchoring shall be done by driving reinforcing rods adjacent to duct spacer assemblies and attaching the rods to the spacer assembly. Provide color, type and depth of warning tape as indicated in the drawings.

1. Partially Completed Duct Banks: During construction wherever a construction joint is necessary in a duct bank, prevent debris such as mud, and, and dirt from entering ducts by providing suitable conduit plugs. Fit concrete envelope of a partially completed duct bank with reinforcing steel extending a minimum of 2 feet back into the envelope and a minimum of 2 feet beyond the end of the envelope. Provide one No. 4 bar in each corner, 3 inches from the edge of the envelope. Secure corner bars with 2 No. 3 ties, spaced approximately one foot apart. Restrain reinforcing assembly from moving during concrete pouring.

3.04 CABLE PULLING

A. Test existing duct lines with a mandrel and thoroughly swab out to remove foreign material before pulling cables. Pull cables down grade with the feed-in point at the manhole or buildings of the highest elevation. Use flexible cable feeds to convey cables through handhole opening and into duct runs. Do not exceed the specified cable bending radii when installing

cable under any conditions, including turn-ups into enclosures. If basket-grip type cable-pulling devices are used to pull cable in place, cut off the section of cable under the grip before splicing and terminating.

B. Cable Lubricants: Use lubricants that are specifically recommended by the cable manufacturer for assisting in pulling jacketed cables.

3.05 CABLES IN UNDERGROUND STRUCTURES

A. Do not install cables utilizing the shortest path between penetrations, but route along those walls providing the longest route and the maximum spare cable lengths. Form cables to closely parallel walls, not to interfere with duct entrances.

B. Cable Tag Installation: Install cable tags in each handhole as specified, including each splice. Tag wire and cable provided by this contract. Install cable tags over the fireproofing, if any, and locate the tags so that they are clearly visible without disturbing any cabling or wiring in the handholes.

3.06 CONDUCTORS INSTALLED IN PARALLEL

Conductors shall be grouped such that each conduit of a parallel run contains one Phase A conductor, one Phase B conductor, one Phase C conductor, and one neutral conductor.

3.07 LOW VOLTAGE CABLE SPLICING AND TERMINATING

Make terminations and splices with materials and methods as indicated or specified herein and as designated by the written instructions of the manufacturer. Do not allow the cables to be moved until after the splicing material has completely set. Make splices in underground distribution systems only in accessible locations such as handholes or aboveground termination cabinets.

3.08 GROUNDING SYSTEMS

A. Provide grounding system as indicated, in accordance with NFPA 70 and IEEE C2, and as specified herein.

B. Grounding Connections: Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.

1. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.

2. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies shall be as recommended by the manufacturer. An embossing die

code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

C. Grounding Conductors: Provide bare grounding conductors, except where installed in conduit with associated phase conductors. Ground equipment with No. 6 AWG. Ground other noncurrent-carrying metal parts and equipment frames of metal-enclosed equipment. Ground metallic frames and covers of handholes and pull boxes with a braided, copper ground strap with equivalent ampacity of No. 6 AWG.

3.09 EXCAVATING, BACKFILLING, AND COMPACTING

Provide in accordance with NFPA 70 and DIVISION 2 - SITE CONSTRUCTION.

3.10 FIELD QUALITY CONTROL

A. Performance of Field Acceptance Checks and Tests: Perform in accordance with the manufacturer's recommendations, and include the following visual and mechanical inspections and electrical tests, performed in accordance with NETA ATS.

1. Grounding System:

a. Visual and Mechanical Inspection: Inspect ground system for compliance with contract plans and specifications

2. Mandrel Test: After new ductline is complete, draw bristle brush through ductline and perform mandrel test. Mandrel shall be a wooden plug, 8-inch minimum length, with a diameter 1/2 inch less than duct inside diameter. Perform test on all new ducts 2 inch and larger.

3. Test all 600-volt class conductors to verify that no short circuits or accidental grounds exist. Make tests using an instrument which applies a voltage of approximately 500 volts to provide a direct reading in resistance.

B. Test Report: Provide 3 copies of each test report to the University.

1. 600-volt cables (identify each cable and test result).

C. Follow-Up Verification: Upon completion of acceptance checks and tests, the Contractor shall show by demonstration in service that circuits and devices are in good operating condition and properly performing the intended function. As an exception to requirements stated elsewhere in the contract, the University shall be given 5 working days advance notice of the dates and times of checking and testing.

END OF SECTION

SECTION 16510 - INTERIOR LIGHTING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

This section includes, but is not limited to, interior luminaires, lamps, drivers, emergency lighting units, lighting controls, and all required components and accessories.

