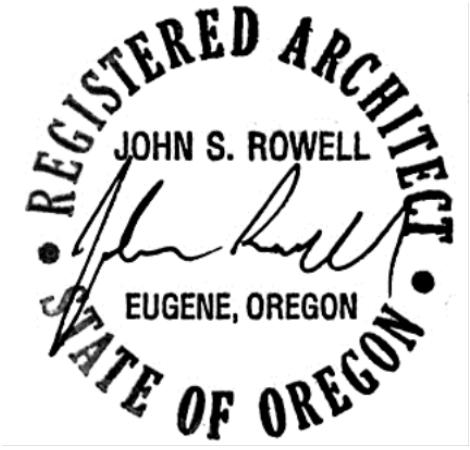
University of Oregon -
Watkins Geochemistry Isotope Lab
CP12-128

Project Manual

100% Construction Documents
02.18.13



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Architects

University of Oregon -
Watkins Geochemistry Isotope Lab

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Rowell Brokaw
Architects

SECTION 00 0110

TABLE OF CONTENTS

END OF TABLE OF CONTENTS

UNIVERSITY OF OREGON

Cascade Hall
Watkins Geochemistry Isotope Lab

TABLE OF CONTENTS

OREGON UNIVERSITY SYSTEM

NOTICE OF RETAINER CONTRACT OPPORTUNITY

THIS OPPORTUNITY IS ONLY AVAILABLE TO CONTRACTORS WITH A CURRENT OREGON UNIVERSITY SYSTEM (OUS) RETAINER CONTRACT FOR CONSTRUCTION RELATED SERVICES. ~~THIS OPPORTUNITY IS ALSO ONLY AVAILABLE TO INVITED CONTRACTORS.~~

The State of Oregon, acting by and through the State Board of Higher Education on behalf of the University of Oregon ("Owner") is accepting sealed bids for a public improvement project at the University of Oregon Capital Construction Office until **2:00 PM** Pacific Time, March 20th, 2013 ("Closing Date and Time") for the Watkins Geochemistry Isotope Lab project located on the campus of the University of Oregon, in Eugene, Oregon ("Project"). The Project includes the renovation of an existing laboratory space to meet Class 10,000 Cleanroom standards for metal-free geochemistry research.

A **mandatory examination of the site and conditions** will be conducted at 10 AM February 26th, 2013. Bidders shall meet with Owner's Representative at the University of Oregon, Cascade Hall, Room 210G for that purpose. Attendance will be documented through a sign-in sheet prepared by the Owner's Representative. Prime bidders who arrive more than 5 minutes after start of time of the meeting (as stated in the solicitation and by the Owner's Representative's watch) or after the discussion portion of the meeting (whichever comes first) shall not be permitted to sign in and will not be permitted to submit a bid on the Project.

Bids will be received on a lump-sum basis for all of the work. **Bid packets may be obtained on the OUS Bid and Business Opportunities website (http://secure.ous.edu/bid/).**

All bidders must comply with requirements of the prevailing wage law in ORS 279C.800 through ORS 279C.870. All bidders must be registered with the Construction Contractor's Board at the time of bid submission. No bid will be considered unless fully completed in the manner provided in the "Instructions to Bidders" upon the Bid Form provided and accompanied by Bid Security. OUS encourages bids from Minority, Women, and Emerging Small Businesses.

OREGON STATE BOARD OF HIGHER EDUCATION

By: Jamie Moffitt, Vice President for Finance and Administration

OREGON UNIVERSITY SYSTEM

STANDARD RETAINER CONTRACT

INSTRUCTIONS TO BIDDERS

Table of Contents

INSTRUCTIONS TO BIDDERS

Oregon Administrative Rules ("OAR") Chapter 580, Divisions 61 and 63 govern this OUS procurement process.

Article 1. Definitions

1.1. Capitalized words used herein but not defined shall have the meaning set forth in the OUS Retainer General Conditions and OAR 580-061-0010. The following terms used herein shall have the meaning set forth below:

"Bid Form"- refers to OUS Contract Form B-5 provided by Owner to be completed by Bidder.

"Project Manual"- The Project Manual includes, but is not necessarily limited to the following: the Advertisement for Bids or Notice of Contracting Opportunity, these Instructions to Bidders, Supplemental Instructions to Bidders, Bid Form, OUS Retainer Contract General Conditions, Supplemental General Conditions (if any), Sample Retainer Contract Supplement, Performance Bond, Payment Bond, and the Plans and Specifications.

Article 2. Scope of Work

2.1 The Work contemplated in this document shall be for the Owner in connection with the Project described in the Project Manual.

Article 3. Examination of Site and Conditions

3.1 Before making a Bid, the Bidder shall examine the Work site to ascertain its physical condition. The Bidder shall be responsible for being fully informed as to the quality, quantity and sources of supply of the materials listed on the Project Manual. Failure to comply with this Section will not release Contractor from entering into the Contract nor excuse Contractor from performing the Work in strict accordance with the terms of the Contract Documents.

3.2 The Owner will not be responsible for any loss or unanticipated costs which may arise as a result of Contractor's failure to be fully informed in advance with regard to all conditions pertaining to the Work and the character of the Work required.

3.3. No statement made by any officer, agent, or employee of the Owner in relation to the physical conditions pertaining to the Work site or quality, quantity, and supply of materials will be binding on the Owner, unless included in writing in the Project Manual or an Addendum.

Article 4. Substitute Materials Approval Process

4.1 Prior to submitting a Bid including a Substitution, the Bidder must first seek approval of the Substitution from the Architect (or Engineer, as appropriate hereafter) by submitting a written request for approval at least three calendar days prior to the Closing Date and Time. The Bidder submitting the request shall be responsible for its timely delivery.

4.2 Substitution approval requests shall be accompanied by samples, records of performance, certified copies of tests by impartial and recognized laboratories, and such other information as the Architect may request.

4.3 Within a reasonable time after receiving such a request the Owner (or Architect if so designated) will consider

whether the Substitution sought by Bidder is of equal value, utility, as the designated product in the Project Manual. If the requested Substitution is approved an Addendum to the Project Manual shall be issued. A copy of each Addendum will be posted on the OUS Bid and Business Opportunities website (http://secure.ous.edu/bid) and shall become a part of the Project Manual.

4.4 When the Architect approves a Substitution by Addendum, it is with the understanding that the Contractor guarantees the substituted article or material to be equal or better than the one specified.

Article 5. Interpretation of Project Manual

5.1 A Bidder in doubt as to the meaning of any part of the Project Manual may submit a written request for an interpretation to the Architect at any time prior to three calendar days prior to the Closing Date and Time.

5.2 Any interpretation of the Project Manual will be made only by a duly issued Addendum. The Owner will not be responsible for any other explanation or interpretation of the Project Manual nor for any other approval of a particular manufacturer's process or item.

5.3 To establish a basis of quality, certain processes, types of machinery and equipment or kinds of materials may be specified in the Project Manual either by description of process or by designating a manufacturer by name and referring to a brand or product designation or by specifying a kind of material. Whenever a process is designated or a manufacturer named, brand or item designation given, or whenever a process or material covered by patent is designated or described, it shall be understood that the words "or approved equal" follow such name, designation or description, whether they do so or not.

Article 6. Execution of the Bid Form

6.1 The Bid Form relates to Bids on a specific Project Manual. Only the amounts and information asked for on the Bid Form furnished by the Owner will be considered as the Bid. Each Bidder shall Bid upon the Work exactly as set forth in the Bid Form. The Bidder shall include in the Bid a sum to cover the cost of all items contemplated by the Project Manual. Bids that fail to address alternates set forth on the Bid Form may be considered non-responsive.

6.2 Each Bid Form must: 1) Be completed in accordance with these instructions; 2) Include the appropriate signatures as noted on the Bid Form; 3) Include numbers pertaining to base Bids stated both in writing and in figures; and 4) Include the Bidder's typed or clearly printed address.

6.3 When Bidding on an alternate for which there is no charge, the Bidder shall write the words "No Charge" in the space provided on the Bid Form. If one or more alternates is shown on the Bid Form, the Bidder shall indicate whether each is "add" or "deduct."

Article 7. Prohibition of Alterations to Bid

7.1 Bids which are incomplete, or contain ambiguities or conditions not provided for in the Bid Form, may be rejected.

Article 8. Submission of Bid

8.1 Each Bid shall be sealed in an envelope, properly addressed to the appropriate project representative of the Owner, showing on the outside of the envelope the name of the Bidder and the name of the project. Bids will be received at the time and place stated in the Advertisement for Bids.

Article 9. Bid Closing and Opening of Bids

9.1 All Bids must be received by the Owner before the Closing Date and Time. Any Bids received after the Closing Date and Time will be rejected and returned to the Bidder unopened.

Article 10. Acceptance or Rejection of Bids by Owner

10.1 Unless all Bids are rejected, the Owner will award the Contract based on the lowest responsive Bid from a responsible Bidder. If that Bidder does not execute the Contract, the Contract will be awarded to the next lowest responsible Bidder or Bidders in succession.

10.2 The procedures for Contract awards shall be in compliance with the provisions of OARs adopted by the Owner.

10.3 The Owner reserves the right to reject all Bids and to waive minor informalities.

10.4 In determining the lowest Bidder, the Owner reserves the right to take into consideration any or all authorized base Bids as well as alternates or combinations indicated in the Bid Form.

10.5 If Owner has not accepted a Bid within 30 calendar days after the opening of the Bids, each of the three lowest Bidders may withdraw the Bid submitted.

Article 11. Withdrawal of Bid

11.1 At any time prior to the Closing Date and Time a Bidder may withdraw its Bid. This will not preclude the submission of another Bid by such Bidder prior to the Closing Date and Time.

11.2 After the Closing Date and Time, no Bidder will be permitted to withdraw its Bid within the time period specified in Article 10 for award and execution, except as provided for in that Article.

Article 12. Execution of Contract, Agreement, Performance Bond and Payment Bond

12.1 The Owner will provide the successful Bidder with Contract Documents within 10 calendar days after the award of the Contract. The Bidder shall be required to execute the Contract as provided, including a Performance Bond and a Payment Bond from a surety company licensed to do surety business in the State of Oregon, within 20 calendar days after the award of the Contract. The Contract Documents shall be delivered to the Owner in the manner stated in the Notice of Award.

Article 13. Recyclable Products

13.1 Contractors must use recyclable products to the maximum extent economically feasible in the performance of the Contract.

OREGON UNIVERSITY SYSTEM

STANDARD RETAINER CONTRACT

SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

Project Name: Watkins Geochemistry Isotope Lab

The following modify the Oregon University System "Instructions to Bidders, Form B-2" for this procurement. Where a portion of the Instructions to Bidders has been modified by these Supplemental Instructions to Bidders, the unaltered portions shall remain in effect.

RESERVED

OREGON UNIVERSITY SYSTEM

STANDARD RETAINER CONTRACT

BID FORM

OUS CAMPUS: UNIVERSITY OF OREGON

PROJECT: Watkins Geochemistry Isotope Lab

BID CLOSING DATE: March 20th, 2013, 2PM (Pacific Time)

FROM: _____
Name of Contractor

TO: The State of Oregon, acting by and through the Oregon State Board of Higher Education, on behalf of the University of Oregon ("Owner")
(campus or office name and address)

Capital Construction
1295 Franklin Boulevard
1276 University of Oregon
Eugene, OR 97403-1276

1. The Undersigned (*check one of the following and insert information as requested*):

____a. An individual doing business under an assumed name registered under the laws of the State of _____; or

____b. A partnership registered under the laws of the State of _____; or

____c. A corporation organized under the laws of the State of _____; or

____d. A limited liability corporation/company organized under the laws of the State of _____;

hereby proposes to furnish all material and labor and perform all Work hereinafter indicated for the above project in strict accordance with the Contract Documents for the Basic Bid as follows:

_____ Dollars ($_____)

and the Undersigned agrees to be bound by each of the following documents:

• Notice of Retainer Contract Opportunity

• Instructions to Bidders
• Supplemental Instructions to Bidders, if any
• OUS Retainer Contract General Conditions
• UO Supplemental Retainer Contract General Conditions
• Sample Retainer Contract Supplement
• Performance Bond and Payment Bond
• Plans and Specifications
• Prevailing Wage Rates
• Payroll and Certified Statement Form
(found at http://egov.oregon.gov/BOLI/WHD/PWR/W_PWR_Forms.shtml)

• Any ADDENDA numbered ____ through____, inclusive *(fill in blanks).*

2. The work shall be completed within the time stipulated and specified in Division 1, Section 01 1000, of the Specifications.

3. The Undersigned certifies that: (1) This Bid has been arrived at independently and is being submitted without collusion with and without any agreement, understanding, or planned common course of action with any other vendor of materials, supplies, equipment or services described in the invitation to bid designed to limit independent bidding or competition; and (2) The contents of the Bid have not been communicated by the Undersigned or its employees or agents to any person not an employee or agent of the Undersigned and will not be communicated to such person prior to the official opening of the Bid.

4. The undersigned **HAS, HAS NOT** (*circle applicable status*) paid unemployment or income taxes in Oregon within the past 12 months and **HAS, HAS NOT** (*circle applicable status*) a business address in Oregon.

5. The Undersigned agrees, if awarded a contract, to comply with the provisions of ORS 279C.800 through 279C.870 pertaining to the payment of the prevailing rates of wage.

6. Contractor's CCB registration number is _____. As a condition to submitting a bid, a Contractor must be registered with the Oregon Construction Contractors Board in accordance with ORS 701.035 to 701.055, and disclose the registration number. Failure to register and disclose the number will render the bid unresponsive and it will be rejected, unless contrary to federal law.

7. The successful Bidder hereby certifies that all subcontractors who will perform construction work as described in ORS 701.005(2) were registered with the Construction Contractors Board in accordance with ORS 701.035 to 701.055 at the time the subcontractor(s) made a bid to work under the Contract.

8. The successful Bidder hereby certifies that, in compliance with the Worker's Compensation Law of the State of Oregon, its Worker's Compensation Insurance provider is _____, Policy No. _____, and that Contractor shall submit Certificates of Insurance as required.

9. Contractor's Project Manager for this project is: _____,
Office Phone: _____ Cell Phone: _____.

10. The Undersigned certifies that it has not discriminated against minority, women, or emerging small businesses in obtaining any subcontracts for this project.

11. The Undersigned agrees, if awarded the Contract, to execute and deliver to Owner, within twenty (20) calendar days after receiving the Contract Documents, an Agreement Form and a satisfactory Performance Bond and Payment Bond, each in an amount equal to one hundred (100) percent of the Contract sum, using forms provided by the Owner. The surety requested to issue the Performance Bond and Payment Bond will be:

_____.
(name of surety company - not insurance agency)
The Undersigned hereby authorizes said surety company to disclose any information to the Owner concerning the Undersigned's ability to supply a Performance Bond and Payment Bond each in the amount of the Contract.

12. In determining the lowest Bidder, the Owner reserves the right to take into consideration any or all authorized base Bids as well as alternates or combinations indicated in the Bid Form.

By signature below, Contractor agrees to be bound by this Bid.

NAME OF FIRM _____

ADDRESS _____

_____

FEDERAL TAX ID _____

TELEPHONE NO _____

FAX NO _____

SIGNATURE 1) _____
Sole Individual

or 2) _____
Partner

or 3) _____
Authorized Officer of Corporation

(SEAL)

_____
Attested: Secretary of Corporation

Payment information will be reported to the IRS under the name and taxpayer ID # provided above. Information not matching IRS records could subject Contractor to 31 percent backup withholding.

***** ***END OF BID*** *****

OREGON UNIVERSITY SYSTEM

RETAINER SUPPLEMENTAL GENERAL CONDITIONS

To The

GENERAL CONDITIONS FOR RETAINER CONTRACTS

Supplement No. _____
Project Name _____

The following modify the July 1, 2012 Oregon University System "General Conditions for Retainer Contracts ("OUS Retainer General Conditions") for the above referenced Retainer Contract Supplement. Where a portion of the OUS Retainer General Conditions is modified by these Supplemental General Conditions, the unaltered portions shall remain in effect.

Section B.4 is hereby deleted and replaced with the following:

Contractor shall obtain and pay for all necessary permits, licenses and fees, except for those specifically excluded in the Retainer Supplemental General Conditions, for the construction of the Work, for temporary obstructions, enclosures, opening of streets for pipes, walls, utilities, environmental Work, etc., as required for the project. Contractor shall be responsible for all violations of the law, in connection with the construction or caused by obstructing streets, sidewalks or otherwise. Contractor shall give all requisite notices to public authorities. Notwithstanding the first sentence of this paragraph, Owner shall pay for the following: Plan check fees and permit fees required for the general building permit, systems development charges, and building department inspection fees. Notwithstanding the foregoing, however, Contractor shall obtain all permits, licenses and fees required for the construction of the Work.

Section K.2 is hereby deleted and replaced with the following:

As part of the Work, Contractor shall submit two completed operation and maintenance manuals ("O & M Manuals") for review by the Owner prior to submission of any pay request for more than 75% of the Work. Owner's receipt of the O & M Manuals shall be a condition precedent to any payment thereafter due. The O & M Manuals shall contain a complete set of all submittals, all product data as required by the specifications, training information, telephone list and contact information for all consultants, manufacturers, installer and suppliers, manufacturer's printed data, record and shop drawings, schematic diagrams of systems, appropriate equipment indices, warranties and bonds. The Owner shall review and return one O & M Manual for any modifications or adjustments

required. Prior to submission of its final pay request, Contractor shall deliver two complete and approved sets of O & M Manuals in paper form and one complete and approved set in electronic form to the Owner and Owner's receipt of the O & M Manuals shall be a condition precedent to Owner's obligation to make final payment.