1.03 RELATED WORK

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

B. SECTION 16100 - ELECTRICAL WORK applies to this section, with additions and modifications specified herein.

1.04 APPLICABLE PUBLICATIONS

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

1.05 DESCRIPTION OF WORK

The work includes providing luminaires, lighting control devices, and battery-powered units and systems for interior use. Materials not normally furnished by manufacturers of these devices are specified in SECTION 16100 - ELECTRICAL WORK.

1.06 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

B. Data, shop drawings, and reports shall employ the terminology, classifications, and methods prescribed by the IES Lighting Handbook, as applicable, for the lighting system specified.

1. Manufacturer's Data:

a. Luminaires.

b. Dimming drivers.

c. Emergency lighting equipment.

d. Exit lights.

e. Lighting control network wireless hub.

f. Occupancy/vacancy sensor wall switches.

g. Occupancy sensors.

h. Dimming load controllers.

i. Lighting control system switches.

2. Shop Drawings: Project specific lighting control/wiring diagrams.

PART 2 - PRODUCTS

2.01 LED LIGHTING FIXTURES

A. Provide lighting fixtures specifically engineered for LED light sources and drivers. Use of linear or screw-base retrofit LED light sources is not acceptable. LED lighting fixtures shall carry a minimum manufacturer's warranty of 5 years. The Surety shall not be held liable beyond two (2) years of the project acceptance date.

B. LED Light Sources:

1. Correlated Color Temperature (CCT) shall be in accordance with NEMA ANSLG C78.377: Nominal CCT: 3500 degrees K, unless otherwise specified.

2. Color Rendering Index (CRI) shall be greater than or equal to 80 unless otherwise indicated.

3. Color Consistency: Manufacturer shall utilize a maximum 4-step MacAdam ellipse binning tolerance for color consistency of LEDs used in luminaires.

C. Luminaire LED Power Supply Units (Drivers):

1. LED Power Supply Units (Drivers): UL 1310. LED Power Supply Units (Drivers) shall meet the following requirements:

a. Minimum efficiency shall be 85 percent.

b. Shall be rated to operate between ambient temperatures of minus 22 degrees F and 104 degrees F.

c. Shall be designed to operate on the voltage system to which they are connected, typically ranging from 120V to 277V nominal.

d. Operating frequency shall be: 60 Hz.

e. Power Factor (PF) shall be greater than or equal to 0.90.

f. Total Harmonic Distortion (THD) current shall be less than or equal to 20 percent.

g. Shall be mounted integral to luminaire. Remote mounting of power supply is not allowed unless noted.

h. Power supplies in luminaires shall be UL listed with a sound rating of “A”.

i. Shall be dimmable, and compatible with a standard dimming control circuit of 0 - 10V or other approved dimming system where indicated.

j. Shall be equipped with over-temperature protection circuit that turns light source off until normal operating temperature is achieved.

2.02 RECESSED AND FLUSH-MOUNTED FIXTURES

Provide type that can be relamped from the bottom. Access to driver shall be from the bottom. Trim for the exposed surface of flush-mounted fixtures shall be as indicated. Delete thermal insulation immediately surrounding recessed luminaires.

2.03 OCCUPANCY/VACANCY SENSOR WALL SWITCH

A. UL listed, utilizing dual-technology using passive infrared (PIR) and ultrasonic technologies. 120/277V, single pole or 3-way as indicated, single relay or dual relay as indicated, with neutral conductor, white finish.

B. Occupancy detection to turn lights on requires both ultrasonic and infrared sensor detection. Lights shall remain on if either the ultrasonic or infrared sensor detects movement. Infrared sensor shall have lens selected for indicated usage and daylight filter to prevent short wavelength infrared interference. Ultrasonic sensor frequency shall be crystal controlled.

C. Sensor shall provide a nominal range of coverage of 900 square feet of major motion coverage and 400 square feet of minor motion coverage, when mounted at 4 feet above the floor with a 180-degree field of view.

D. Lutron Maestro MS-B or pre-approved equivalent.

2.04 NETWORKED LIGHTING MANAGEMENT SYSTEM

A. Networked lighting control system shall be compatible with and be provided with the capability to be integrated into the existing Lutron Vive campus lighting control system. All wireless/RF lighting control system devices shall be compatible for use with the existing campus lighting control system.

B. Wireless Hub:

1. Flush, ceiling mount. Communicates with controls utilizing wireless technology with a range radius of approximately 70 feet.

2. Supports timeclock events based on both sunrise and sunset or fixed time-of-day.

3. Wireless remote controls and sensors shall communicate directly with the load devices they control where located within 30 feet of the associated device.

4. Ethernet 10/100 Mbps connection for integration into the existing campus lighting control system network.

5. 120/277V power supply. 24V input to wireless hub.