Section K.4 is hereby deleted and replaced with the following:

As part of the Work, and prior to submission of the final application for payment, the Contractor shall schedule with the Owner and provide training sessions for all equipment and systems as required by the Contract Documents. Contractor shall schedule training sessions at least two weeks in advance of the date of training to allow Owner to provide its personnel with adequate notice. The O & M Manual shall be used as a basis for training. In addition to any off-site training required by the Contract Documents, training shall include a formal session conducted at the Work site after the equipment and/or system is completely installed and operational in its normal operating environment.

OREGON UNIVERSITY SYSTEM

GENERAL CONDITIONS FOR RETAINER CONTRACTS

July 1, 2012

INSTRUCTIONS: The attached **Oregon University System General Conditions for Retainer Contracts ("OUS Retainer General Conditions")** apply to all designated retainer contracts. Changes to the OUS Retainer General Conditions (including any additions, deletions or substitutions) should only be made by attaching Retainer Supplemental General Conditions. The text of these OUS Retainer General Conditions should not otherwise be altered.

TABLE OF SECTIONS

OREGON UNIVERSITY SYSTEM
GENERAL CONDITIONS FOR RETAINER CONTRACTS
("OUS Retainer General Conditions")

SECTION A
GENERAL PROVISIONS

A.1 DEFINITION OF TERMS

In the Contract Documents the following terms shall be as defined below:

AMENDMENT, means a writing which, when fully executed by the Parties to this Contract, constitutes a change to a Contract Document. Amendments to Supplements (hereinafter a "Supplement Amendment") shall be issued in accordance with the changes provisions of Section D and, if applicable, establish a Contract Price or Contract Time adjustment.

APPLICABLE LAWS, means federal, state and local laws, codes, rules, regulations and ordinances applicable to the Work and to the Contract.

ARCHITECT/ENGINEER, means the Person appointed by the Owner to make drawings and specifications and, to provide contract administration of the Work contemplated by the Contract to the extent provided herein or by supplemental instruction of Owner (under which Owner may delegate responsibilities to the Architect/Engineer), in accordance with ORS Chapter 671 (Architects) or ORS Chapter 672 (Engineers) and administrative rules adopted thereunder.

CHANGE ORDER, means a written order issued by the Owner to be later included as an Amendment. A Change Order shall not be effective until executed as an Amendment.

CLAIM, means a demand by Contractor pursuant to Section D.3 for review of the denial of Contractor's initial request for an adjustment of Contract terms, payment of money, extension of Contract Time or other relief, submitted in accordance with the requirements and within the time limits established for review of Claims in these OUS Retainer General Conditions.

CONSTRUCTION CHANGE DIRECTIVE, means a written order by the Owner to the Contractor requiring a change in the Work within the general scope of the Contract Documents, issued under the changes provisions of Section D.

CONTRACT, means the written agreement between the Owner and the Contractor comprised of the Contract Documents which describe the Work to be done and the obligations between the parties.

CONTRACT DOCUMENTS, means the Solicitation Document and addenda thereto, Instructions to Offerors, Supplemental Instructions to Offerors, the OUS Retainer Contract, OUS Retainer General Conditions, Retainer Supplemental General Conditions, if any, the accepted Offer, Plans, Specifications, Supplements, Amendments, and Construction Change Directives .

CONTRACT PERIOD, as set forth in the Contract Documents, means the total period of time beginning with the full execution of a Supplement and, if applicable, the issuance of a Notice to Proceed and concluding upon Final Completion.

CONTRACT PRICE, means the total of the awarded Offer amount, as increased or decreased by the price of approved alternates, as indicated in the Contract Documents.

CONTRACT TIME, means any incremental period of time allowed under the Contract to complete any portion of the Work as reflected in the project schedule.

CONTRACTOR, means the Person awarded the Contract for the Work contemplated.

DAYS, are calendar days, including weekdays, weekends and holidays, unless otherwise specified.

DIRECT COSTS, means, unless otherwise provided in the Contract Documents, the cost of materials, including sales tax, cost of delivery; cost of labor, including social security, Medicare and unemployment insurance, and fringe benefits required by agreement or custom; worker's compensation insurance; project specific insurance (including, without limitation, Builder's Risk Insurance and Builder's Risk Installation Floater); bond premiums, rental cost of equipment, and machinery required for execution of the Work; and the additional costs of field personnel directly attributable to the Work.

FINAL COMPLETION, means the final completion of all requirements under the Contract, including Contract Closeout as described in Section K but excluding Warranty Work as described in Section I.2, and the final payment and release of all retainage, if any, released.

FORCE MAJEURE, means an act, event or occurrence caused by fire, riot, war, acts of God, nature, sovereign, or public enemy, strikes, freight embargoes or any other act, event or occurrence that is beyond the control of the party to this Contract who is asserting Force Majeure.

MWESB REPORT, means an accurate report by the Contractor to the Owner identifying all Minority, Women and Emerging Small Business (MWESB) enterprises, as those terms are defined in ORS 200.005, receiving contracts throughout the course of the Work. An initial MWESB report is required (see Section E.2.9) and MWESB Reports are required annually (see Section E.2.9) and as a condition of final payment (see Section K.1). The initial report shall be in the form required by OUS and as posted from time to time on the OUS website and shall include the total number of contracts and subcontracts awarded to MWESB enterprises and the dollar value of their respective contracts and subcontracts. The annual reports shall include the total number of contracts and subcontracts awarded to MWESB enterprises, the dollar value of each, and the expenditure toward each contract and subcontract during the previous twelve (12) months. The final report shall include the total number of contracts and subcontracts awarded to MWESB enterprises and the dollar value of their respective contracts and subcontracts including all Supplements and Amendments incorporated during the course of the project. The reports shall only include enterprises certified with the State of Oregon as MWESB enterprises and shall include individual identification of each enterprise as a Minority business enterprise, a Women business enterprise, and/or an Emerging Small Business Enterprise, as applicable.

NOTICE TO PROCEED, means the official written notice from the Owner stating that the Contractor is to proceed with the Work defined in the Contract Documents. Notwithstanding the Notice to Proceed, Contractor shall not be authorized to proceed with the Work until all initial Contract requirements, including the Contract, performance bond and payment bond, and certificates of insurance, have been fully executed and submitted to Owner in a suitable form.

OFFER, means a bid in connection with Instructions to Bidders or a proposal in connection with a Request for Proposals.

OFFEROR, means a bidder in connection with Instructions to Bidders or a proposer in connection with a Request for Proposals.

OVERHEAD, means those items which may be included in the Contractor's markup (general and administrative expense and profit) and that shall not be charged as Direct Cost of the Work, including without limitation such Overhead expenses as wages or salary of personnel above the level of foreman (i.e., superintendents and project managers), expenses of Contractor's offices and supplies at the job site (e.g. job trailer) and at Contractor's principal place of business and including expenses of personnel staffing the job site office and Contractor's principal place of business, and Commercial General Liability Insurance and Automobile Liability Insurance.

OWNER, means the State of Oregon acting by and through the Oregon State Board of Higher Education, in its own right or on behalf of one of its institutions as identified in the Solicitation Document, also known as the Oregon University System (OUS). Owner may elect, by written notice to Contractor, to delegate certain duties to more than one party, including without limitation, to an Architect/Engineer. However, nothing in these OUS Retainer General Conditions is intended to abrogate the separate design professional responsibilities of Architects under ORS Chapter 671 or of Engineers under ORS Chapter 672.

PERSON, means a natural person or entity doing business as a sole proprietorship, a partnership, a joint venture, a corporation, a limited liability company or partnership, or any other entity possessing the legal capacity to contract.

PLANS, means the drawings which show the location, type, dimensions, and details of the Work to be done under the Contract.

PUNCH LIST, means the list of Work yet to be completed or deficiencies which need to be corrected in order to achieve Final Completion of the Contract.

RECORD DOCUMENT, means the as-built Plans, Specifications, testing and inspection records, product data, samples, manufacturer and distributor/supplier warranties evidencing transfer of ownership to Owner, operational and maintenance manuals, shop drawings, Construction Change Directives, MWESB Reports, correspondence, certificate(s) of occupancy, and other documents listed in Subsection B.9.1 of these OUS Retainer General Conditions, recording all Services performed.

SOLICITATION DOCUMENT, means Instructions to Bidders or Offerors or a Request for Proposal or a Request for Quotes.

SPECIFICATION, means any description of the physical or functional characteristics of the Work, or of the nature of a supply, service or construction item. Specifications may include a description of any requirement for inspecting, testing or preparing a supply, service or construction item for delivery and the quantities or qualities of materials to be furnished under the Contract. Specifications generally will state the results or products to be obtained and may, on occasion, describe the method and manner of doing the Work to be performed. Specifications may be incorporated by reference and/or may be attached to the Contract.

SUBCONTRACTOR, means a Person having a direct contract with the Contractor, or another Subcontractor, to perform one or more items of the Work.

SUBSTANTIAL COMPLETION, means the date when the Owner accepts in writing the construction, alteration or repair of the improvement to real property constituting the Work or any designated portion thereof as having reached that state of completion when it may be used or occupied for its intended purpose. Substantial Completion of facilities with operating systems occurs only after thirty (30) continuous Days of successful, trouble-free operation of the operating systems as provided in Section K.4.2.

SUBSTITUTIONS, means items that in function, performance, reliability, quality, and general configuration are the same or better than the product(s) specified. Approval of any substitute item shall be solely determined by the Owner. The decision of the Owner is final.

SUPPLEMENT, means a writing which, when fully executed by the Parties thereto, constitutes written agreement between the Owner and the Contractor comprised of the Contract Documents which describe the Work to be done and the obligations between the parties.

RETAINER SUPPLEMENTAL GENERAL CONDITIONS, means those conditions that remove from, add to, or modify these OUS Retainer General Conditions. Retainer Supplemental General Conditions may be included in the Solicitation Document or may be a separate attachment to the Contract.

WORK, means the furnishing of all materials, equipment, labor, transportation, services and incidentals necessary to successfully complete any individual item or the entire Contract and the carrying out of duties and obligations imposed by the Contract Documents.

A.2 SCOPE OF WORK

The Work contemplated under this Contract includes all labor, materials, transportation, equipment and services for, and incidental to, the completion of all construction work in connection with the project described in the Contract Documents. The Contractor shall perform all Work necessary so that the project can be legally occupied and fully used for the intended use as set forth in the Contract Documents.

A.3 INTERPRETATION OF CONTRACT DOCUMENTS

A.3.1 Unless otherwise specifically defined in the Contract Documents, words which have well-known technical meanings or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Contract Documents are intended to be complementary. Whatever is called for in one, is interpreted to be called for in all. However, in the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following descending order of precedence:

(a) Contract Supplements, Amendments and Construction Change Directives, with those of later date having precedence over those of an earlier date;

(b) The Retainer Supplemental General Conditions;

(c) The OUS Retainer Contract;

(d) The OUS Retainer General Conditions;

(e) Division One (General Requirements) of the Specifications;

(f) Detailed Schedules of finishes, equipment and other items included in the Specifications;

(g) Plans and Specifications (other than Division One and the Detailed Schedules to the Specifications);

(h) Large-scale drawings on Plans;

(i) Small-scale drawings on Plans;

(j) Dimension numbers written on Plans which shall prevail and take precedence over dimensions scaled from Plans;

(k) The Solicitation Document, and any addenda thereto;

(l) The accepted Offer.

A.3.2 In the case of an inconsistency between Plans and Specifications or within either document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Owner's interpretation in writing.

A.3.3 If the Contractor finds discrepancies in, or omissions from the Contract Documents, or if the Contractor is in doubt as to their meaning, the Contractor shall at once notify the Owner. Matters concerning and interpretation of requirements of the Contract Documents will be decided by the Owner, who may delegate that duty in some instances to the Architect/Engineer. Responses to Contractor's requests for interpretation of Contract Documents will be made in writing by Owner (or the Architect/Engineer) within any time limits agreed upon or otherwise with reasonable promptness. Interpretations and decisions of the Owner (or Architect/Engineer) will be consistent with the intent of and reasonably inferable from the Contract Documents. Contractor shall not proceed without direction in writing from the Owner (or Architect/Engineer).

A.3.4 References to standard specifications, manuals, codes of any technical society, organization or association, to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, laws or regulations in effect in the jurisdiction where the project is occurring on the first published date of the Solicitation Document, except as may be otherwise specifically stated.

A.4 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE

A.4.1 It is understood that the Contractor, before submitting an Offer, has made a careful examination of the Contract Documents; has become fully informed as to the quality and quantity of materials and the character of the Work required; and has made a careful examination of the location and conditions of the Work and the sources of supply for materials. The Owner will in no case be responsible for any loss or for any unanticipated costs that may be suffered by the Contractor as a result of the Contractor's failure to acquire full information in advance in regard to all conditions pertaining to the Work. No oral agreement or conversation with any officer, agent, or personnel of the Owner, or with the Architect/Engineer either before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.

A.4.2 Should the Plans or Specifications fail to particularly describe the materials, kind of goods, or details of construction of any aspect of the Work, Contractor shall have the duty to make inquiry of the Owner and Architect/Engineer as to what is required prior to performance of the Work. Absent Specifications to the contrary, the materials or processes that would normally be used to produce first quality finished Work shall be considered a part of the Contract requirements.

A.4.3 Any design errors or omissions noted by the Contractor shall be reported promptly to the Owner, including without limitation, any nonconformity with Applicable Laws.

A.4.4 If the Contractor believes that adjustments to cost or Contract Time is involved because of clarifications or instructions issued by the Owner (or Architect/Engineer) in response to the Contractor's notices or requests for information, the Contractor must submit a written request to the Owner, setting forth the nature and specific extent of the request, including all time and cost impacts against the Contract as soon as possible, but no later than thirty (30) Days after receipt by Contractor of the clarifications or instructions issued. If the Owner denies Contractor's request for additional compensation, additional Contract Time, or other relief that Contractor believes results from the clarifications or instructions, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process. If the Contractor fails to perform the obligations of Sections A.4.1 to A.4.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations.

A.5 INDEPENDENT CONTRACTOR STATUS

The service or services to be performed under this Contract are those of an independent contractor as defined in ORS 670.600. Contractor represents and warrants that it is not an officer, employee or agent of the Owner as those terms are used in ORS 30.265.

A.6 RETIREMENT SYSTEM STATUS AND TAXES

Contractor represents and warrants that it is not a contributing member of the Public Employees' Retirement System and will be responsible for any federal or state taxes applicable to payment received under this Contract. Contractor will not be eligible for any benefits from these Contract payments of federal Social Security, employment insurance, workers' compensation or the Public Employees' Retirement System, except as a self-employed individual. Unless the Contractor is subject to backup withholding, Owner will not withhold from such payments any amount(s) to cover Contractor's federal or state tax obligations.

A.7 GOVERNMENT EMPLOYMENT STATUS

A.7.1 If this payment is to be charged against federal funds, Contractor represents and warrants that it is not currently employed by the Federal Government. This does not preclude the Contractor from holding another contract with the Federal Government.

A.7.2 Contractor represents and warrants that Contractor is not an employee of the State of Oregon for purposes of performing Work under this Contract.

SECTION B
ADMINISTRATION OF THE CONTRACT

B.1 OWNER'S ADMINISTRATION OF THE CONTRACT

B.1.1 The Owner shall administer the Contract as described in the Contract Documents (1) during construction (2) until final payment is due and (3) during the one-year period for correction of Work. The Owner will act as provided in the Contract Documents, unless modified in writing in accordance with other provisions of the Contract. In performing these tasks, the Owner may rely on the Architect/Engineer or other consultants to perform some or all of these tasks.

B.1.2 The Owner will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the Work, and (3) to determine in general if Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. The Owner will not make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Owner will neither have control over or charge of, nor be responsible for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work.

B.1.3 Except as otherwise provided in the Contract Documents or when direct communications have been specifically authorized, the Owner and Contractor shall communicate with each other about matters arising out of or relating to the Contract. Communications by and with the Architect/Engineer's consultants shall be through the Architect/Engineer. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

B.1.4 Based upon the Architect/Engineer's evaluations of the Contractor's Application for Payment, or unless otherwise stipulated by the Owner, the Architect/Engineer will review and

certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

B.2 CONTRACTOR'S MEANS AND METHODS; MITIGATION OF IMPACTS

B.2.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures.

B.2.2 The Contractor is responsible to protect and maintain the Work during the course of construction and to mitigate any adverse impacts to the project, including those caused by authorized changes, which may affect cost, schedule, or quality.

B.2.3 The Contractor is responsible for the actions of all its personnel, laborers, suppliers, and Subcontractors on the project. The Contractor shall enforce strict discipline and good order among Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of persons who are unfit or unskilled for the tasks assigned to them.

B.3 MATERIALS AND WORKMANSHIP

B.3.1 The intent of the Contract Documents is to provide for the construction and completion in every detail of the Work described. All Work shall be performed in a professional manner and unless the means or methods of performing a task are specified elsewhere in the Contract Documents, Contractor shall employ methods that are generally accepted and used by the industry, in accordance with industry standards.

B.3.2 The Contractor is responsible to perform the Work as required by the Contract Documents. Defective Work shall be corrected at the Contractor's expense.

B.3.3 Work done and materials furnished shall be subject to inspection and/or observation and testing by the Owner to determine if they conform to the Contract Documents. Inspection of the Work by the Owner does not relieve the Contractor of responsibility for the Work in accordance with the Contract Documents.

B.3.4 Contractor shall furnish adequate facilities, as required, for the Owner to have safe access to the Work including without limitation walkways, railings, ladders, tunnels, and platforms. Producers, suppliers, and fabricators shall also provide proper facilities and access to their facilities.

B.3.5 The Contractor shall furnish Samples of materials for testing by the Owner and include the cost of the Samples in the Contract Price.

B.4 PERMITS

Contractor shall obtain and pay for all necessary permits, licenses and fees, except for those specifically excluded in the Retainer Supplemental General Conditions, for the construction of the Work, for temporary obstructions, enclosures, opening of streets for pipes, walls, utilities, environmental Work, etc., as required for the project. Contractor shall be responsible for all violations of the law, in connection with the construction or caused by obstructing streets, sidewalks or otherwise. Contractor shall give all requisite notices to public authorities.

B.5 COMPLIANCE WITH GOVERNMENT REGULATIONS

B.5.1 Contractor shall comply with Applicable Laws pertaining to the Work and the Contract. Failure to comply with such requirements shall constitute a breach of Contract and shall be grounds for Contract termination. Without limiting the generality of the foregoing, Contractor expressly agrees to comply with the following, as applicable:
(i) Title VI and VII of Civil Rights Act of 1964, as amended; (ii) Section 503 and 504 of the Rehabilitation Act of 1973, as amended; (iii) the Health Insurance Portability and Accountability Act of 1996; (iv) the Americans with Disabilities Act of 1990, as amended; (v) ORS Chapter 659A; as amended; (vi) all regulations and administrative rules established pursuant to the foregoing laws; and (vii) all other applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations.

B.5.2 Contractor shall comply with all applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations, and

(a) Contractor shall not discriminate against Disadvantaged, Minority, Women or Emerging Small Business enterprises, as those terms are defined in ORS 200.005, or a business enterprise that is owned or controlled by or that employs a disabled veteran, as that term is defined in ORS 408.225, in the awarding of subcontracts.

(b) Contractor shall maintain, in current and valid form, all licenses and certificates required by Applicable Laws or this Contract when performing the Work.

B.5.3 Unless contrary to federal law, Contractor shall certify that it shall not accept a bid from Subcontractors to perform Work as described in ORS 701.005 under this Contract unless such Subcontractors are registered with the Construction Contractors Board in accordance with ORS 701.035 to 701.055 at the time they submit their bids to the Contractor.

B.5.4 Unless contrary to federal law, Contractor shall certify that each landscape contractor, as defined in ORS 671.520(2), performing Work under this Contract holds a valid landscape contractor's license issued pursuant to ORS 671.560.

B.5.5 The following notice is applicable to Contractors who perform excavation Work. ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through OAR 952-001-0090. You may obtain copies of the rules by calling the center at (503)232-1987.

B.5.6 Failure to comply with any or all of the requirements of B.5.1 through B.5.5 shall be a breach of Contract and constitute grounds for Contract termination. Damages or costs resulting from such noncompliance shall be the responsibility of Contractor.

B.6 SUPERINTENDENCE

Contractor shall keep on the site, during the progress of the Work, a competent superintendent and any necessary assistants who shall be satisfactory to the Owner and who shall represent the Contractor on the site. Directions given to the superintendent by the Owner shall be confirmed in writing to the Contractor.

B.7 INSPECTION

B.7.1 Owner shall have access to the Work at all times.

B.7.2 Inspection of the Work will be made by the Owner at its discretion. The Owner will have authority to reject Work that

does not conform to the Contract Documents. Any Work found to be not in conformance with the Contract Documents, in the discretion of the Owner, shall be removed and replaced at the Contractor's expense.

B.7.3 Contractor shall make or obtain at the appropriate time all tests, inspections and approvals of portions of the Work required by the Contract Documents or by Applicable Laws or orders of public authorities having jurisdiction. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work. The Contractor shall give the Owner timely notice of when and where tests and inspections are to be made so that the Owner may be present for such procedures. Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Owner.

B.7.4 As required by the Contract Documents, Work done or material used without required inspection or testing and/or without providing timely notice to the Owner may be ordered removed at the Contractor's expense.

B.7.5 If directed to do so any time before the Work is accepted, the Contractor shall uncover portions of the completed Work for inspection. After inspection, the Contractor shall restore such portions of Work to the standard required by the Contract. If the Work uncovered is unacceptable or was done without required testing or inspection or sufficient notice to the Owner, the uncovering and restoration shall be done at the Contractor's expense. If the Work uncovered is acceptable and was done with sufficient notice to the Owner, the uncovering and restoration will be paid for pursuant to a Supplement Amendment.

B.7.6 If any testing or inspection reveals failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Owner's and Architect/Engineer's services and expenses, shall be at the Contractor's expense.

B.7.7 When the United States government participates in the cost of the Work, or the Owner has an agreement with other public or private organizations, or if any portion of the Work is being performed for a third party or in close proximity to third party facilities, representatives of these organizations shall have the right to inspect the Work affecting their interests or property. Their right to inspect shall not make them a party to the Contract and shall not interfere with the rights of the parties of the Contract. Instructions or orders of such parties shall be transmitted to the Contractor, through the Owner.

B.8 SEVERABILITY

If any provision of this Contract is declared by a court to be illegal or in conflict with any law, the validity of the remaining terms and provisions shall not be affected and the rights and obligations of the parties shall be construed and enforced as if the Contract did not contain the particular provision held to be invalid.

B.9 ACCESS TO RECORDS

B.9.1 Contractor shall keep, at all times on the Work site, one record copy of the complete Contract Documents, including the Plans, Specifications, Construction Change Directives and addenda, in good order and marked currently to record field changes and selections made during construction, and one record copy of Shop Drawings, Product Data, Samples and similar submittals, and shall at all times give the Owner access thereto.

B.9.2 Contractor shall retain and the Owner and its duly authorized representatives shall have access, for a period not less than ten (10) years, to all Record Documents, financial and accounting records, and other books, documents, papers and records of Contractor which are pertinent to the Contract, including records pertaining to Overhead and indirect costs, for the purpose of making audit, examination, excerpts and transcripts. If for any reason, any part of the Work or this Contract shall be subject to litigation, Contractor shall retain all such records until all litigation is resolved and Contractor shall continue to provide Owner and/or its agents with full access to such records until such time as all litigation is complete and all periods for appeal have expired and full and final satisfaction of any judgment, order or decree is recorded and Owner receives a record copy of documentation from Contractor.

B.10 WAIVER

Failure of the Owner to enforce any provision of this Contract shall not constitute a waiver or relinquishment by the Owner of the right to such performance in the future nor of the right to enforce any other provision of this Contract.

B.11 SUBCONTRACTS AND ASSIGNMENT

B.11.1 Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound by the terms and conditions of these OUS Retainer General Conditions, and to assume toward the Contractor all of the obligations and responsibilities which the Contractor assumes toward the Owner thereunder, unless (1) the same are clearly inapplicable to the subcontract at issue because of legal requirements or industry practices, or (2) specific exceptions are requested by Contractor and approved in writing by Owner. Where appropriate, Contractor shall require each Subcontractor to enter into similar agreements with sub-subcontractors at any level.

B.11.2 At Owner's request, Contractor shall submit to Owner prior to their execution either Contractor's form of subcontract, or the subcontract to be executed with any particular Subcontractor. If Owner disapproves such form, Contractor shall not execute the form until the matters disapproved are resolved to Owner's satisfaction. Owner's review, comment upon or approval of any such form shall not relieve Contractor of its obligations under this Agreement or be deemed a waiver of such obligations of Contractor.

B.11.3 Contractor shall not assign, sell, or transfer its rights, or delegate its responsibilities under this Contract, in whole or in part, without the prior written approval of the Owner. No such written approval shall relieve Contractor of any obligations of this Contract, and any transferee shall be considered the agent of the Contractor and bound to perform in accordance with the Contract Documents. Contractor shall remain liable as between the original parties to the Contract as if no assignment had occurred.

B.12 SUCCESSORS IN INTEREST

The provisions of this Contract shall be binding upon and shall accrue to the benefit of the parties to the Contract and their respective permitted successors and assigns.

B.13 OWNER'S RIGHT TO DO WORK

Owner reserves the right to perform other or additional work at or near the project site with other forces than those of the Contractor. If such work takes place within or next to the project site, Contractor shall coordinate work with the other contractors or forces, cooperate with all

other contractors or forces, carry out the Work in a way that will minimize interference and delay for all forces involved, place and dispose of materials being used so as not to interfere with the operations of another, and join the Work with the work of the others in an acceptable manner and perform it in proper sequence to that of the others. The Owner will resolve any disagreements that may arise between or among Contractor and the other contractors over the method or order of doing all work (including the Work). In case of unavoidable interference, the Owner will establish work priority (including the Work) which generally will be in the sequence that the contracts were awarded.

B.14 OTHER CONTRACTS

In all cases and at any time, the Owner has the right to execute other contracts related to or unrelated to the Work of this Contract. The Contractor of this Contract shall fully cooperate with any and all other contractors without additional cost to the Owner in the manner described in section B.13.

B.15 GOVERNING LAW

This Contract shall be governed by and construed in accordance with the laws of the State of Oregon without regard to principles of conflict of laws.

B.16 LITIGATION

Any Claim between Owner and Contractor that arises from or relates to this Contract and that is not resolved through the Claims Review Process in Section D.3 shall be brought and conducted solely and exclusively within the Circuit Court of Marion County for the State of Oregon; provided, however, if a Claim must be brought in a federal forum, then it shall be brought and conducted solely and exclusively within the United States District Court for the District of Oregon. In no event shall this section be construed as a waiver by the State of Oregon of any form of defense or immunity, whether sovereign immunity, governmental immunity, immunity based on the Eleventh Amendment to the Constitution of the United States or otherwise, from any claim or from the jurisdiction of any court. CONTRACTOR, BY EXECUTION OF THIS CONTRACT, HEREBY CONSENTS TO THE IN PERSONAM JURISDICTION OF THE COURTS REFERENCED IN THIS SECTION B.16.

B.17 ALLOWANCES

B.17.1 The Contractor shall include in the Contract Price all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct.

B.17.2 Unless otherwise provided in the Contract Documents:

(a) when finally reconciled, allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

(b) Contractor's costs for unloading and handling at the site, labor, installation costs, Overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Price but not in the allowances;

(c) whenever costs are more than or less than allowances, the Contract Price shall be adjusted accordingly by Amendment. The amount of the Amendment shall reflect (i) the difference between actual costs and the allowances under Section B.17.2(a) and (2) changes in Contractor's costs under Section B.17.2(b).

(d) Unless Owner requests otherwise, Contractor shall provide to Owner a proposed fixed price for any allowance work prior to its performance.

B.18 SUBMITTALS, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

B.18.1 The Contractor shall prepare and keep current, for the Architect's/Engineer's approval (or for the approval of Owner if approval authority has not been delegated to the Architect/Engineer), a schedule and list of submittals which is coordinated with the Contractor's construction schedule and allows the Architect/Engineer reasonable time to review submittals. Owner reserves the right to finally approve the schedule and list of submittals. Submittals include, without limitation, Shop Drawings, Product Data, and Samples which are described below:

(a) Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor (including any sub-subcontractor), manufacturer, supplier or distributor to illustrate some portion of the Work.

(b) Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

(c) Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

B.18.2 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review of submittals by the Architect/Engineer is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, or for approval of safety precautions or, unless otherwise specifically stated by the Architect/Engineer, of any construction means, methods, techniques, sequences or procedures, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect/Engineer's review of the Contractor's submittals shall not relieve the Contractor of its obligations under the Contract Documents. The Architect/Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component. Informational submittals upon which the Architect/Engineer is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect/Engineer without action.

B.18.3 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect/Engineer Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect/Engineer without action.

B.18.4 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

B.18.5 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect/Engineer.

B.18.6 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect/Engineer's review or approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submittal and (i) the Architect/Engineer has given written approval to the specific deviation as a minor change in the Work, or (ii) a Supplement Amendment or Construction Change Directive has been executed by Owner authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect/Engineer's review or approval thereof.

B.18.7 In the event that Owner elects not to have the obligations and duties described under this Section B.18 performed by the Architect/Engineer, or in the event no Architect/Engineer is employed by Owner on the project, all obligations and duties assigned to the Architect/Engineer hereunder shall be performed by the Owner.

B.19 SUBSTITUTIONS

The Contractor may make Substitutions only with the consent of the Owner, after evaluation by the Owner and only in accordance with a Supplement Amendment or Construction Change Directive. Substitutions shall be subject to the requirements of the bid documents. By making requests for Substitutions, the Contractor: represents that the Contractor has personally investigated the proposed substitute product; represents that the Contractor will provide the same warranty for the Substitution that the Contractor would for the product originally specified unless approved otherwise; certifies that the cost data presented is complete and includes all related costs under this Contract including redesign costs, and waives all claims for additional costs related to the Substitution which subsequently become apparent; and will coordinate the installation of the accepted Substitution, making such changes as may be required for the Work to be completed in all respects.

B.20 USE OF PLANS AND SPECIFICATIONS

Plans, Specifications and related Contract Documents furnished to Contractor by Owner or Owner's Architect/Engineer shall be used solely for the performance of the Work under this Contract. Contractor and its Subcontractors and suppliers are authorized to use and reproduce applicable portions of such documents appropriate to the execution of the Work, but shall not claim any ownership or other interest in them beyond the scope of this Contract, and no such interest shall attach. Unless otherwise indicated, all common law, statutory and other reserved rights, in addition to copyrights, are retained by Owner.

B.21 FUNDS AVAILABLE AND AUTHORIZED

Owner reasonably believes at the time of entering into this Contract that sufficient funds are available and authorized for expenditure to finance the cost of this Contract within the Owner's appropriation or limitation. Contractor understands and agrees that, to the extent that sufficient funds are not available and authorized for expenditure to finance the cost of this Contract, Owner's payment of amounts under this Contract attributable to Services performed after the last day of the current biennium is contingent on Owner receiving from the Oregon Legislative Assembly appropriations, limitations or other expenditure authority sufficient to allow Owner, in the exercise of its reasonable administrative discretion, to continue to make payments under this Contract.

B.22 NO THIRD PARTY BENEFICIARIES

Owner and Contractor are the only parties to this Contract and are the only parties entitled to enforce its terms. Nothing in this Contract gives, is intended to give, or shall be construed to give or provide any benefit or right, whether directly, indirectly, or otherwise, to third persons unless such third persons are individually identified by name herein and expressly described as intended beneficiaries of the terms of this Contract.

SECTION C
WAGES AND LABOR

C.1 MINIMUM WAGE RATES ON PUBLIC WORKS

Contractor shall comply fully with the provisions of ORS 279C.800 through 279C.870. Documents establishing those conditions, as determined by the Commissioner of the Bureau of Labor and Industries (BOLI), are included as attachments to or are incorporated by reference in the Contract Documents. Pursuant to ORS 279C.830(1)(d), Contractor shall pay workers at not less than the specified minimum hourly rate of wage, and shall include that requirement in all subcontracts. If the Work is subject to both the state prevailing wage rate law and the federal Davis-Bacon Act, Contractor shall pay the higher of the applicable state or federal prevailing rate of wage. Contractor shall provide written notice to all workers of the number of hours per day and days per week such workers may be required to work.

C.2 PAYROLL CERTIFICATION AND FEE REQUIREMENTS

C.2.1 In accordance with ORS 279C.845, the Contractor and every Subcontractor shall submit written certified statements to the Owner, on the form prescribed by the Commissioner of the Bureau of Labor and Industries, certifying the hourly rate of wage paid each worker which the Contractor or the Subcontractor has employed on the project and further certifying that no worker employed on the project has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the Contract, which certificate and statement shall be verified by the oath of the Contractor or the Subcontractor that the Contractor or Subcontractor has read the certified statement, that the Contractor or Subcontractor knows the contents of the certified statement, and, that to the Contractor's or Subcontractor's best knowledge and belief, the certified statement is true. The certified statements shall set out accurately and completely the payroll records for the prior week, including the name and address of each worker, the worker's correct classification, rate of pay, daily and weekly number of hours worked, deductions made, and actual wages paid. Certified statements for each week during which the Contractor or Subcontractor has employed a worker on the project shall be submitted once a month, by the fifth business day of the following month. The Contractor and Subcontractors shall preserve the certified statements for a period of ten (10) years from the date of completion of the Contract.

C.2.2 Pursuant to ORS 279C.845(7),the Owner shall retain 25 percent of any amount earned by the Contractor on this public works project until the Contractor has filed the certified statements required by section C.2.1. The Owner shall pay to the Contractor the amount retained under this subsection within 14 days after the Contractor files the required certified statements, regardless of whether a Subcontractor has failed to file certified statements.

C.2.3 Pursuant to ORS 279C.845(8), the Contractor shall retain 25 percent of any amount earned by a first-tier Subcontractor on this public works project until the first-tier Subcontractor has

filed with the Owner the certified statements required by C.2.1. Before paying any amount retained under this subsection, the Contractor shall verify that the first-tier Subcontractor has filed the certified statement. Within 14 days after the first-tier Subcontractor files the required certified statement the Contractor shall pay the first-tier Subcontractor any amount retained under this subsection.

C.2.4 In accordance with statutory requirements and administrative rules promulgated by the Commissioner of the Bureau of Labor and Industries, the fee required by ORS 279C.825(1) will be paid by Owner to the Commissioner.