6. Lutron #HJS-1-FM or pre-approved equivalent.

C. Dimming Load Controller:

1. Radio frequency, plenum rated, junction box mount, with line voltage relays and 0-10V dimming outputs.

2. The load controller shall communicate with RF input occupancy sensors and switches.

3. Switch rating of 8A, resistive or capacitive loads. 0-10V, Class 2 control link for 60 mA maximum output.

4. LED status indicator to indicate load status and provide programming feedback. Power failure memory to return connected loads to the previous level prior to power interruption.

5. Lutron #RMJS-8T-DV-B or pre-approved equivalent.

D. Occupancy Sensors:

1. Wireless, battery powered, infrared occupancy/vacancy sensors that automatically control lights via RF communication to compatible dimming and switching devices. Sensors shall wirelessly transmit

commands to the associated dimming and switching devices to automatically turn lights on or off.

2. Sensors shall have an LED occupant detection indicator. Sensors shall have adjustable sensitivity and adjustable delayed-off time range of one minute to 30 minutes. Sensors shall be white and suitable for both wall or ceiling mounting as indicated.

3. Changes to sensor settings can be made at the sensor with both pushbuttons or via a wireless configuration tool that communicates with the sensor using a bi-directional infrared signal.

4. Infrared sensor shall have lens selected for indicated usage and daylight filter to prevent short wavelength infrared interference. Ceiling mounted sensors shall provide 360-degree coverage with a nominal radius range of coverage of 324 square feet at a ceiling height of 8 feet. Wall mounted sensors shall provide 180-degree coverage with a minor motion field of view of 1,500 square feet.

5. Lutron #LRF2-OCR2B or #LRF2-OWLB or pre-approved equivalent.

E. Dimming Wall Switch:

1. Wireless, battery powered, 2-button raise/lower controls via RF communication to compatible dimming load controllers, with light icon.

2. Provide wallbox adapter kit and matching wall plate, gangs as required.

3. Lutron #PJ2-2BRL-GWH-L01or pre-approved equivalent.

F. Electronic Switch:

1. Rated for 120/277V, 8A (lighting), 3A (fan) specification grade electronic switch utilizing RF communication with the wireless lighting control system hub.

2. Lutron #MRF2S-8S-DV or pre-approved equivalent.

2.05 EXIT LIGHTS

A. UL 924, NFPA 70, and NFPA 101. Exit lights shall be self-powered type with low voltage disconnect.

B. Provide with automatic power failure device, test switch, pilot light, and fully automatic high/low trickle charger in a self-contained power pack. Battery shall be sealed electrolyte type, shall operate unattended, and require no maintenance, including no additional water, for a period of not less than 5 years. LED exit light shall have emergency run time of 1 1/2 hours

(minimum). The light emitting diodes shall have rated lamp life of 70,000 hours (minimum).

2.06 EMERGENCY LIGHTING EQUIPMENT

UL 924, NFPA 70, and NFPA 101.

A. Emergency Lighting Unit: Provide as indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Electrical installations shall conform to IEEE C2, NFPA 70, and to the requirements specified herein.

B. Lighting Fixtures: Set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved drawings. Installation shall meet requirements of NFPA 70. Mounting heights specified or indicated shall be to the bottom of fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Obtain approval of the exact mounting for lighting fixtures on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Recessed and semi-recessed fixtures shall be independently supported from the building structure by a minimum of 4 wires or threaded rods per fixture and located near each corner of each fixture. Ceiling grid clips are not allowed as an alternative to independently supported light fixtures. Round fixtures or fixtures smaller in size than the ceiling grid shall be independently supported from the building structure by a minimum of 4 wires or threaded rods per fixture spaced approximately equidistant around the fixture. Do not support fixtures by ceiling acoustical panels. Where fixtures of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support such fixtures independently and provide at least two 3/4-inch metal channels spanning, and secured to, the ceiling tees for centering and aligning the fixture. Provide wires or threaded rods for lighting fixture support in this section.

C. Exit Lights and Emergency Lighting Units: Wire exit lights and emergency lighting units ahead of the switch to the normal lighting circuit located in the same room or area.

D. Occupancy Sensor: Provide quantity of sensor units indicated as a minimum. Provide additional units to give full coverage over controlled area. Full coverage shall provide hand and arm motion detection for office and administration type areas. Locate the sensor(s) as indicated and in accordance with the manufacturer's recommendations to maximize energy savings and to avoid nuisance activation and deactivation due to sudden

temperature or airflow changes and usage. Set sensor “on” duration to 15 minutes.

3.02 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in SECTION 09900 - PAINTING.

3.03 GROUNDING

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

3.04 FIELD TESTS

A. Operating Test: Upon completion of the installation, conduct an operating test to show that the equipment operates in accordance with the requirements of this section. Make adjustments and add and/or replace light fixtures and other equipment as required to correct deficiencies.

B. Lighting Control Test:

1. Conduct operational control of installed and energized luminaires. Set time delays and aim as directed by University.

2. Manufacturer’s authorized service representative shall conduct an on-site training course for operating staff and maintenance personnel on system capabilities, operation, adjustment and maintenance. The training period shall consist of a total of 2 hours of normal working time.

3. Provide an additional post-start up site visit by the manufacturer or manufacturer’s representative after system start up to evaluate system usage and discuss opportunities to make system adjustments. The post startup visit shall be scheduled at the discretion of the State within one year of initial operation and acceptance of the system.

END OF SECTION

SECTION 16710 - BUILDING TELECOMMUNICATION SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

As specified in SECTION 01001.

1.02 SUMMARY

Work in this section includes the structured cabling system for the telecommunication systems which shall be provided for this project. Work includes, but is not limited to, the passive cabling infrastructure, pathways, and spaces to support the telecommunication systems specified herein. Structured cabling system will be utilized to support voice (telephone) and data connections where indicated. The structured cabling system shall consist of horizontal distribution systems to support the telecommunications systems where indicated. Materials not normally furnished by manufacturers of these devices are specified in SECTION 16100 - ELECTRICAL WORK.

1.03 APPLICABLE PUBLICATIONS

The publications cited within this section form a part of this specification to the extent referenced. Unless otherwise indicated, most recent edition of the publication with current revisions and amendments will be enforced.

1.04 SUBMITTALS

A. Submit in accordance with SECTION 01300 - SUBMITTALS.

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

C. Telecommunication Shop Drawings:

1. Telecommunication System Drawings and Diagrams.

2. Telecommunication Distribution Floor Plans/Space Drawings.

3. Telecommunication Details.

D. Manufacturer's Data:

1. Telecommunications Cabling and Connectors.

2. Termination Equipment, including patch panels.

3. Telecommunication Outlets, including outlet box, mounting plate brackets faceplates, and jacks.

4. Telecommunications Backboard.

5. Telecommunications Grounding Busbar.

E. Qualifications: Telecommunications Contractor

F. Test Reports: Telecommunication system cabling test reports.

G. Record Documentation.

H. Labeling: Telecommunications system infrastructure administration/ identification scheme.

1.05 MANUFACTURER'S STANDARD OF QUALITY

A. It is the intent of these specifications and applicable drawings to identify the essential requirements related to the telecommunications wiring system and the quality of materials, construction, design, and overall workmanship. All manufacturers shall meet these minimum requirements.

B. All products referenced in this section may be substituted with a product of the same or better operating specifications if substitution is submitted and approved. Contractor shall list all apparatus or materials substitutions, and provide sufficient product information or specifications, to illustrate product is equivalent to those specified herein.

C. Products from Other Manufacturers: The products of other manufacturers that meet or exceed the material, construction, and standard of quality specified hereinafter shall be submitted for approval with the requirements below:

1. Manufacturers requesting substitution approval shall submit evidence of at least 2 years' experience manufacturing the type of products covered in this specification. Catalogs and technical data identifying conformance to the specifications shall be submitted for substitution approval.

2. The acceptance of any other manufacturer's product shall not relieve the Contractor of his responsibility for providing a complete and functioning voice and data.

1.06 QUALITY ASSURANCE

A. Brand names, manufacturer's names and catalog numbers indicate a standard of design and quality required. Acceptable manufacturers for telecommunication apparatus include Tyco Electronics, Belden, BerkTek/Ortronics, Blonder Tongue, Corning, CommScope/Systimax,

Leviton, Pass & Seymour, Siemon, and Suttle. All apparatus supplied shall bear the name of the approved manufacturer of its nameplates.

B. Cabling, equipment, and hardware manufacturers shall have a minimum of 3 years' experience in the manufacturing, assembly, and factory testing of components which comply with TIA-568-C.0, TIA-568-C.1, TIA-568-C.2 and TIA-568-C.3.

C. Preparation of shop drawings and submittals shall be done under the supervision of a BICSI Registered Communications Distribution Designer (RCDD).

D. All Contractor personnel shall be fully trained and qualified to perform tasks associated with the installation, termination and testing of UTP and optical fiber, including but not limited to connector termination and the proper operation of cabling test devices.