C.3 PROMPT PAYMENT AND CONTRACT CONDITIONS

C.3.1 As a condition to Owner's performance hereunder, the Contractor shall:

C.3.1.1 Make payment promptly, as due, to all persons supplying to Contractor labor or materials for the prosecution of the Work provided for in this Contract.

C.3.1.2 Pay all contributions or amounts due the State Industrial Accident Fund from such Contractor or Subcontractor incurred in the performance of the Contract.

C.3.1.3 Not permit any lien or claim to be filed or prosecuted against the Owner on account of any labor or material furnished. Contractor will not assign any claims that Contractor has against Owner, or assign any sums due by Owner, to Subcontractors, suppliers, or manufacturers, and will not make any agreement or act in any way to give Subcontractors a claim or standing to make a claim against the Owner.

C.3.1.4 Pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.

C.3.2 As a condition to Owner's performance hereunder, if Contractor fails, neglects or refuses to make prompt payment of any claim for labor or services furnished to the Contractor of a Subcontractor by any person in connection with the project as such claim becomes due, the proper officer(s) representing the Owner may pay the claim and charge the amount of the payment against funds due or to become due Contractor under this Contract. Payment of claims in this manner shall not relieve the Contractor or the Contractor's surety from obligation with respect to any unpaid claims.

C.3.3 Contractor shall include in each subcontract for property or services entered into by the Contractor and a first-tier subcontractor, including a material supplier, for the purpose of performing a construction contract, a payment clause that obligates the Contractor to pay the first-tier Subcontractor for satisfactory performance under its subcontract within ten (10) Days out of such amounts as are paid to the Contractor by the public contracting agency under such contract.

C.3.4 All employers, including Contractor, that employ subject workers who work under this contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. Contractor shall ensure that each of its Subcontractors complies with these requirements.

C.4 PAYMENT FOR MEDICAL CARE

As a condition to Owner's performance hereunder, Contractor shall promptly, as due, make payment to any person, partnership, association or corporation furnishing medical, surgical, and hospital care or other needed care and attention, incident to sickness or injury, to the employees of such Contractor, all sums of which the Contractor agrees to pay for such services and all moneys and sums which the Contractor has collected or deducted from the wages of personnel pursuant to any law, contract or agreement for the purpose of providing or paying for such services.

C.5 HOURS OF LABOR

As a condition to Owner's performance hereunder, no person shall be employed to perform Work under this Contract for more than ten (10) hours in any one day or forty (40) hours in any one week, except in cases of necessity, emergency or where public policy absolutely requires it. In such instances, Contractor shall pay the employee at least time and a half pay:

(a) For all overtime in excess of eight (8) hours a day or forty (40) hours in any one week when the work week is five consecutive Days, Monday through Friday; or

(b) For all overtime in excess of ten (10) hours a day or forty (40) hours in any one week when the work week is four consecutive Days, Monday through Friday; and

(c) For all Work performed on Saturday and on any legal holiday specified in ORS 279C.540.

This section C.5 will not apply to Contractor's Work under this Contract to the extent Contractor is currently a party to a collective bargaining agreement with any labor organization.

This Section C.5 shall not excuse Contractor from completion of the Work within the time required under this Contract.

SECTION D
CHANGES IN THE WORK

D.1 CHANGES IN WORK

D.1.1 The terms of this Contract shall not be waived, altered, modified, supplemented or amended in any manner whatsoever, without prior written agreement and then only after any necessary approvals have been obtained. A Supplement or Amendment is required, which shall not be effective until its execution by the parties to this Contract and all approvals required by public contracting laws have been obtained.

D.1.2 It is mutually agreed that changes in Plans, quantities, or details of construction are inherent in the nature of construction and may be necessary or desirable during the course of construction. Within the general scope of this Contract, the Owner may at any time, without notice to the sureties and without impairing the Contract, require changes consistent with this Section D.1. All changes to the Work shall be documented and Amendments shall be executed under the conditions of the Contract Documents. Such changes may include, but are not limited to:

(a) Modification of specifications and design.
(b) Increases or decreases in quantities.
(c) Increases or decreases to the amount of Work.
(d) Addition or elimination of any Work item.
(e) Change in the duration of the project.
(f) Acceleration or delay in performance of Work.
(g) Deductive changes.

Deductive changes are those that reduce the scope of the Work, and shall be made by mutual agreement whenever feasible. In cases of suspension or partial termination under Section J, Owner reserves the right to unilaterally impose a deductive change and to self perform such Work, for which the provisions of B.13 (Owner's Right to Do Work) shall then apply. Adjustments in compensation shall be made under the provisions of D.1.3, in which costs for deductive changes shall be based upon a Direct Costs adjustment together with the related

percentage markup specified for profit, Overhead and other indirect costs, unless otherwise agreed to by Owner.

D.1.3 The Owner and Contractor agree that adjustments to or deletions from the Work shall be administered and compensated according to the following:

(a) Unit pricing may be utilized at the Owner's option when unit prices or solicitation alternates were provided that established the cost for adjustments to Work, and a binding obligation exists under the Contract on the parties covering the terms and conditions of the adjustment to Work.

(b) If the Owner elects not to utilize unit pricing, or in the event that unit pricing is not available or appropriate, fixed pricing may be used for adjustments to or deletions from the Work. In fixed pricing the basis of payments or total price shall be agreed upon in writing between the parties to the Contract, and shall be established before the Work is done whenever feasible. Notwithstanding the foregoing, the mark-ups set forth in D.1.3(c) shall be utilized in establishing fixed pricing, and such mark-ups shall not be exceeded. Cost and price data relating to adjustments to or deletions from the Work shall be supplied by Contractor to Owner upon request, but Owner shall be under no obligation to make such requests.

(c) In the event that unit pricing and fixed pricing are not utilized, then adjustments to or deletions from the Work shall be performed on a cost reimbursement basis for Direct Costs. Such Work shall be compensated on the basis of the actual, reasonable and allowable cost of labor, equipment, and material furnished on the Work performed. In addition, the following markups shall be added to the Contractor's or Subcontractor's Direct Costs as full compensation for profit, Overhead and other indirect costs for Work directly performed with the Contractor's or Subcontractor's own forces:

On Labor.....	15%
On Equipment.....	10%
On Materials.....	10%

(d) When adjustments to or deletions from the Work under D.1.3(c) are invoiced by an authorized Subcontractor at any level, each ascending tier Subcontractor or Contractor will be allowed a supplemental mark-up on each piece of subcontract Work covered by a an Amendment as follows:

$0.00 - $5,000.00	10%, and then
Over $5,000.00	5%

Payments made to the Contractor shall be complete compensation for Overhead, profit, and all costs that were incurred by the Contractor or by other forces furnished by the Contractor, including Subcontractors, for adjustments to or deletions from the Work pursuant to a Supplement Amendment. Owner may establish a maximum cost for additional Work under this Section D.1.3, which shall not be exceeded for reimbursement without additional written authorization from Owner in the form of a Supplement Amendment. Contractor shall not be required to complete such additional Work without additional authorization.

D.1.4 Any necessary adjustment of Contract Time that may be required as a result of adjustments to or deletions from the Work must be agreed upon by the parties before the start of the revised Work unless Owner authorizes Contractor to start the revised Work before agreement on Contract Time adjustment. Contractor shall submit any request for additional compensation (and additional Contract Time if Contractor was authorized to start Work before an adjustment of Contract Time was approved) as soon as possible but no later than thirty (30) Days after receipt of Owner's request for additional Work . If Contractor's request for additional compensation or adjustment of Contract Time is not made within the thirty (30) Day time limit, Contractor's requests pertaining to that additional Work shall be barred. The thirty (30) Day time limit for making requests shall not be extended for any reason, including without limitation Contractor's claimed inability to determine the amount of additional compensation or adjustment of Contract Time, unless an extension is granted in writing by Owner. If the Owner denies Contractor's request for additional compensation or adjustment of Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process. No other reimbursement, compensation, or payment will be made, except as provided in Section D.1.5 for impact claims.

D.1.5 If any adjustment to Work under Section D.1.3 causes an increase or decrease in the Contractor's cost of, or the Contract Time required for the performance of any other part of the Work under this Contract, Contractor shall submit a written request to the Owner, setting forth the nature and specific extent of the request, including all time and cost impacts against the Contract as soon as possible, but no later than thirty (30) Days after receipt of Owner's request for adjustments to or deletions from the Work by Contractor.

The thirty (30) Day time limit applies to claims of Subcontractors, suppliers, or manufacturers who may be affected by Owner's request for adjustments to or deletions from the Work and who request additional compensation or an extension of Contract Time to perform; Contractor has responsibility for contacting its Subcontractors, suppliers, or manufacturers within the thirty (30) Day time limit, and including their requests with Contractor's requests. If the request involves Work to be completed by Subcontractors, or materials to be furnished by suppliers or manufacturers, such requests shall be submitted to the Contractor in writing with full analysis and justification for the adjustments to compensation and Contract Time requested. The Contractor shall analyze and evaluate the merits of the requests submitted by Subcontractors, suppliers, and manufacturers to Contractor prior to including those requests and Contractor's analysis and evaluation of those requests with Contractor's requests for adjustments to compensation or Contract Time that Contractor submits to the Owner. Failure of Subcontractors, suppliers, manufacturers or others to submit their requests to Contractor for inclusion with Contractor's requests submitted to Owner within the time period and by the means described in this section shall constitute a waiver of these Subcontractor claims. The Owner will not consider direct requests or claims from Subcontractors, suppliers, manufacturers or others not a party to this Contract. The consideration of such requests and claims under this section does not give any Person, not a party to the Contract the right to bring a claim against Owner, whether in this claims process, in litigation, or in any dispute resolution process.

If the Owner denies the Contractor's request for adjustment to compensation or Contract Time, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

D.1.6 No request or Claim by the Contractor for additional costs or an adjustment of Contract Time shall be allowed if made after receipt of final payment application under this Contract. Final payment application must be made by Contractor within the time required under Section E.6.4.

D.1.7 It is understood that changes in the Work are inherent in construction of this type. The number of changes, the scope of those changes, and the effect they have on the progress of the original Work cannot be defined at this time. The Contractor is notified that numerous changes may be required and that there will be no compensation made, unless and only to the extent otherwise provided in the Contract Documents, to the Contractor

directly related to the number of changes. Each change will be evaluated for extension of Contract Time and increase or decrease in compensation based on its own merit.

D.2 DELAYS

D.2.1 Delays in construction include "Avoidable Delays", which are defined in Section D.2.1.1, and "Unavoidable Delays", which are defined in Section D.2.1.2. The effect of Avoidable Delays is described in Section D.2.2 and the effect of Unavoidable Delays is described in Section D.2.3.

D.2.1.1 Avoidable Delays include any delays other than Unavoidable Delays, and include delays that otherwise would be considered Unavoidable Delays but that:

(a) Could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its Subcontractors.

(b) Affect only a portion of the Work and do not necessarily prevent or delay the prosecution of neither other parts of the Work nor the completion of the whole Work within the Contract Time.

(c) Do not impact activities on the accepted critical path schedule.

(d) Are associated with the reasonable interference of other contractors employed by the Owner that do not necessarily prevent the completion of the whole Work within the Contract Time.

D.2.1.2 Unavoidable Delays include delays other than Avoidable Delays that are:

(a) To the extent caused by any actions of the Owner, or any other employee or agent of the Owner, or by separate contractor employed by the Owner.

(b) To the extent caused by any site conditions which differ materially from what was represented in the Contract Documents or from conditions that would normally be expected to exist and be inherent to the construction activities defined in the Contract Documents. The Contractor shall notify the Owner immediately of differing site conditions before the area has been disturbed. The Owner will investigate the area and make a determination as to whether or not the conditions differ materially from either the conditions stated in the Contract Documents or those which could reasonably be expected in execution of this particular Contract. If Contractor and the Owner agree that a differing site condition exists, any adjustment to compensation or Contract Time will be determined based on the process set forth in Section D.1.5 for adjustments to or deletions from Work. If the Owner disagrees that a differing site condition exists and denies Contractor's request for additional compensation or Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

(c) To the extent caused by Force Majeure acts, events or occurrences that could not have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its Subcontractors.

(d) To the extent caused by adverse weather conditions. Any adverse weather conditions must be substantiated by documentary evidence that weather conditions were abnormal for the specific time period claimed, could not have been anticipated by the Contractor, and adversely impacted the project in a manner that could not be avoided by rescheduling the Work or by implementing measures to protect against the weather so that the Work could proceed. A rain, windstorm, high water, or other natural phenomenon for the specific locality of the Work, which might reasonably have been anticipated from the previous 10-year historical records of the general locality of the Work, shall not be construed as abnormal. The parties agree that rainfall greater than the following levels cannot be reasonably anticipated:

(i) Daily rainfall equal to, or greater than, 0.50 inch during a month when the monthly rainfall exceeds the normal monthly average by twenty-five percent (25 %) or more.

(ii) daily rainfall equal to, or greater than, 0.75 inch at any time.

The Office of the Environmental Data Service of the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce nearest the project site shall be considered the official agency of record for weather information.

D.2.2 Contractor shall not be entitled to additional compensation or additional Contract Time for Avoidable Delays.

D.2.3 In the event of Unavoidable Delays, based on principles of equitable adjustment, Contractor may be entitled to the following:

(a) Contractor may be entitled to additional compensation or additional Contract Time, or both, for Unavoidable Delays described in Section D.2.1.2 (a) and (b).

(b) Contractor may be entitled to additional Contract Time for Unavoidable Delays described in Section D.2.1.2(c) and (d).

In the event of any requests for additional compensation or additional Contract Time, or both, as applicable, arising under this Section D.2.3 for Unavoidable Delays, other than requests for additional compensation or additional Contract Time for differing site conditions for which a review process is established under Section D.2.1.2 (b), Contractor shall submit a written notification of the delay to the Owner within two (2) Days of the occurrence of the cause of the delay. This written notification shall state the cause of the potential delay, the project components impacted by the delay, and the anticipated additional Contract Time extension or the additional compensation, or both, as applicable, resulting from the delay. Within seven (7) Days after the cause of the delay has been mitigated, or in no case more than thirty (30) Days after the initial written notification, the Contractor shall submit to the Owner, a complete and detailed request for additional compensation or additional Contract Time, or both, as applicable, resulting from the delay. If the Owner denies Contractor's request for additional compensation or adjustment of Contract Time, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

If Contractor does not timely submit the notices required under this Section D.2, then unless otherwise prohibited by law, Contractor's Claim shall be barred.

D.3 CLAIMS REVIEW PROCESS

D.3.1 All Contractor Claims shall be referred to the Owner for review. Contractor's Claims, including Claims for adjustments to compensation or Contract Time, shall be submitted in writing by Contractor to the Owner within five (5) Days after a denial of Contractor's initial request for an adjustment of Contract terms, payment of money, extension of Contract Time or other relief, provided that such initial request has been submitted in accordance with the requirements and within the time limits

established in these OUS Retainer General Conditions. Within thirty (30) Days after the initial Claim, Contractor shall submit to the Owner a complete and detailed description of the Claim (the "Detailed Notice") that includes all information required by Section D.3.2. Unless the Claim is made in accordance with these time requirements, it shall be waived by Contractor.

D.3.2 The Detailed Notice of the Claim shall be submitted in writing by Contractor and shall include a detailed, factual statement of the basis of the Claim, pertinent dates, Contract provisions which support or allow the Claim, reference to or copies of any documents which support the Claim, the dollar value of the Claim, and the Contract Time adjustment requested for the Claim. If the Claim involves Work to be completed by Subcontractors, the Contractor will analyze and evaluate the merits of the Subcontractor claim prior to forwarding it and that analysis and evaluation to the Owner. The Owner will not consider direct claims from Subcontractors, suppliers, manufacturers, or others not a party to this Contract. Contractor agrees that it will make no agreement, covenant, or assignment, nor will it commit any other act that will permit or assist any Subcontractor, supplier, manufacturer, or other to directly or indirectly make a claim against Owner.

D.3.3 The Owner will review all Claims and take one or more of the following preliminary actions within ten (10) Days of receipt of the Detailed Notice of a Claim: (1) request additional supporting information from the Contractor; (2) inform the Contractor and Owner in writing of the time required for adequate review and response; (3) reject the Claim in whole or in part and identify the reasons for rejection; (4) based on principles of equitable adjustment, recommend approval of all or part of the Claim; or (5) propose an alternate resolution.

D.3.4 The Owner's decision shall be final and binding on the Contractor unless appealed by written notice to the Owner within fifteen (15) Days of receipt of the decision. The Contractor must present written documentation supporting the Claim within fifteen (15) Days of the notice of appeal. After receiving the appeal documentation, the Owner shall review the materials and render a decision within thirty (30) Days after receiving the appeal documents.

D.3.5 The decision of the Owner shall be final and binding unless the Contractor delivers to the Owner its request for mediation, which shall be a non-binding process, within fifteen (15) Days of the date of the Owner's decision. The mediation process will be considered to have commenced as of the date the Contractor delivers the request. Both parties acknowledge and agree that participation in mediation is a prerequisite to commencement of litigation of any disputes relating to the Contract. Both parties further agree to exercise their best efforts in good faith to resolve all disputes within sixty (60) Days of the commencement of the mediation through the mediation process set forth herein.

In the event that a lawsuit must be filed within this sixty (60) Day period in order to preserve a cause of action, the parties agree that, notwithstanding the filing, they shall proceed diligently with the mediation to its conclusion prior to actively prosecuting the lawsuit, and shall seek from the Court in which the lawsuit is pending such stays or extensions, including the filing of an answer, as may be necessary to facilitate the mediation process. Further, in the event settlements are reached on any issues through mediation, the plaintiff shall promptly cause to be entered by the Court a stipulated general judgment of dismissal with prejudice, or other appropriate order limiting the scope of litigation as provided in the settlement.