E. Supervisors and installers assigned to the installation of this system or any of its components shall be BICSI Registered Cabling Installers, Technician Level. In lieu of BICSI certification, supervisors and installers assigned to the installation of this system or any of its components shall have a minimum of 3 years' experience in the installation of the specified copper and optical fiber components. They shall have factory or factory approved certification indicating that they are qualified to install and test the provided products. Submit documentation for a minimum of 3 and a maximum of 5 successful system installations provided that are equivalent in system size and in construction complexity to the telecommunication system proposed for this project. Include specific experience in installing and testing telecommunication systems and provide names and locations of at least 2 project installations successfully completed using copper and optical fiber telecommunication cabling systems. Contractor shall submit a list of personnel qualified to perform such activities for bid evaluation.

1.07 SHOP DRAWINGS

Contractor shall provide RCDD approved shop drawings in accordance with ANSI/TIA/EIA-606-A. As a minimum, the Contractor shall provide the following drawings:

A. T1 - Building Floor Plans with Building Area/Serving Zone Boundaries and Entrance Facilities: Drawing shall indicate the location of the entrance facilities, telecommunication spaces, serving zones, backbone distribution diagrams, access points, pathways, grounding system and other systems that need to be viewed from the complete building perspective.

B. T2 - Serving Zones / Building Area Drawings - Drop Locations and Cable Identification (IDs): Enlarged plan showing building area or serving zone. These drawings show drop locations, telecommunication spaces, access points and detail call outs for common equipment rooms and other congested areas.

C. T3 - Telecommunication Space Drawings - Detailed Layout of Telecommunication Spaces: Provide telecommunication space drawings which as a minimum include telecommunications room plan views, pathway layouts (racks, equipment cabinets, etc.), rack/cabinet elevations, and backboard elevations. Drawings shall show layout of applicable equipment including outgoing cable connector blocks, equipment spaces, and cabinet/racks. Drawings shall also include a complete list of equipment and material, proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of work including clearance for maintenance and operation.

D. T4 - Typical Detail Drawings: Detailed drawings of symbols and typical details for faceplate labeling/identification, faceplate types, faceplate population installation procedures, detail racking and raceways.

1.08 RECORD DOCUMENTATION

In addition to the standard close out documentation, Contractor shall provide T5 drawings including documentation on installed cables and termination hardware in accordance with ANSI/TIA/EIA-606-A. T5 drawings shall include schedules to show information for cover plate assignments and connecting terminal layout as a minimum. Provide hard copy documentation for the following T5 drawings as a minimum:

A. Cables: A record of installed cables shall be provided in accordance with ANSI/TIA/EIA-606-A. The cable records shall include only the required data fields in accordance with ANSI/TIA/EIA-606-A. Included manufacture date of cable with submittal.

B. Termination Hardware: A record of installed terminating block arrangements and type, and outlets shall be provided in accordance with ANSI/TIA/EIA-606-A. Documentation shall include the required data fields, as a minimum, in accordance with ANSI/TIA/EIA-606-A.

1.09 DEFINITION OF TERMS

A. Apparatus: Generally used herein to include the inter-building cable system, station wiring, cable racks, wiring and equipment frames, cross connect equipment and wiring adapters, information outlets and faceplates, designation strips, materials, supplies or whatsoever that may be purchased, together with the usual appropriate fittings, attachments, appurtenances, and appliances required for the intended operation.

B. Work Specification: The technical specification describing the Scope of Work, including the engineering, furnishing, delivery, installation and testing of the telecommunication wiring system.

C. Intra-Building Wiring System: A wiring system, which includes necessary apparatus, providing communications within a building.

D. Backbone Distribution System: The part of the premise distribution system that provides connection between equipment rooms, telecommunication rooms, telecommunication enclosures, and telecommunication entrance facilities.

E. Horizontal Distribution System: The part of the premise distribution system that provides connection between the horizontal cross connect point within the equipment and/or telecommunications room and the work area.

1.10 WARRANTY

A. Contractor shall warrant the installation and provide an application/manufacturer's warranty in addition to the standard Installation, Workmanship, and Equipment Warranty.

1. Application/Manufacturer's Warranty: Contractor shall extend an Application/ Manufacturer's warranty to the State. This warranty guarantees that any application up to the rated operating speed/bandwidth of the cable (not less than 1Gbps) will run on this wiring system for a period of at least 20 years. As an example, Commscope (Systimax Solutions) offers the SYSTIMAX product's exclusive SYSTIMAX 20-year product and applications warranty. Contractor shall register the installation with the manufacturer to secure such extended warranties and assurances. The Surety shall not be held liable beyond two (2) years of the project acceptance date.

2. Installation Warranty: Contractor shall warrant to the State that the installation, workmanship, equipment, and/or material to be furnished herein shall be new and free from defects in material and workmanship for a period of no less than 2 years from the date of project acceptance; and will be of the kind and quality designated or described herein and shall perform in the manner set forth in the Contract. At time of acceptance, Contractor shall guarantee that the State shall be in sole ownership and title to all materials and equipment, which shall be free of any encumbrance or claims imposed by a third party.

B. If it appears within 2 years from the date of project acceptance, and/or title passage that the installation, workmanship, equipment and/or material furnished hereunder does not meet the warranties specified above and the State notifies the Contractor promptly, the Contractor shall thereupon correct any defect, including non-conformance with the Contract, without delay and expense to the State.

C. If Contractor is obliged to correct defects as specified above, the warranty period for the repaired or replacement part shall be warranted for the remaining warranty term, as determined by the original date of acceptance.

D. The University shall also be entitled to all manufacturer's warranties and guarantees associated with the apparatus or materials provided by the Contractor.

PART 2 - PRODUCTS

2.01 COMPONENTS

UL or third party certified. Provide a complete system of the telecommunications cabling and pathway components using a hierarchical star topology and support structures, pathways and spaces complete with conduits, cable trays, pull wires, terminal boxes, outlets, cables, junction boxes, and backboards. Fixed cables and pathway systems for telecommunication systems shall be UL listed or third-party independent testing laboratory certified, and shall comply with NFPA 70.

2.02 PATHWAYS (BACKBONE AND HORIZONTAL)

A. ANSI/TIA-569-B and Addenda. Pathways shall consist of conduit distribution system as specified within this section and also in SECTION 16100 - ELECTRICAL WORK. Provide grounding and bonding as required by the National Electrical Code (NFPA 70) and TIA J-STD-607-A.

B. Work Area Pathways: Work area pathways shall be sized to support a minimum of two work area cables per telecommunications outlet unless otherwise identified.

1. Work area pathways shall comply with the requirements identified within National Electrical Code (NFPA 70) and ANSI/TIA-569-C.

2. For information outlets, provide minimum one 1”C between each information outlet location and the nearest junction box or communication closet. Conduits shall be concealed in all new walls.

2.03 TELECOMMUNICATIONS CABLING INFRASTRUCTURE

Cabling shall be UL listed for the application and shall comply with TIA-568-C.0, TIA-568-C.1, TIA-568-C.2, TIA-568-C.3 and NFPA 70. Provide a color coding and labeling system for cabling as required by ANSI/TIA/EIA-606-A, UL 969, and as indicated on the drawings. Cabling manufactured more than 12 months prior to date of installation shall not be used.

A. Backbone Cabling:

1. Provide in accordance with ICEA S-83-596, TIA-568-C.3, UL 1666 and NFPA 70. Cable shall be imprinted with fiber count, fiber type and aggregate length at regular intervals not to exceed 40 inches.

2. Provide the number of strands indicated, tight buffered fiber optic cable.

3. Provide tight buffered fiber optic multimode 62.5/125-um diameter (OM1) cable and single-mode (OS1) as indicated.

4. Provide filled, non-conductive fiber optic cable suitable for installation in underground duct applications and wet locations in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70. The cable cordage jacket, fiber, unit and group color shall be in accordance with TIA/EIA-598.

B. Horizontal Cabling:

1. Horizontal Voice/Data Cabling: Comply with NFPA 70, NEMA WC 63.1, ICEA S-90-661 and performance characteristics in ANSI/TIA/EIA-568-C.0 and ANSI/TIA/EIA-568-C.1. Horizontal UTP cabling shall not exceed 295-feet of cabling distance between the horizontal cross-connect point and the communications outlet at work area.

2. Horizontal UTP Copper: ANSI/TIA/EIA-568-C.2, NFPA 70, UTP (unshielded twisted pair), 100-ohm. Provide 4 each individually twisted pair, minimum 24 AWG conductors, Category-6, plenum (CMP) rated with a green PVC jacket. Cables installed in conduit below grade shall be UL listed and labeled for wet location in accordance with NFPA 70.

2.04 TELECOMMUNICATIONS OUTLET BOXES AND MOUNTING PLATE BRACKETS

Telecommunications Outlet Boxes: As specified in SECTION 16100 - ELECTRICAL WORK and as clarified herein. Standard type 4 11/16-inches square by 2 1/8-inches deep with reducer ring. Mount flush in new finished walls at height specified for outlet receptacles. Depth of boxes shall be large enough to allow manufacturers' recommended conductor bend radii.

2.05 TELECOMMUNICATIONS OUTLET/CONNECTOR ASSEMBLIES

A. Outlet/Connector UTP Copper: Outlet/connectors shall comply with FCC Part 68.5, TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.

1. Telephone/Data outlet/connectors shall be UL1863 listed, non-keyed, 8-pin modular, constructed of high impact rated thermoplastic housing and shall be third party verified and shall comply with ANSI/TIA/EIA-568-C.2 Category-6 requirements. Outlet/connectors provided for UTP cabling shall meet or exceed the requirements for the cable provided. Outlet/connectors shall be terminated using a Type 110 IDC PC board connector, color-coded for both T568A and T568B wiring. Each outlet/connector shall be wired T568A. UTP outlet/connectors shall comply with

ANSI/TIA/EIA-568-C.2 for 200 mating cycles. Provide green outlet/connectors.