D.3.6 Should the parties arrive at an impasse regarding any Claims or disputed Claims, it is agreed that the parties shall participate in mediation as specified in Section D.3.5. The mediation process will be considered to have been commenced as of the date one party delivers to the other its request in writing to mediate. The mediator shall be an individual mutually acceptable to both parties, but in the absence of agreement each party shall select a temporary mediator and the temporary mediators shall jointly select the permanent mediator. Each party shall pay its own costs for the time and effort involved in mediation. The cost of the mediator shall be split equally between the two parties. Both parties agree to exercise their best effort in good faith to resolve all disputes in mediation. Participation in mediation is a mandatory requirement of both the Owner and the Contractor. The schedule, time and place for mediation will be mutually acceptable, or, failing mutual agreement, shall be as established by the mediator. The parties agree to comply with Owner's administrative rules governing the confidentiality of mediation, if any, and shall execute all necessary documents to give effect to such confidentiality rules. In any event, the parties shall not subpoena the mediator or otherwise require the mediator to produce records, notes or work product, or to testify in any future proceedings as to information disclosed or representations made in the course of mediation, except to the extent disclosure is required by law.

D.3.7 Unless otherwise directed by Owner, Contractor shall proceed with the Work while any Claim, or mediation or litigation arising from a Claim, is pending. Regardless of the review period or the final decision of the Owner, the Contractor shall continue to diligently pursue the Work as identified in the Contract Documents. In no case is the Contractor justified or allowed to cease or Delay Work, in whole or in part, without a written stop work order from the Owner.

SECTION E
PAYMENTS

E.1 SCHEDULE OF VALUES

The Contractor shall submit, at least ten (10) Days prior to submission of its first application for progress payment, a schedule of values ("Schedule of Values") for the contracted Work. This schedule shall provide a breakdown of values for the contracted Work and will be the basis for progress payments. The breakdown shall demonstrate reasonable, identifiable, and measurable components of the Work. Unless objected to by the Owner, this schedule shall be used as the basis for reviewing Contractor's applications for payment. If objected to by Owner, Contractor shall revise the schedule of values and resubmit the same for approval of Owner.

E.2 APPLICATIONS FOR PAYMENT

E.2.1 Owner shall make progress payments on the Contract monthly as Work progresses, in accordance with the requirements of this Section E.2. Applications for payment shall be based upon estimates of Work completed and the Schedule of Values. As a condition precedent to Owner's obligation to pay, all applications for payment shall be approved by the Owner. A progress payment shall not be considered acceptance or approval of any Work or waiver of any defects therein. Owner shall pay to Contractor interest for overdue invoices at the rate of two-thirds of one percent per month on the progress payment, not including retainage, due the Contractor. Overdue invoices will be those that have not been paid within forty five (45) days from the latest of:

(a) The date of the receipt of the accurate invoice;

(b) The date Owner receives the correct application for payment if no invoice is received;

(c) The date all goods and services have been received; or

(d) The date a Claim is made certain by agreement of the parties or by operation of law.

Notwithstanding the foregoing, in instances when an application for payment is filled out incorrectly, or when there is any defect or impropriety in any submitted application or when there is a good faith dispute, Owner shall so notify the Contractor within fifteen (15) Days stating the reason or reasons the application for payment is defective or improper or the reasons for the dispute. A defective or improper application for payment, if corrected by the Contractor within seven (7) Days of being notified by the Owner, shall not cause a payment to be made later than specified in this section unless interest is also paid. Payment of interest will be postponed when payment on the principal is delayed because of disagreement between the Owner and the Contractor.

Owner reserves the right, instead of requiring the Contractor to correct or resubmit a defective or improper application for payment, to reject the defective or improper portion of the application for payment and pay the remainder of the application for such amounts which are correct and proper.

Owner, upon written notice to the Contractor, may elect to make payments to the Contractor only by means of Electronic Funds Transfers (EFT) through Automated Clearing House (ACH) payments. If Owner makes this election, the Contractor shall arrange for receipt of the EFT/ACH payments.

E.2.2 Contractor shall submit to the Owner an application for each payment and, if required, receipts or other vouchers showing payments for materials and labor including payments to Subcontractors. Contractor shall include in its application for payment a schedule of the percentages of the various parts of the Work completed, based on the Schedule of Values which shall aggregate to the payment application total, and shall include, on the face of each copy thereof, a certificate in substantially the following form:

"I, the undersigned, hereby certify that the above bill is true and correct, and the payment therefore, has not been received.

Signed: _____
Dated: _____"

E.2.3 Generally, applications for payment will be accepted only for materials that have been installed. Under special conditions, applications for payment for stored materials will be accepted at Owner's sole discretion. Such a payment, if made, will be subject to the following conditions:

(a) The request for stored material shall be submitted at least thirty (30) Days in advance of the application for payment on which it appears. Applications for payment shall be entertained for major equipment, components or expenditures only.

(b) The Contractor shall submit applications for payment showing the quantity and cost of the material stored.

(c) The material shall be stored in a bonded warehouse and Owner shall be granted the right to access the material for the purpose of removal or inspection at any time during the Contract Period.

(d) The Contractor shall name the Owner as co-insured on the insurance policy covering the full value of the property while in the care and custody of the Contractor until it is installed. A certificate noting this coverage shall be issued to the Owner.

(e) Payments shall be made for materials and equipment only. The submitted amount in the application for payment shall be reduced by the cost of transportation from the storage site to the project site and for the cost of an inspector to verify delivery and condition of the goods at the storage site. The cost of storage and inspection shall be borne solely by the Contractor.

(f) Within sixty (60) Days of the application for payment, the Contractor shall submit evidence of payment covering the material and/or equipment stored and of payment for the storage site.

(g) Payment for stored materials and/or equipment shall in no way indicate acceptance of the materials and/or equipment or waive any rights under this Contract for the rejection of the Work or materials and/or equipment not in conformance with the Contract Documents.

(h) All required documentation shall be submitted with the respective application for payment.

E.2.4 The Owner reserves the right to withhold all or part of a payment, or may nullify in whole or part any payment previously made, to such extent as may be necessary in the Owner's opinion to protect the Owner from loss because of:

(a) Work that is defective and not remedied, or that has been demonstrated or identified as failing to conform with Applicable Laws or the Contract Documents,

(b) third party claims filed or evidence reasonably indicating that such claims will likely be filed unless security acceptable to the Owner is provided by the Contractor;

(c) failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment (in which case Owner may issue checks made payable jointly to Contractor and such unpaid Persons under this provision, or directly to Subcontractors and suppliers at any level under Section C.3.2.1);

(d) reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Price;

(e) damage to the Work, Owner or another contractor;

(f) reasonable evidence that the Work will not be completed within the Contract Time required by the Contract, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;

(g) failure to carry out the Work in accordance with the Contract Documents; or

(h) assessment of liquidated damages, when withholding is made for offset purposes.

E.2.5 Subject to the provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

(a) Take that portion of the Contract Price properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Price allocated to that portion of the Work in the Schedule of Values, less retainage as provided in Section E.5. Pending final determination of cost to the Owner of changes in the Work, no amounts for changes in the Work can be included in applications for payment until the Contract Price has been adjusted by a Supplement Amendment;

(b) Add that portion of the Contract Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner pursuant to Section E.2.3, suitably stored off the site at a location agreed upon in writing), less retainage as provided in Section E.5;

(c) Subtract the aggregate of previous payments made by the Owner; and

(d) Subtract any amounts for which the Owner has withheld or nullified payment as provided in the Contract Documents.

E.2.6 Contractor's applications for payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier.

E.2.7 The Contractor warrants to Owner that title to all Work covered by an application for payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an application for payment all Work for which payments are received from the Owner shall be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided financing, labor, materials and equipment relating to the Work.

E.2.8 If Contractor disputes any determination by Owner with regard to any application for payment, Contractor nevertheless shall continue to expeditiously perform the Work. No payment made hereunder shall be or be construed to be final acceptance or approval of that portion of the Work to which such partial payment relates or shall relieve Contractor of any of its obligations hereunder.

E.2.9 Contractor shall submit its initial MWESB Report within ten (10) Days of Contractor's execution of the Contract.. Contractor shall submit annual MWESB Reports on June 30 of each year the Contract is active. Contracts - first executed by Contractor within ninety (90) Days before June 30 of the year of execution by Contractor may at the discretion of Owner be exempt from submitting the annual MWESB Report otherwise due on that June 30. The final MWESB Report shall be filed with the application for final payment. Timely receipt of MWESB Reports by Owner shall be a condition precedent to Owner's obligation to pay any progress payments or final payment otherwise due.

E.3 PAYROLL CERTIFICATION REQUIREMENT

Owner's receipt of payroll certification pursuant to Section C.2 of this Contract shall be a condition precedent to Owner's obligation to pay any progress payments or final payment otherwise due.

E.4 DUAL PAYMENT SOURCES

Contractor shall not be compensated for Work performed under this Contract from any state agency other than the agency that is a party to this Contract.

E.5 RETAINAGE

E.5.1 Retainage shall be withheld and released in accordance with the requirements set forth in OAR 580-063-0045.

E.5.1.1 Owner may reserve as retainage from any progress payment an amount not to exceed five percent of the payment. As Work progresses, Owner may reduce the amount of retainage on or may eliminate retainage on any remaining monthly Contract payments after 50 percent of the Work under the Contract is completed if, in the Owner's discretion, such Work is progressing satisfactorily. Elimination or reduction of retainage shall be allowed only upon written application by the Contractor, which application shall include written approval of Contractor's surety; except that when the Work is 97-1/2 percent completed the Owner may, at its discretion and without application by the Contractor, reduce the retained amount to 100 percent of the value of the Work remaining to be done. Upon receipt of written application by the Contractor, Owner shall respond in writing within a reasonable time.

E.5.1.2 Contractor may request in writing:

(a) to be paid amounts which would otherwise have been retained from progress payments where Contractor has deposited acceptable bonds and securities of equal value with Owner or in a custodial account or other mutually-agreed account satisfactory to Owner, with an approved bank or trust company to be held in lieu of the cash retainage for the benefit of Owner;

(b) for construction projects over $1,000,000, that retainage be deposited in an interest bearing account, established through the State Treasurer for state agencies, in a bank, savings bank, trust company or savings association for the benefit of Owner, with earnings from such account accruing to the Contractor; or

(c) that the Owner allow Contractor to deposit a surety bond for the benefit of Owner, in a form acceptable to Owner, in lieu of all or a portion of funds retained, or to be retained. Such bond and any proceeds therefrom shall be made subject to all claims in the manner and priority as set forth for retainage.

When the Owner has accepted the Contractor's election of option (a) or (b), Owner may recover from Contractor any additional costs incurred through such election by reducing Contractor's final payment. Where the Owner has agreed to Contractor's request for option (c), Contractor shall accept like bonds from Subcontractors and suppliers on the project from which Contractor has required retainages.

E. 5.1.3 The retainage held by Owner shall be included in and paid to the Contractor as part of the final payment of the Contract Price. The Owner shall pay to Contractor interest at the rate of two-thirds of one percent per month on the final payment due Contractor, interest to commence forty five (45) Days after the date which Owner receives Contractor's final approved application for payment and Work under the Contract has been completed and accepted and to run until the date when final payment is tendered to Contractor. The Contractor shall notify Owner in writing when the Contractor considers the Work complete and deliver to Owner its final application for payment and Owner shall, within fifteen (15) Days after receiving the written notice and the application for payment, either accept the Work or notify the Contractor of Work yet to be performed on the Contract. If Owner does not within the time allowed notify the Contractor of Work yet to be performed to fulfill contractual obligations, the interest provided by this subsection shall commence to run forty five (45) Days after the end of the 15-Day period.

E.5.1.4 Owner will reduce the amount of the retainage if the Contractor notifies the Owner that the Contractor has deposited in an escrow account with a bank or trust company, in a manner authorized by the Owner, bonds and securities of equal value of a kind approved by the Owner and such bonds and securities have in fact been deposited.

E.5.1.5 Contractor agrees that if Contractor elects to reserve a retainage from any progress payment due to any Subcontractor or supplier, such retainage shall not exceed five percent of the payment, and such retainage withheld from Subcontractors and suppliers shall be subject to the same terms and conditions stated in Subsection E.5 as apply to Owner's retainage from any progress payment due to Contractor.

E.6 FINAL PAYMENT

E.6.1 Upon completion of all the Work under this Contract, the Contractor shall notify the Owner, in writing, that Contractor has completed Contractor's obligations under the Contract and shall prepare its application requesting final payment. Upon receipt of such notice and application for payment, the Owner will inspect the Work, and, if acceptable, submit to Contractor a recommendation as to acceptance of the completed Work and the final estimate of the amount due the Contractor. If the Work is not acceptable, Owner will notify Contractor within fifteen (15) Days of Contractor's request for final payment. Upon approval of this final application for payment by the Owner and compliance by the Contractor with provisions in Section K, and Contractor's satisfaction of other provisions of the Contract Documents as may be applicable, the Owner shall pay to the Contractor all monies due under the provisions of these Contract Documents.

E.6.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Owner (1) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least thirty (30) Days' prior written notice has been given to the Owner, (2) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (3) consent of surety, if any, to final payment and (4), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

E.6.3 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final application for payment.

E.6.4 Contractor agrees to submit its final payment application within ninety (90) Days after Substantial Completion, unless written extension is granted by Owner. Contractor shall not delay final payment application for any reason, including without limitation nonpayment of Subcontractors, suppliers, manufacturers or others not a party to this Contract, or lack of resolution of a dispute with Owner or any other person of matters arising out of or relating to the Contract. If Contractor fails to submit its final payment application within ninety (90) Days after Substantial Completion, and Contractor has not obtained written extension by Owner, all requests or Claims for additional costs or an extension of Contract Time shall be waived.

SECTION F
JOB SITE CONDITIONS

F.1 USE OF PREMISES

Contractor shall confine equipment, storage of materials and operation of Work to the limits indicated by Contract Documents, Applicable Laws, permits or directions of the Owner. Contractor shall follow the Owner's instructions regarding use of premises, if any.

F.2 PROTECTION OF WORKERS, PROPERTY AND THE PUBLIC

F.2.1 Contractor shall maintain continuous and adequate protection of all of the Work from damage and shall protect the Owner, workers and property from injury or loss arising in connection with this Contract. Contractor shall remedy acceptably to the Owner any damage, injury, or loss, except such as may be directly due to errors in the Contract Documents or caused by authorized representatives or personnel of the Owner. Contractor shall adequately protect adjacent property as provided by law and the Contract Documents.

F.2.2 Contractor shall take all necessary precautions for the safety of all personnel on the job site or otherwise engaged in the undertaking of the Work and shall comply with the Contract Documents, best practices and all applicable provisions of federal, state and municipal safety laws and building and fire codes to prevent accidents or injury to persons on, about or adjacent to the premises where the Work is being performed. Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for protection of workers and the public against any hazards created by construction. Contractor shall designate a responsible employee or associate on the Work site, whose duty shall be the prevention of accidents. The name and position of the person designated shall be reported to the Owner. The Owner has no responsibility for Work site safety. Work site safety shall be the responsibility of the Contractor.

F.2.3 Contractor shall not enter upon private property without first obtaining permission from the property owner or its duly authorized representative. Contractor shall be responsible for the preservation of all public and private property along and adjacent to the Work contemplated under the Contract and shall use every precaution necessary to prevent damage thereto. In the event the Contractor damages any property, the Contractor shall at once notify the property owner and make, or arrange to make, full restitution. Contractor shall, immediately and in writing, report to the Owner, all pertinent facts relating to such property damage and the ultimate disposition of the claim for damage.

F.2.4 Contractor shall be responsible for protection of adjacent work areas including impacts brought about by activities, equipment, labor, utilities, vehicles and materials on the site.

F.2.5 Contractor shall at all times direct its activities in such a manner as to minimize adverse effects on the environment. Handling of all materials shall be conducted so no release will occur that may pollute or become hazardous.

F.2.6 In an emergency affecting the safety of life or limb or of the Work or of adjoining property, the Contractor, without special instruction or authorization from the Owner, shall act reasonably to prevent threatened loss or injury, and shall so act, without appeal, if instructed by the Owner. Any compensation claimed by the Contractor on account of emergency work shall be determined in accordance with section D.

F.3 CUTTING AND PATCHING

F.3.1 Contractor shall be responsible for coordinating all cutting, fitting, or patching of the Work to make its several parts come together properly and fit to receive or be received by work of other contractors or Subcontractors shown upon, or reasonably implied by, the Contract Documents.

F.3.2 Contractor shall be responsible for restoring all cut, fitted, or patched surfaces to an original condition; provided, however, that if a different condition is specified in the Contract Documents, then Contractor shall be responsible for restoring such surfaces to the condition specified in the Contract Documents.

F.4 CLEANING UP

From time to time as may be prudent or ordered by the Owner and, in any event, immediately after completion of the Work, the Contractor shall, at its own expense, clean up and remove all refuse and unused materials of any kind resulting from the Work. If Contractor fails to do so within twenty-four hours after notification by the Owner the work may be done by others and the cost charged to the Contractor and deducted from payment due the Contractor.