2. Cover Plates: Telecommunications cover plates shall comply with UL 514C, TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2; flush design constructed of metal, 0.032-inch minimum thickness, type 430 stainless steel. Gangs as required.

B. Stenciled lettering for data circuits shall be provided using thermal ink transfer process.

C. UTP Copper Patch Panels: Provide in accordance with TIA-568-C.1 and TIA-568-C.2. Panels shall be third party verified and shall comply with TIA Category 6 requirements. Panels shall be constructed of 0.09-inch minimum aluminum and shall be rack mounted and compatible with an EIA compliant 19-inch equipment rack. Panel shall be non-keyed, 8-pin modular ports, wired to T568A. Provide ports for the number of horizontal and backbone cables terminated on the panel plus 25 percent spare. Patch panels shall terminate the building cabling on Type 110 IDCs and shall utilize a printed circuit board interface. The rear of each panel shall have incoming cable strain-relief and routing guides. Panels shall have each port factory numbered and equipped with laminated plastic nameplates above each port. Patch panel shall meet or exceed the requirements for the cable provided. Provide pre-connectorized patch cords as complete assemblies with matching connectors as specified.

D. Fiber Optic Patch Panels: Provide panel for maintenance and cross-connecting of optical fiber cables. Panel shall be constructed of 11-gauge aluminum and shall be rack mounted and compatible with an EIA compliant 19-inch equipment rack. Provide ports for the number of horizontal and backbone cables terminated on the panel plus 25 percent spare. Each panel shall provide adapters as duplex LC in accordance with TIA/EIA-604-10 with zirconia ceramic alignment sleeves. Provide dust cover for unused adapters. The rear of each panel shall have a cable management tray a minimum of 8 inches deep with removable cover, incoming cable strain-relief and routing guides. Panels shall have each adapter factory numbered and be equipped with laminated plastic nameplates above each. Provide pre-connectorized patch cords as complete assemblies with matching connectors as specified. Patch cables shall be provided with crossover orientation in accordance with TIA-568-C.3.

E. Connector Blocks: Provide insulation connector (IDC) Type 110 for Category 6 systems. Provide blocks for the number of horizontal and backbone cables terminated on the block plus 25 percent spare.

2.06 BACKBOARDS

Provide void-free, interior grade A-C plywood, 3/4-inch thick, 8 feet high, width as indicated. Backboards shall be fire rated by manufacturing process. Fire stamp shall be clearly visible.

2.07 GROUNDING AND BONDING PRODUCTS

Comply with UL 467, ANSI J-STD-607-A, and NFPA 70. Components shall be identified as required by ANSI/TIA/EIA-606-A.

2.08 IDENTIFICATION

Provide nameplates for equipment rooms and telecommunications rooms doors in accordance with schedule provided on drawings. Provide equipment nameplates in accordance with SECTION 16100 - ELECTRICAL WORK. Passive telecommunications infrastructure components and cabling shall be labeled and identified as indicated on drawings and in accordance with ANSI/TIA/EIA-606-A.

PART 3 - EXECUTION

3.01 INSTALLATION

Telecommunications cabling and pathway systems, including the horizontal cable, pathway systems, telecommunications outlet/connector assemblies, and associated hardware shall be installed in accordance with TIA-568-C.0, TIA-568-C.1, TIA-568-C.2, TIA-568-C.3, TIA-569, NFPA 70, and UL standards as applicable. Cabling shall be connected in a hierarchical star topology network. Daisy chaining cables between outlets is not acceptable. Metal raceway bases, covers, and dividers shall be bonded and grounded in accordance with ANSI J-STD-607-A.

A. Cabling: Install UTP and optical fiber telecommunications cabling and pathway system as detailed in ANSI/TIA/EIA-568-B, TIA-568-C.1, TIA-568-C.2, and TIA-568.C.3. Screw terminals shall not be used except where specifically indicated on plans. Use an approved insulation displacement connection (IDC) tool kit for copper cable terminations. Do not untwist UTP cables more than one half inch from the point of termination to maintain cable geometry. Provide service loop on each end of the cable, minimum 10-feet unless otherwise noted, at each backboard location and in the telecommunications room/server room. Do not exceed manufacturers' cable pull tensions for copper. Provide a device to monitor cable pull tensions. Do not exceed 25 pounds pull tension for 4 pair copper cables. Do not chafe or damage outer jacket materials. Use only lubricants approved by cable manufacturer. Do not over cinch cables, or crush cables with staples. For UTP cable bend radii shall not be less than 6 times the cable diameter.