F.5 ENVIRONMENTAL CONTAMINATION

F.5.1. Contractor shall be held responsible for and shall indemnify, defend (with counsel of Owner's choice),and hold harmless Owner from and against any costs, expenses, damages, claims, and causes of action, (including attorney fees), or any of them, resulting from all spills, releases, discharges, leaks and disposal of environmental pollution, including storage, transportation, and handling during the performance of the Work or Contractor's obligations under the Contract which occur as a result of, or are contributed by, the negligence or actions of Contractor or its personnel, agents, or Subcontractors or any failure to perform in accordance with the Contract Documents (except to the extent otherwise void under ORS 30.140). Nothing in this section F.5.1 shall limit Contractor's responsibility for obtaining insurance coverages required under Section G.3 of this Contract, and Contractor shall take no action that would void or impair such coverages.

F.5.1.1 Contractor agrees to promptly dispose of such spills, releases, discharge or leaks to the satisfaction of Owner and regulatory agencies having jurisdiction in a manner that complies with Applicable Laws. Cleanup shall be at no cost to the Owner and shall be performed by properly qualified and, if applicable, licensed personnel.

F.5.1.2 Contractor shall obtain the Owner's written consent prior to bringing onto the Work site any (i) environmental pollutants or (ii) hazardous substances or materials, as the same or reasonably similar terms are used in any Applicable Laws. Notwithstanding such written consent from the Owner, the Contractor, at all times, shall:

(a) properly handle, use and dispose of all environmental pollutants and hazardous substances or materials brought onto the Work site, in accordance with all Applicable Laws;

(b) be responsible for any and all spills, releases, discharges, or leaks of (or from) environmental pollutants or hazardous substances or materials which Contractor has brought onto the Work site; and

(c) promptly clean up and remediate, without cost to the Owner, such spills, releases, discharges, or leaks to the Owner's satisfaction and in compliance with all Applicable Laws.

F.5.2 Contractor shall report all reportable quantity releases, as such releases are defined in Applicable Laws, including but not limited to 40 CFR Part 302, Table 302.4 and in OAR 340-142-0050 , to applicable federal, state, and local regulatory and emergency response agencies. Upon discovery, regardless of quantity, Contractor must telephonically report all releases to the Owner. A written follow-up report shall be submitted to Owner within 48 hours of the telephonic report. Such written report shall contain, as a minimum:

(a) Description of items released (identity, quantity, manifest numbers, and any and all other documentation required by law.)

(b) Whether amount of items released is EPA/DEQ reportable, and, if so, when reported.

(c) Exact time and location of release, including a description of the area involved.

(d) Containment procedures initiated.

(e) Summary of communications about the release between Contractor and members of the press or State , local or federal officials other than Owner.

(f) Description of cleanup procedures employed or to be employed at the site, including disposal location of spill residue.

(g) Personal injuries, if any, resulting from, or aggravated by, the release.

F.6 ENVIRONMENTAL CLEAN-UP

F.6.1 Unless disposition of environmental pollution is specifically a part of this Contract, or was caused by the Contractor (reference F.5 Environmental Contamination), Contractor shall immediately notify Owner of any hazardous substance(s) which Contractor discovers or encounters during performance of the Work required by this Contract. "Hazardous substance(s)" means any hazardous, toxic and radioactive materials and those substances defined as "hazardous substances," "hazardous materials," "hazardous wastes," "toxic substances," or other similar designations in any federal, state, or local law, regulation, or ordinance, including without limitation asbestos, polychlorinated biphenyl (PCB), or petroleum, and any substances, materials or wastes regulated by 40 CFR, Part 261 and defined as hazardous in 40 CFR S 261.3. In addition to notifying Owner of any hazardous substance(s) discovered or encountered, Contractor shall immediately cease working in any particular area of the project where a hazardous substance(s) has been discovered or encountered if continued work in such area would present a risk or danger to the health or well being of Contractor's or any Subcontractor's work force, property or the environment.

F.6.2 Upon being notified by Contractor of the presence of hazardous substance(s) on the project site, Owner shall arrange for the proper disposition of such hazardous substance(s).

F.7 FORCE MAJEURE

A party to this Contract shall not be held responsible for delay or default due to Force Majeure acts, events or occurrences unless they could have been avoided by the exercise of reasonable care, prudence, foresight, and diligence by that party. The Owner may terminate this Contract upon written notice after determining that delay or default caused by Force Majeure acts, events or occurrences will reasonably prevent successful performance of the Contract.

SECTION G
INDEMNITY, BONDING, AND INSURANCE

G.1 RESPONSIBILITY FOR DAMAGES / INDEMNITY

G.1.1 Contractor shall be responsible for all damage to property, injury to persons, and loss, expense, inconvenience, and delay that may be caused by, or result from, the carrying out of the Work to be done under this Contract, or from any act, omission or neglect of the Contractor, its Subcontractors, employees, guests, visitors, invitees and agents.

G.1.2 To the fullest extent permitted by law, Contractor shall indemnify, defend (with counsel approved by Owner) and hold harmless the Owner, Architect/Engineer, Architect/Engineer's

consultants, and their respective officers, directors, agents, employees, partners, members, stockholders and affiliated companies (collectively "Indemnitees") from and against all liabilities, damages, losses, claims, expenses (including reasonable attorney fees), demands and actions of any nature whatsoever which arise out of, result from or are related to, (a) any damage, injury, loss, expense, inconvenience or delay described in this Section G.1., (b) any accident or occurrence which happens or is alleged to have happened in or about the project site or any place where the Work is being performed, or in the vicinity of either, at any time prior to the time the Work is fully completed in all respects, (c) any failure of the Contractor to observe or perform any duty or obligation under the Contract Documents which is to be observed or performed by the Contractor, or any breach of any agreement, representation or warranty of the Contractor contained in the Contract Documents or in any subcontract, (d) the negligent acts or omissions of the Contractor, a Subcontractor or anyone directly or indirectly employed by them or any one of them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder (except to the extent otherwise void under ORS 30.140), and (e) any lien filed upon the project or bond claim in connection with the Work. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section G.1.2.

G.1.3 In claims against any person or entity indemnified under Section G.1.2 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section G.1.2 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

G.2 PERFORMANCE AND PAYMENT SECURITY; PUBLIC WORKS BOND

G.2.1 When the Contract Price is $100,000 or more (or $50,000 or more in the case of Contracts for highways, bridges and other transportation projects), the Contractor shall furnish and maintain in effect at all times during the Contract Period a performance bond in a sum equal to the Contract Price and a separate payment bond also in a sum equal to the Contract Price. Contractor shall furnish such bonds even if the Contract Price is less than the above thresholds if otherwise required by the Contract Documents.

G.2.2 Bond forms furnished by the Owner and notarized by awarded Contractor's surety company authorized to do business in Oregon are the only acceptable forms of performance and payment security, unless otherwise specified in the Contract Documents.

G.2.3 Before execution of the Contract the Contractor shall file with the Construction Contractors Board, and maintain in full force and effect, the separate public works bond required by Oregon Laws 2005, Chapter 360, and OAR 839-025-0015, unless otherwise exempt under those provisions. The Contractor shall also include in every subcontract a provision requiring the Subcontractor to have a public works bond filed with the Construction Contractors Board before starting Work, unless otherwise exempt, and shall verify that the Subcontractor has filed a public works bond before permitting any Subcontractor to start Work.

G.3 INSURANCE

G.3.1 Primary Coverage: Insurance carried by Contractor under this Contract shall be the primary coverage. The coverages indicated are minimums unless otherwise specified in the Contract Documents.

G.3.2 Workers' Compensation: All employers, including Contractor, that employ subject workers who work under this Contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. This shall include Employer's Liability Insurance with coverage limits of not less than the minimum amount required by statute for each accident. Contractors who perform the Work without the assistance or labor of any employee need not obtain such coverage if the Contractor certifies so in writing. Contractor shall ensure that each of its Subcontractors complies with these requirements. The Contractor shall require proof of such Workers' Compensation coverage by receiving and keeping on file a certificate of insurance from each Subcontractor or anyone else directly employed by either the Contractor or its Subcontractors.

G.3.3 Builder's Risk Insurance:

G.3.3.1 Builder's Risk: During the term of this Contract, for new construction the Contractor shall obtain and keep in effect Builder's Risk insurance on an all risk forms, including earthquake and flood, for an amount equal to the full amount of the Contract, plus any changes in values due to modifications, Change Orders and loss of materials added. Such Builder's Risk shall include, in addition to earthquake and flood, theft, vandalism, mischief, collapse, transit, debris removal, and architect's fees ("soft costs") associated with delay of project due to insured peril. Any deductible shall not exceed $50,000 for each loss, except the earthquake and flood deductible which shall not exceed 2 percent of each loss or $50,000, whichever is greater. The deductible shall be paid by Contractor if Contractor is negligent. The policy will include as loss payees Owner, the Contractor and its Subcontractors as their interests may appear.

G.3.3.2 Builder's Risk Installation Floater: For Work other than new construction, Contractor shall obtain and keep in effect during the term of this Contract, a Builder's Risk Installation Floater for coverage of the Contractor's labor, materials and equipment to be used for completion of the Work performed under this Contract. The minimum amount of coverage to be carried shall be equal to the full amount of the Contract. The policy will include as loss payees Owner, the Contractor and its Subcontractors as their interests may appear. Owner may waive this requirement at its sole and absolute discretion.

G.3.3.3 Such insurance shall be maintained until Owner has occupied the facility.

G.3.3.4 A loss insured under the Builder's Risk insurance shall be adjusted by the Owner and made payable to the Owner as loss payee. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner. The Owner shall have power to adjust and settle a loss with insurers.

G.3.4 General Liability Insurance:

G.3.4.1 Commercial General Liability: Upon issuance of a Supplement, Contractor shall obtain, and keep in effect at Contractor's expense for the term of the Supplement, Commercial General Liability Insurance covering bodily injury and property damage in the amount of $1,000,000 per claim and $2,000,000 per occurrence in a form satisfactory to Owner. This insurance shall include personal injury liability, products and completed operations, and contractual liability coverage for the

indemnities provided under this Contract (to the extent contractual liability coverage for the indemnity is available in the marketplace), and shall be issued on an occurrence basis.

G.3.4.2 Automobile Liability: Contractor shall obtain, at Contractor's expense, and keep in effect during the term of this Contract, Automobile Liability Insurance covering owned, and/or hired vehicles, as applicable. The coverage may be written in combination with the Commercial General Liability Insurance. Contractor shall provide proof of insurance of not less than $1,000,000 per claim and $2,000,000 per occurrence. Contractor and its Subcontractors shall be responsible for ensuring that all non-owned vehicles maintain adequate Automobile Liability insurance while on site.

G.3.4.3 Owner may adjust the insurance amounts required in Section G.3.4.1 and G.3.4.2 based upon institution specific risk assessments through the issuance of Supplemental General Conditions and a Supplement.

G.3.4.4 "Tail" Coverage: If any of the required liability insurance is arranged on a "claims made" basis, "tail" coverage will be required at the completion of this Contract for a duration of 36 months or the maximum time period available in the marketplace if less than 36 months. Contractor shall furnish certification of "tail" coverage as described or continuous "claims made" liability coverage for 36 months following Final Completion. Continuous "claims made" coverage will be acceptable in lieu of "tail" coverage, provided its retroactive date is on or before the effective date of this Contract. Owner's receipt of the policy endorsement evidencing such coverage shall be a condition precedent to Owner's obligation to make final payment and to Owner's final acceptance of Work or services and related warranty (if any).

G.3.4.5: Umbrella Liability (if required by Owner through issuance of Supplemental General Conditions): Contractor shall obtain, at Contractor's expense, and keep in effect during the term of this Contract, Umbrella liability Insurance over and above the general liability, automobile liability and workers' compensation coverage if required by Owner in specified limits at time of requirement.

G.3.4.6 Pollution Liability (if required by Owner through issuance of Supplemental General Conditions): Contractor shall obtain, at Contractor's expense, and keep in effect during the term of this Contract, Pollution liability Insurance in minimum amounts of $3,000,000 naming Owner as "additional insured," as noted in the "additional insured section below.

G.3.5 Additional Insured: The general liability insurance coverage, professional liability, umbrella, and pollution liability if required, shall include the Owner as additional insureds but only with respect to the Contractor's activities to be performed under this Contract.

If Contractor cannot obtain an insurer to name the Owner as additional insureds, Contractor shall obtain at Contractor's expense, and keep in effect during the term of this Contract, Owners and Contractors Protective Liability Insurance, naming the Owner as additional insureds with not less than a $2,000,000 limit per occurrence. This policy must be kept in effect for 36 months following Final Completion. As evidence of coverage, Contractor shall furnish the actual policy to Owner prior to execution of the Contract.

G.3.6 Notice of Cancellation or Change: If the Contractor receives a non-renewal or cancellation notice from an insurance carrier affording coverage required herein, or receives notice that coverage no longer complies with the insurance requirements herein, Contractor agrees to notify Owner by fax within five (5) business days with a copy of the non-renewal or cancellation notice, or written specifics as to which coverage is no longer in compliance. When notified by Owner, the Contractor agrees to stop Work pursuant to this Contract, unless all required insurance remains in effect. Any failure to comply with the reporting provisions of this insurance, except for the potential exhaustion of aggregate limits, shall not affect the coverages provided to the Owner and its institutions, divisions, officers, and employees.

Owner shall have the right, but not the obligation, of prohibiting Contractor from entering the Work site until a new certificate(s) of insurance is provided to Owner evidencing the replacement coverage. The Contractor acknowledges and agrees that Owner reserves the right to withhold payment to Contractor until evidence of reinstated or replacement coverage is provided to Owner.

G.3.7 Certificate(s) of Insurance: As evidence of the insurance coverage required by this Contract, the Contractor shall furnish certificate(s) of insurance to the Owner prior to execution of the Contract. The certificate(s) will specify all of the parties who are additional insureds or loss payees for this contract. Insurance coverage required under this Contract shall be obtained from insurance companies or entities acceptable to the Owner and that are eligible to provide such insurance under Oregon law. Eligible insurers include admitted insurers that have been issued a certificate of authority from the Oregon Department of Consumer and Business Services authorizing them to conduct an insurance business and issue policies of insurance in the state of Oregon, and certain non-admitted surplus lines insurers that satisfy the requirements of applicable Oregon law and which are subject to approval by the Owner. The Contractor shall be financially responsible for all deductibles, self-insured retentions and/or self-insurance included hereunder. Any deductible, self-insured retention and/or self-insurance in excess of $50,000 shall be subject to approval by the Owner in writing and shall be a condition precedent to the effectiveness of any Supplement.

G.3.8 Retainer Contract Program: For the OUS Retainer Contract Program the term "Contract" as used in this Section G in the phrases "keep in effect during the term of this Contract" and "prior to execution of the Contract" shall mean each Retainer Contract Supplement issued under the Retainer Contract.

SECTION H
SCHEDULE OF WORK

H.1 CONTRACT PERIOD

H.1.1 Time is of the essence. The Contractor shall at all times carry on the Work diligently, without delay and punctually fulfill all requirements herein. If required by the Contract Documents, Contractor shall commence Work on the site within fifteen (15) Days of Notice to Proceed, unless directed otherwise.

H.1.2 Unless specifically extended by Supplement Amendment , all Work shall be complete by the date contained in the Contract Documents. The Owner shall have the right to accelerate the completion date of the Work, which may require the use of overtime. Such accelerated Work schedule shall be an acceleration in performance of Work under Section D.1.2 (f) and shall be subject to the provisions of Section D.1.

H.1.3 The Owner shall not waive any rights under the Contract by permitting the Contractor to continue or complete in whole or in part the Work after the date described in Section H.1.2 above.

H.2 SCHEDULE

H.2.1 Contractor shall provide, by or before the pre-construction conference, the initial as-planned schedule for review and acceptance by the Owner. The submitted schedule must illustrate Work by project components, with labor trades, and long lead items broken down by

building and/or floor where applicable. If Owner shall so elect, Contractor shall provide the schedule in CPM format showing the graphical network of planned activities, including i) a reasonably detailed list of all activities required to complete the Work; ii) the time and duration that each activity will take to completion; and iii) the dependencies between the activities. Schedules lacking adequate detail, or unreasonably detailed, will be rejected. The schedule shall include the following: Notice to Proceed or the date the Work commences, if no Notice to Proceed is issued by Owner, Substantial Completion, and Final Completion. Schedules shall be updated monthly, unless otherwise required by the Contract Documents, and submitted with the monthly application for payment. Acceptance of the Schedule by the Owner does not constitute agreement by the Owner as to the Contractor's sequencing, means, methods, or durations. Any positive difference between the Contractor's scheduled completion and the Contract completion date is float owned by the Owner. Owner reserves the right to negotiate the float if it is deemed to be in Owner's best interest to do so. In no case shall the Contractor make a claim for delays if the Work is completed within the Contract Time but after Contractor's scheduled completion. **H.3 PARTIAL OCCUPANCY OR USE**

H.3.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage, provided such occupancy or use is consented to by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have reasonably accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, insurance or self-insurance, maintenance, heat, utilities, and damage to the Work, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents with respect to such portion of the Work. Approval by the Contractor to partial occupancy or use shall not be unreasonably withheld. Immediately prior to such partial occupancy or use, the Owner and Contractor shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work. Partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

SECTION I
CORRECTION OF WORK

I.1 CORRECTION OF WORK BEFORE FINAL PAYMENT

The Contractor warrants to the Owner that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects, and that the Work will conform to the requirements of the Contract Documents. Work failing to conform to these requirements shall be deemed defective. Contractor shall promptly remove from the premises and replace all defective materials and equipment as determined by the Owner, whether incorporated in the Work or not. Removal and replacement shall be without loss or expense to the Owner, and Contractor shall bear the cost of repairing all Work destroyed or damaged by such removal or replacement. Contractor shall be allowed a period of no longer than thirty (30) Days after Substantial Completion for completion of defective (Punch List) work. At the end of the thirty-day period, or earlier if requested by the Contractor, Owner shall arrange for inspection of the Work by the Architect/Engineer. Should the work not be complete, and all corrections made, the costs for all subsequent reinspections shall be borne by the Contractor. If Contractor fails to complete the Punch List work within the thirty (30) Day period, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within ten (10) Days after demand without affecting Contractor's obligations.

I.2 WARRANTY WORK

I.2.1 Neither the final certificate of payment nor any provision of the Contract Documents shall relieve the Contractor from responsibility for defective Work and, unless a longer period is specified, Contractor shall correct all defects that appear in the Work within a period of one year from the date of issuance of the written notice of Substantial Completion by the Owner except for latent defects which will be remedied by the Contractor at any time they become apparent. The Owner shall give Contractor notice of defects with reasonable promptness. Contractor shall perform such warranty work within a reasonable time after Owner's demand. If Contractor fails to complete the warranty work within such period as Owner determines reasonable, or at any time in the event of warranty work consisting of emergency repairs, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within ten (10) Days after demand, without affecting Contractor's obligations. The Contractor shall perform the warranty Work by correcting defects within twenty-four (24) hours of notification by Owner, unless otherwise specified in the Contract Documents. Should the Contractor fail to respond within the specified response time, the Owner may, at its option, complete the necessary repairs using another contractor or its own forces. If Owner completes the repairs using Owner's own forces, Contractor shall pay Owner at the rate of one and one-half (1½) times the standard hourly rate of Owner's forces, plus related overhead and any direct non-salary costs. If Owner completes the repairs using another contractor, Contractor shall pay Owner the amount of Owner's direct costs billed by the other contractor for the work, plus the direct salary costs and related overhead and direct non-salary expenses of Owner's forces who are required to monitor that contractor's work. Work performed by Owner using Owner's own forces or those of another contractor shall not affect the Contractor's contractual duties under these provisions, including warranty provisions.

I.2.2 Nothing in this Section I.2 shall negate guarantees or warranties for periods longer than one year including, without limitation, such guarantees or warranties required by other sections of the Contract Documents for specific installations, materials, processes, equipment or fixtures.

I.2.3 In addition to Contractor's warranty, manufacturer's warranties shall pass to the Owner and shall not take effect until such portion of the Work covered by the applicable warranty has been accepted in writing by the Owner.

I.2.4 The one-year period for correction of Work shall be extended with respect to portions of Work performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work, and shall be extended by corrective Work performed by the Contractor pursuant to this Section, as to the Work corrected. The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

I.2.5 Nothing contained in this Section I.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the period for correction of Work as described in this Section I.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

I.2.6 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Price will be reduced as appropriate and

equitable. Such adjustment shall be effected whether or not final payment has been made.

SECTION J
SUSPENSION AND/OR TERMINATION OF THE WORK

J.1 OWNER'S RIGHT TO SUSPEND THE WORK

J.1.1 The Owner has the authority to suspend portions or all of the Work due to the following causes:

(a) Failure of the Contractor to correct unsafe conditions;

(b) Failure of the Contractor to carry out any provision of the Contract;

(c) Failure of the Contractor to carry out orders;

(d) Conditions, in the opinion of the Owner, which are unsuitable for performing the Work;

(e) Time required to investigate differing site conditions;

(f) Any reason considered to be in the public interest.

J.1.2 The Owner shall notify Contractor and the Contractor's Surety in writing of the effective date and time of the suspension, and Owner shall notify Contractor and Contractor's surety in writing to resume Work.

J.2 CONTRACTOR'S RESPONSIBILITIES

J.2.1 During the period of the suspension, Contractor is responsible to continue maintenance at the project just as if the Work were in progress. This includes, but is not limited to, protection of completed Work, maintenance of access, protection of stored materials, temporary facilities, and clean-up.

J.2.2 When the Work is recommenced after the suspension, the Contractor shall replace or renew any Work damaged during the suspension, remove any materials or facilities used as part of temporary maintenance, and complete the Work in every respect as though its prosecution had been continuous and without suspension.

J.3 COMPENSATION FOR SUSPENSION

J.3.1 Depending on the reason for suspension of the Work, the Contractor or the Owner may be due compensation by the other party. If the suspension was required due to acts or omissions of Contractor, the Owner may assess the Contractor actual costs of the suspension in terms of administration, remedial work by the Owner's forces or another contractor to correct the problem associated with the suspension, rent of temporary facilities, and other actual costs related to the suspension. If the suspension was caused by acts or omissions of the Owner, the Contractor may be due compensation which shall be defined using Section D, Changes in Work. If the suspension was required through no fault of the Contractor or the Owner, neither party shall owe the other for the impact.

J.4 OWNER'S RIGHT TO TERMINATE CONTRACT

J.4.1 The Owner may, without prejudice to any other right or remedy, and after giving Contractor seven (7) Days' written notice and an opportunity to cure, terminate the Contract in whole or in part under the following conditions:

(a) If Contractor should, voluntarily or involuntarily, seek protection under the United States Bankruptcy Code and Contractor as debtor-in-possession or the Trustee for the estate fails to assume the Contract within a reasonable time;

(b) If Contractor should make a general assignment for the benefit of Contractor's creditors;

(c) If a receiver should be appointed on account of Contractor's insolvency;

(d) If Contractor should repeatedly refuse or fail to supply an adequate number of skilled workers or proper materials to carry on the Work as required by the Contract Documents, or otherwise fail to perform the Work in a timely manner;

(e) If Contractor should repeatedly fail to make prompt payment to Subcontractors or for material or labor, or should disregard laws, ordinances or the instructions of the Owner; or

(f) If Contractor is otherwise in breach of any part of the Contract.

(g) If Contractor is in violation of Applicable Laws, either in the conduct of its business or in its performance of the Work.

J.4.2 At any time that any of the above occurs, Owner may exercise all rights and remedies available to Owner at law or in equity, and, in addition, Owner may take possession of the premises and of all materials and appliances and finish the Work by whatever method it may deem expedient. In such case, the Contractor shall not be entitled to receive further payment until the Work is completed. If the Owner's cost of finishing the Work exceeds the unpaid balance of the Contract Price, Contractor shall pay the difference to the Owner.

J.5 TERMINATION FOR CONVENIENCE

J.5.1 Owner may terminate the Contract in whole or in part whenever Owner determines that termination of the Contract is in the best interest of Owner or the public.

J.5.2 The Owner shall provide the Contractor with seven (7) Days prior written notice of a termination for Owner's or for public convenience. After such notice, the Contractor shall provide the Owner with immediate and peaceful possession of the premises and materials located on and off the premises for which the Contractor received progress payment under Section E. Compensation for Work terminated by the Owner under this provision will be according to Section E. In no circumstance shall Contractor be entitled to lost profits for Work not performed due to termination.

J.6 ACTION UPON TERMINATION

J.6.1 Upon receiving a notice of termination, and except as directed otherwise by the Owner, Contractor shall immediately cease placing further subcontracts or orders for materials, services, or facilities. In addition, Contractor shall terminate all subcontracts or orders to the extent they relate to the Work terminated and, with the prior written approval of the Owner, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts and orders.

J.6.2 As directed by the Owner, Contractor shall, upon termination, transfer title and deliver to the Owner all Record Documents, information, and other property that, if the Contract had been completed, would have been required to be furnished to the Owner.

I.6.3 Upon Owner's notice of termination pursuant to either Section J.4 or J.5, if Owner shall so elect, Contractor shall assign to the Owner such subcontracts and orders as Owner shall specify. In

the event Owner elects to take assignment of any such subcontract or order, Contractor shall take such action and shall execute such documents as Owner shall reasonably require for the effectiveness of such assignment and Contractor shall ensure that no contractual arrangement between it and its subcontractors or suppliers of any tier or sub-tier shall prevent such assignment.

SECTION K
CONTRACT CLOSE OUT

K.1 RECORD DOCUMENTS

As a condition of final payment (and subject to the provisions of section E.6), Contractor shall comply with the following: Contractor shall provide Record Documents for the entire project to Owner. Record Documents shall depict the project as constructed and shall reflect each and every change, modification, and deletion made during the construction. Record Documents are part of the Work and shall be provided prior to the Owner's issuance of final payment. Record Documents include all modifications to the Contract Documents, unless otherwise directed, and accurate MWESB Reports.

K.2 OPERATION AND MAINTENANCE MANUALS

As part of the Work, Contractor shall submit two completed operation and maintenance manuals ("O & M Manuals") for review by the Owner prior to submission of any pay request for more than 75% of the Work. Owner's receipt of the O & M Manuals shall be a condition precedent to any payment thereafter due. The O & M Manuals shall contain a complete set of all submittals, all product data as required by the specifications, training information, telephone list and contact information for all consultants, manufacturers, installer and suppliers, manufacturer's printed data, record and shop drawings, schematic diagrams of systems, appropriate equipment indices, warranties and bonds. The Owner shall review and return one O & M Manual for any modifications or adjustments required. Prior to submission of its final pay request, Contractor shall deliver three (3) complete and approved sets of O & M Manuals to the Owner and Owner's receipt of the O & M Manuals shall be a condition precedent to Owner's obligation to make final payment.

K.3 COMPLETION NOTICES

K.3.1 Contractor shall provide Owner written notice of both Substantial and Final Completion. The certificate of Substantial Completion shall state the date of Substantial Completion, the responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and the time within which the Contractor shall finish all items on the Punch List accompanying the Certificate. Both completion notices must be signed by the Contractor and the Owner to be valid. The Owner shall provide the final signature on the approved notices. The notices shall take effect on the date they are signed by the Owner.

K.3.2 Substantial Completion of a facility with operating systems (e.g., mechanical, electrical, HVAC) shall be that degree of completion that has provided a minimum of thirty (30) continuous Days of successful, trouble-free operation, which period shall begin after all performance and acceptance testing has been successfully demonstrated to the Owner. All equipment contained in the Work, plus all other components necessary to enable the Owner to operate the facility in the manner that was intended, shall be complete on the Substantial Completion date. The Contractor may request that a Punch List be prepared by the Owner with submission of the request for the Substantial Completion notice.

K.4 TRAINING

As part of the Work, and prior to submission of the final application for payment, the Contractor shall schedule with the Owner training sessions for all equipment and systems as required by the Contract Documents. Contractor shall schedule training sessions at least two weeks in advance of the date of training to allow Owner to provide its personnel with adequate notice. The O & M Manual shall be used as a basis for training. Training shall be a formal session conducted at the Work site after the equipment and/or system is completely installed and operational in its normal operating environment.

K.5 EXTRA MATERIALS

As part of the Work, Contractor shall provide spare parts, extra maintenance materials, and other materials or products in the quantities specified in the Contract Documents prior to final payment. Delivery point for extra materials shall be designated by the Owner.

K.6 ENVIRONMENTAL CLEAN-UP

As part of the Final Completion notice, or as a separate written notice submitted with or before the notice of Final Completion, the Contractor shall notify the Owner that all environmental and pollution clean-up, remediation and closure have been completed in accordance with all Applicable Laws and pursuant to the authority of all agencies having jurisdiction, and Contractor shall provide Owner with any and all documentation related to the same, including but not limited to directives, orders, letters, certificates and permits related to or arising from such environmental pollution. The notice shall reaffirm the indemnification given under Section F.5.1 above. Contractor's completion of its obligations under this Section K.6 and Owner's receipt of documents evidencing such completion shall be a condition precedent to Owner's obligation to make final payment.

K.7 CERTIFICATE OF OCCUPANCY

Owner's receipt of an unconditioned certificate of occupancy from the appropriate state and/or local building officials shall be a condition precedent to Owner's obligation to make final payment, except to the extent failure to obtain an unconditional certificate of occupancy is due to the fault or neglect of Owner.

K.8 OTHER CONTRACTOR RESPONSIBILITIES

The Contractor shall be responsible for returning to the Owner all property of Owner issued to Contractor during construction such as keys, security passes, site admittance badges, and all other pertinent items. Upon notice from Owner, Contractor shall be responsible for notifying the appropriate utility companies to transfer utility charges from the Contractor to the Owner. The utility transfer date shall not be before Substantial Completion and may not be until Final Completion, if the Owner does not take beneficial use of the facility and the Contractor's forces continue with the Work.

K.9 SURVIVAL

All warranty and indemnification provisions of this Contract, and all of Contractor's other obligations under this Contract that are not fully performed by the time of Final Completion or termination, shall survive Final Completion or any termination of the Contract.

OREGON UNIVERSITY SYSTEM

STANDARD PUBLIC IMPROVEMENT CONTRACT

PERFORMANCE BOND

Bond No._____
Solicitation _____
Project Name _____

_____(Surety #1)	Bond Amount No. 1:	$_____
_____(Surety #2)*	Bond Amount No. 2:*	$_____
* *If using multiple sureties*	Total Penal Sum of Bond:	$_____

We, _____as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto the State of Oregon, acting by and through the State Board of Higher Education, on behalf of the OUS (OUS), the sum of (Total Penal Sum of Bond)

_____

(Provided, that we the Sureties bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety), and

WHEREAS, the Principal has entered into a contract with the OUS, the plans, specifications, terms and conditions of which are contained in the above-referenced Solicitation;

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, and schedule of contract prices, are made a part of this Performance Bond by reference, whether or not attached to the contract (all hereafter called "Contract"); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and all authorized modifications of the Contract which increase the amount of the work, the amount of the Contract, or constitute an authorized extension of the time for performance, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal herein shall faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things undertaken by Contractor to be performed under the Contract, upon the terms set forth therein,

and within the time prescribed therein, or as extended as provided in the Contract, with or without notice to the Sureties, and shall indemnify and save harmless the OUS, and _____(name of institution and any other Owner agency), and members thereof, its officers, employees and agents, against any direct or indirect damages or claim of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the Contract by the Principal or its subcontractors, and shall in all respects perform said contract according to law, then this obligation is to be void; otherwise, it shall remain in full force and effect.

Nonpayment of the bond premium will not invalidate this bond, nor shall the State of Oregon or the OUS, be obligated for the payment of any premiums.

This bond is given and received under authority of ORS Chapters 279C and 351, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES.

Dated this _____ day of _____, 20__.

PRINCIPAL: _____

By_____
Signature

_____
Official Capacity

Attest: _____
Corporation Secretary

SURETY: _____
[Add signatures for each surety if using multiple bonds]

BY ATTORNEY-IN-FACT:
[Power-of-Attorney must accompany each surety bond]

_____
Name

_____
Signature

_____
Address

_____
City State Zip

_____ _____
Phone Fax

OREGON UNIVERSITY SYSTEM

STANDARD PUBLIC IMPROVEMENT CONTRACT

PAYMENT BOND

Bond No. _____
Solicitation _____
Project Name _____

_____(Surety #1)	Bond Amount No. 1:	$ _____
_____(Surety #2)*	Bond Amount No. 2:*	$ _____
** If using multiple sureties*	Total Penal Sum of Bond:	$ _____

We, _____, as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto the State of Oregon, acting by and through the State Board of Higher education, on behalf of the Oregon University System (OUS), the sum of (Total Penal Sum of Bond) _____ _____
(Provided, that we the Sureties bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety), and

WHEREAS, the Principal has entered into a contract with the OUS, the plans, specifications, terms and conditions of which are contained in above-referenced Solicitation;

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, and schedule of contract prices, are made a part of this Payment Bond by reference, whether or not attached to the contract (all hereafter called "Contract"); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and schedule of contract prices which are set forth in the Contract and any attachments, and all authorized modifications of the Contract which increase the amount of the work, or the cost of the Contract, or constitute authorized extensions of time for performance of the Contract, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal shall faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things by it undertaken to be performed under said Contract and any duly authorized modifications that are made, upon the terms set forth therein, and within the time prescribed therein, or as extended therein as provided in the Contract, with or without notice to the Sureties, and shall indemnify and save harmless the OUS and _____ (name of institution and any other Owner agency), and members thereof, its officers, employees and agents, against any claim for direct or indirect damages of every kind and description that shall be suffered or

claimed to be suffered in connection with or arising out of the performance of the Contract by the Contractor or its subcontractors, and shall promptly pay all persons supplying labor, materials or both to the Principal or its subcontractors for prosecution of the work provided in the Contract; and shall promptly pay all contributions due the State Industrial Accident Fund and the State Unemployment Compensation Fund from the Principal or its subcontractors in connection with the performance of the Contract; and shall pay over to the Oregon Department of Revenue all sums required to be deducted and retained from the wages of employees of the Principal and its subcontractors pursuant to ORS 316.167, and shall permit no lien nor claim to be filed or prosecuted against the State on account of any labor or materials furnished; and shall do all things required of the Principal by the laws of this State, then this obligation shall be void; otherwise, it shall remain in full force and effect.

Nonpayment of the bond premium will not invalidate this bond, nor shall the State of Oregon, or the OUS be obligated for the payment of any premiums.

This bond is given and received under authority of ORS Chapters 279C and 351, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES:

Dated this _____day of _____, 20__.