1. Optical Fiber Backbone Cable: Install backbone optical fiber in indicated pathways. Do not exceed manufacturer’s recommended bending radii and pull tension. Prepare cable for pulling by cutting outer jacket 10 inches leaving strength members together and attach to pulling eye.

2. Horizontal Cabling: Install horizontal cabling and pathways between telecommunications closet and telecommunications outlet

assemblies in accordance with project requirements and TIA wiring standards.

B. Pathway Installations: Comply with TIA-569, NFPA 70 and associated addenda. Conceal conduit within finished walls and ceilings, where possible. Keep conduit minimum 6 inches away from parallel runs of electrical power equipment, flues, steam, and hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit is visible after completion of project.

C. Work Area Outlets:

1. Terminations: Terminate UTP cable in accordance with TIA-568-B.1, TIA-568-C.2, and wiring configuration as specified.

2. Faceplates: As a minimum, each jack shall be labeled as to its function and a unique number to identify cable link in accordance with ANSI/TIA/EIA-606-A.

3. Cables: Unshielded twisted pair shall have a minimum of 6 inches of slack cable loosely coiled into the telecommunications outlet boxes. Minimum manufacturer's bend radius for each type of cable shall not be exceeded.

4. Pull Cords: Pull cords shall be installed in all conduits which do not initially have cable installed.

D. Telecommunications Room Termination: Install termination hardware required for copper and optical fiber system. An insulation displacement tool shall be used for terminating copper cable to insulation displacement connectors.

E. Patch Panels: Patch panels shall be mounted in equipment racks with sufficient ports to accommodate the installed cable plant plus 25 percent spare.

1. Copper Patch Panel: Copper cable entering a patch panel shall be secured to the panel are recommended by the manufacturer to prevent movement of the cable.

2. Fiber Optic Patch Panel: Fiber optic cable loop shall be provided as recommended by the manufacturer. The outer jacket of each cable entering a patch panel shall be secured to the panel to prevent movement of the fibers within the panel using clamps or brackets specifically manufactured for that purpose.

F. Grounding and Bonding: In accordance with ANSI J-STD-607-A and NFPA 70.

3.02 LABELING

A. Labels: All labels shall be in accordance with ANSI/TIA/EIA-606-A and as indicated on the construction documents. Handwritten labeling unacceptable. Stenciled lettering for voice and data cables shall be provided using either thermal ink transfer process or laser printer.

B. Cable: All cables shall be color coded and labeled using color labels on both ends with identifiers in accordance with ANSI/TIA/EIA-606-A and as indicated on the construction documents.

C. Termination Hardware: All communication outlets and patch panel connections shall be labeled using color coded labels with identifiers in accordance with ANSI/TIA/EIA-606-A and as indicated on the construction documents.

3.03 TESTING

A. Telecommunications Cabling Testing: Perform telecommunications cabling inspection, verification, and performance tests in accordance with TIA-568-C.1, TIA-568-C.2 and TIA-568-C.3. Test equipment shall conform to TIA-1152. Perform optical fiber field inspection tests via attenuation measurements on factory reels and provide results along with manufacturer certification for factory reel tests. Remove failed cable reels from project site upon attenuation test failure.

1. Inspection: Visually inspect cabling jacket materials for UL or third-party certification markings. Visually inspect UTP and optical fiber jacket materials for UL or third-party certification markings. Inspect cabling terminations at backboards and at outlets to confirm color code for tip and ring pin assignments, and inspect cabling connections to confirm compliance with TIA-568, TIA-568-C.2 and TIA-568-C.3. Visually confirm marking of outlets, wallplates, outlet/connectors, and patch panels.

2. Verification Tests: For multimode optical fiber, perform optical fiber end-to-end attenuation tests in accordance with TIA-568-C.3. and TIA-526-14 using Method A, Optical Power Meter and Light Source. For single-mode optical fiber, perform optical fiber end-to-end attenuation tests in accordance with TIA-568-C.3 and TIA-526-7 using Method A, Optical Power Meter and Light Source.

3. Performance Tests: Perform Category 6 link tests for each outlet in accordance with TIA-568-C.1 and TIA-568-C.2. Tests shall include wire map, length, insertion loss, NEXT, PSNEXT, ELFEXT, PSELFEXT, return loss, propagation delay, and delay skew.

4. Final Verification Tests: Perform verification tests for UTP systems after the complete telecommunications cabling and workstation outlet/connectors are installed.

a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local and long-distance telephone call.

b. Data Tests: These tests assume that the Information Technology Staff has a network installed and are available to assist with testing. Connect to network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

END OF SECTION