PRINCIPAL: _____

By _____
Signature

_____
Official Capacity

Attest: _____
Corporation Secretary

SURETY: _____
[Add signatures for each if using multiple bonds]

BY ATTORNEY-IN-FACT:
[Power-of-Attorney must accompany each bond]

_____
Name

_____
Signature

_____
Address

_____
City State Zip

_____
Phone Fax

RETAINER CONTRACT SUPPLEMENT
OUS RETAINER CONTRACT FOR CONSTRUCTION RELATED SERVICES

Supplement No.
Project Name
Owner's Project Manager

This Retainer Contract Supplement dated (the "Supplement") is entered into between:

"Contractor":

Federal Tax ID No.

and "Owner": The State of Oregon, acting by and through the State Board of Higher Education, on behalf of:

(collectively, the "Parties") pursuant to the Retainer Contract for Construction Related Services between the Parties terminating June 30, 2014 (the "Retainer Contract"). Capitalized terms have the meaning defined in the OUS Retainer General Conditions unless otherwise defined in the Retainer Contract or herein.

1. DESCRIPTION OF THE PROJECT. The project to which this Supplement pertains is described as follows: (the "Project").

2. WORK TO BE PERFORMED. Contractor shall perform the following work on the Project : (the "Work"). Contractor will perform the Work according to the terms and conditions of this Supplement and the Contract Documents, which are incorporated herein by this reference.

3. SCHEDULE. Contractor shall perform the Work according to the following schedule: (the "Schedule").

4. COMPENSATION. Owner shall compensate Contractor for Work ☐ (a) in the firm, fixed-price amount of $; or ☐ (b) on a time and materials basis subject to a maximum not-to-exceed price of $ _____; in accordance with the requirements of the OUS Retainer General Conditions. If the Work is performed on a time and materials basis, Contractor's listing of wage rates, material unit costs and overhead charges for the Work is attached to this Supplement.

The cost of the Work under this Supplement, even if this Supplement is later amended to include additional work, must not exceed the greater of $1,000,000 or the maximum allowable under

OAR 580-063-0030.

5. TERM. This Supplement is effective on the date it has been signed by every Party hereto and all approvals required by Applicable Law have been obtained (the "Effective Date"). No Work shall be performed or payment made prior to the Effective Date. Contractor shall perform its obligations in accordance with the Contract Documents, unless this Supplement is earlier terminated or suspended.

6. PERFORMANCE AND PAYMENT BONDS. The performance and payment bond requirements for this Project are as follows (check one of the following):

☐ As a condition precedent to the effectiveness of this Supplement and to Owner's obligation to make payment for the Work, Contractor shall provide the Owner with a performance bond and a separate payment bond in a sum equal to the Contract Price stated in Section 4 of this Supplement.

☐ This Project has a Contract price of $100,000 or less, and Owner has determined that performance and payment bonds will not be required for this Project.

7. MINIMUM WAGE RATES.

☐ Prevailing Wage Rates requirements do not apply to this Project because the maximum compensation for all Owner-contracted Work does not exceed $50,000.

☐ Prevailing Wage Rates requirements apply to this Project because the maximum compensation for all Owner-contracted Work is more than $50,000. Contractor and all subcontractors shall comply with the provisions of ORS 279C.800 through 279C.870, relative to Prevailing Wage Rates and the required public works bond, as outlined in Sections C.1, C.2 and G.2.3 of the OUS Retainer General Conditions. The Bureau of Labor and Industries (BOLI) wage rates and requirements set forth in the following BOLI booklet (and any listed amendments to that booklet), which are incorporated herein by reference, apply to the Work authorized under this Supplement:

PREVAILING WAGE RATES for Public Works Contracts in Oregon, ____, 20__, as amended _____, 20__ **[delete "as amended _____, 20__" if there have been no amendments since last rate change]**, which can be downloaded at the following web address:

[http://www.boli.state.or.us/BOLI/WHD/PWR/pwr_book.shtml]

The Work will take place in _____ County, Oregon.

8. TAX COMPLIANCE CERTIFICATION. Contractor hereby certifies and affirms, under penalty of perjury as provided in ORS 305.385(6), that, to the best of Contractor's knowledge, Contractor is not in violation of any of the tax laws described in ORS 305.380(4). For purposes of this certification, "tax laws" means a state tax imposed by ORS 320.005 to 320.150 and 403.200 to 403.250, ORS Chapters 118, 314, 316, 317, 318, 321 and 323; the elderly rental assistance program under ORS 310.630 to 310.706; and local taxes administered by the Oregon Department of Revenue under ORS 305.620.

9. INSURANCE REQUIREMENTS.

☐ Contractor shall comply with and obtain the insurance coverage amounts stated in the OUS Retainer General Conditions.

☐ The Owner has determined that the Contractor shall obtain insurance in the amount described in the Retainer Supplemental General Conditions, attached hereto.

10. KEY PERSONS. ☐ If checked here, the following provision is incorporated into this Supplement:

The Parties agree that certain Contractor personnel are specifically valuable to the Project ("Key Persons"). Key Persons shall not be replaced during the Project without the written consent of Owner, which shall not be unreasonably withheld. If Contractor intends to substitute personnel, Owner shall receive the request at least 15 days prior to the effective date of substitution. When replacements have been approved by Owner, Contractor shall provide a transition period of at least 10 working days during which the original and replacement personnel shall be working on the Project concurrently. Upon authorization for the replacement of a Key Person, all subsequent substitutions of that Key Person shall require Owner's written consent in accordance with this Section. The Key Persons for this Project are the following:

Project Executive: _____ shall be Contractor's Project Executive, and will provide oversight and guidance throughout the Project term.

Project Manager: _____ shall be Contractor's Project Manager and will participate in all meetings throughout the Project term.

Job Superintendent: _____ shall be Contractor's on-site Job Superintendent throughout the Project term.

Project Engineer: _____ shall be Contractor's Project Engineer, providing assistance to the Project Manager, and subcontractor and supplier coordination throughout the Project term.

11. OTHER TERMS. Except as specifically modified by this Supplement, all terms of the Retainer Contract remain unchanged.

12. EXECUTION AND COUNTERPARTS. This Supplement may be executed in several counterparts, each of which shall be an original, all of which shall constitute but one and the same instrument.

Contractor hereby confirms and certifies that the representations, warranties, and certifications contained in the Retainer Contract remain true and correct as of the Effective Date of this Supplement.

IN WITNESS HEREOF, the Parties have duly executed this Supplement as of the dates indicated below.

, Contractor

The State of Oregon, acting by and through

	the State Board of Higher Education, on behalf of , Owner
By: _____	By: _____
Title: _____	Title: _____
Date: _____	Date: _____

RETAINER CONTRACT SUPPLEMENT AMENDMENT
OUS RETAINER CONTRACT FOR CONSTRUCTION RELATED SERVICES

Supplement No.:
Amendment No.:
Project Name:

This Amendment dated to the Retainer Contract Supplement is entered into between:

"Contractor":

Federal Tax ID No.

and "Owner": The State of Oregon, acting by and through the State Board of Higher Education, on behalf of:

(collectively the "Parties") pursuant to the Retainer Contract for Construction Related Services between the Parties expiring June 30, 2014 (the "Retainer Contract"). Capitalized terms have the meaning defined in the OUS Retainer General Conditions unless otherwise defined in the Contract Documents.

1. SERVICES: The Work described in the Retainer Contract Supplement is being amended as follows**:** .

2. SCHEDULE. The schedule contained in Section 3 of the Retainer Contract Supplement is hereby replaced in its entirety with the following schedule: .

3. COMPENSATION. Section 4 of the Retainer Contract Supplement, is hereby replaced in its entirety with the following:

"Owner will compensate Contractor for Work ☐ (a) in the firm, fixed-price amount of $; or ☐ (b) on a time and materials basis subject to a maximum not-to-exceed price of $_____; in accordance with the requirements of the OUS Retainer General Conditions. If the Project is done on a time and materials basis, Contractor's listing of wage rates, material unit costs and overhead charges for the Work is attached to this Supplement.

The total cost of Work including the original amount contemplated in the Supplement and the additional amount contemplated in this Amendment, must not exceed the greater of $1,000,000 or the maximum allowable under OAR 580-063-0030."

4. TERM. This Amendment is effective on the date it has been executed by the Parties and all required approvals have been obtained (the "Effective Date"). No Work will be performed or payment made prior to the Effective Date.

5. TAX COMPLIANCE CERTIFICATION. Contractor hereby certifies and affirms, under penalty of perjury as provided in ORS 305.385(6), that, to the best of Contractor's knowledge, Contractor is not in violation of any of the tax laws described in ORS 305.380(4). For purposes of this certification, "tax laws" means a state tax imposed by ORS 320.005 to 320.150 and 403.200 to 403.250, ORS Chapters 118, 314, 316, 317, 318, 321 and 323; the elderly rental assistance program under ORS 310.630 to 310.706; and local taxes administered by the Oregon Department of Revenue under ORS 305.620.

6. EXECUTION AND COUNTERPARTS. This Amendment may be executed in several counterparts, each of which shall be an original, all of which shall constitute but one and the same instrument.

Contractor hereby confirms and certifies that the representations, warranties and certifications contained in the Retainer Contract and the Retainer Contract Supplement remain true and correct as of the Effective Date of this Amendment.

IN WITNESS HEREOF, the Parties have duly executed this Amendment as of the dates indicated below.

, Contractor	The State of Oregon, acting by and through the State Board of Higher Education, on behalf of , Owner
By: _____	By: _____
Title: _____	Title: _____
Date: _____	Date: _____

PREVAILING WAGE RATES

for

Public Works Contracts in Oregon

OREGON BUREAU OF LABOR AND INDUSTRIES

Brad Avakian
Commissioner
Bureau of Labor and Industries

Effective: January 1, 2013

http://www.oregon.gov/boli/WHD/PWR/Pages/January_2013_Index.aspx

CapCon MWESB Project Contract Report

File Version 4.10.13

Created: September 15, 2011/Updated 4/3/12

Purpose of File:

Each Fiscal year, the OUS campuses are required to report data to the State Legislature on Minority, Women and Emerging Small Business Contractors and Sub-Contractors who provide goods and services. Various statistics are calculated, based on the data input being provided by the contractors. This file is for the collection of the data for each project by contract. Each University will compile statistics associated with all of their contracts during each fiscal year. Once consolidated at the University level, the information is sent to OUS who in turn consolidates all of the information from the seven institutions and reports it to the Legislature.

General Information on how to use the file:

You will fill this form out at least twice for your project. Small projects that do NOT span over the end of a fiscal year (June 30 – July 1) will require two submittals (An Initial and a Final). Any project spanning over the end of a fiscal year will require three submittals (Initial, Year-End and Final). For larger projects that span over multiple fiscal years, the Year-End report will need to be submitted multiple times.

The first Submittal will always be the "Initial" report which is due within 10 days of the execution of the contract or in the case of a CM/GC contract, the establishment of an Early Work Amendment or Guaranteed Maximum Price Amendment.

At the end of every fiscal year, you are required to submit a "Year-End" report.

At the completion of the project you are required to submit a "Final" report.

2) The areas shaded in gray in the OVERALL PROJECT DATA section are for input by the Contractor. The gray portion of the "Individual Contractor/Sub-Contractor Data Entry Matrix" is also an area intended for Contractor input.

3) For some items, a drop-down box is provided. This is to maintain the consistency of data used to sort information.

4) For other items, simply type in the information. If the type of information typed in is incorrect, you will get an error message or your results may look incorrect. For example, when you enter a date, simply type it: 8/17/11. You do not need to spell out the month.

Saving your file:

1) FILE NAMING CONVENTION – All files submitted to the campus shall be named as defined by the following naming convention: (filename = FYXX_ContractNumber_SubmissionStatus)

FYXX = XX refers to the two digit extension of the year. Example "FY12" for Fiscal Year 2012.

Include an underscore between the FYXX and the Contract Number. There should be no blanks in the filename.

ContractNumber = Insert the number that is established on the front of your contract with the campus.

Include an underscore between the Contract Number and the Submission Status. There should be no blanks in the filename.2) SubmissionStatus = "I" for Initial; "Y" for Year end; "F" for Final. This should correspond with what you select at the top of the report as explained in item 1 of "Filling Out the Form" below.

Filling Out the Form:

1) Use the drop-down box adjacent to the REPORT BEING SUBMITTED heading to pick the corresponding report you are submitting for your project. This will establish highlighted headings (in light green) in the "Individual C/S-C Data Entry Matrix" & OPERALL PROJECT DATA sections that define for you which columns or rows should be completely filled out prior to submission.

2) Next, fill in the information in the OVERALL PROJECT DATA section. Again, rows highlighted in green will tell you which cells to fill in based upon the type of report being submitted. Only fill in the cells that are highlighted. The top 5 cells should remain the same for the duration of the reporting on the project. Cell B-11 should also remain unchanged after the initial submittal. Cells B-14 thru B-16 may change over the life of the project if you add additional sub-contractors as the project progresses.

3) Once you have completed the OVERALL PROJECT DATA section, begin entering each sub-contractor in the "Individual C/S-C Data Entry Matrix table. Columns F, J, K & L are drop-down selections in the table area. Just pick the appropriate response for these columns. There are "notes" that pop up as you select cells in the columns that helps explain what information is needed for each column.

4) **IMPORTANT:** Use the tab key to move across the columns. This is necessary in order to avoid generating false information in the cells so that calculations occur appropriately.

5) The first two rows of the Matrix are formatted to receive information. They will be identified in bright red when you make the selection of the type of form you are submitting (Cell B-1). To add another row that is properly formatted (like the rows above it), simply press the tab key when you get to the last column in the row you just filled in.

6) To change information in a cell, simply type over it or press the Delete key on your keyboard. Using other methods to change data can cause unwanted results. For example, copy and paste can add unwanted data. Using the spacebar to delete information actually leaves behind a space—which is a character—which will cause math errors.

7) You must have a State of Oregon Certification Number OR indicate that a contractor is self-identifying as a MWESB. If you have not filled in one of these, then the Name of the Contractor will remain bright red (which is an error symbol).

8) All cells in the CALCULATED REPORTING DATA section are automatically generated formulas and cannot be changed.

9) Columns to be completed are as follows:

Name of MWESB General/ Subcontractor: List each MWESB used on the project (all tiers). If you as the General, are an MWESB contractor, submit your information in the first row.

State of Oregon MWESB Certification Number: This is the number provided when a contractor or subcontractor applies for and receives this certification. Enter this number.

Self-Identified or Other Certified: If a sub-contractor indicates that they are a women, minority or emerging small business, but doesn't have certification, indicate here by identifying with a "Yes" by picking it from the drop-down box.

Initial Sub-Contract Value: This is the value of the subcontract-with the specific contractor listed, not to be confused with the value of the overall construction contract between the Contractor and the Owner. Once this number is entered, it should not change on subsequent submittals of the form.

Sub-Contract value billed within the fiscal year (July 1-June 30): This is the value for work performed during the year being reported. If your reporting requirements span multiple years due to the size of your project, this information may be replaced by new information for subsequent years.

Final Sub-Contract Value: This is the final value of the sub-contract, including any additions or deductions that occur over the course of the project.

MORE THAN ONE OF THE FOLLOWING CATEGORIES CAN BE SELECTED:

Minority-Owned: Certified by the State of Oregon or self-identifying; select Yes from the drop-down if it applies or leave blank if it does not.

Women-Owned: Certified by the State of Oregon or self-identifying; select Yes from the drop-down if it applies or leave blank if it does not.

Emerging Small Business: Certified by the State of Oregon or self-identifying; select Yes from the drop-down if it applies or leave blank if it does not apply.

10) Check your work prior to submitting the document to make sure that all cells in (light green) highlighted rows or columns are completed. If you do not have light green highlights showing up on your document, please return to #1 in this section and follow the directions given. REMEMBER TO SAVE YOUR FILE AGAIN NOW.

Submitting your Form:

Follow the directions as provided by the campus you are contracted with to submit this document. Typically you should be given an E-mail address within your contract transmittal or cover letter for which to submit the file.

Oregon University System

CapCon MWESB Subcontractor Report

REPORT BEING SUBMITTED	

OVERALL PROJECT DATA

Reporting Period	2011
Campus	
General Contractor's Name	
Contract Number	
Project Name	
Contract Execution Date (Date Contract was Signed by the Owner)	
Date of Final Payment Application	
Initial Total Contract Value	
Total Contract Value billed within the fiscal year (July 1 - June 30)	
Final Total Contract Value	
Total Number of Subcontractors Used on Project	
Total Number of First-Tier Subcontractors Used on Project	
Number of First-Tier MWESB Subcontractors	

CALCULATED REPORTING DATA (Self Calculating - No Data Entry)

Number of MWESB Subcontractors	0
% MWESB Subcontractors	
% First-Tier MWESB Subcontractors	

CERTIFIED MWESB TOTALS

Value Awarded to MWESB Contractors	$0.00
% Value Awarded to MWESB Contractors	
Value - **minority-owned** MWESB subcontractors	$0.00
% - **minority-owned** MWESB subcontractors	
Value - **women-owned** MWESB subcontractors	$0.00
% - **women-owned** MWESB subcontractors	
Value - **emerging small business** MWESB subcontractors	$0.00
% - **emerging small business** MWESB subcontractors	

SELF-IDENTIFIED or OTHER CERTIFIED MWESB TOTALS

Value - **self-identified or other certified** subcontractors	$0.00
% - **self-identified or other certified** subcontractors	

OVERALL PROJECT CONTRACT HISTORY

% Value Awarded to MWESB Contractors at Initial Contract	#DIV/0!
% Value Awarded to MWESB Contractors at Final Contract	#DIV/0!

FOR OFFICIAL USE ONLY:

Date Received by the Campus	
Initials of Campus staff who checked the document	

Oregon University System

CapCon MWESB Subcontractor Report

Name of MWESB General/ Subcontractor/ Supplier	State of Oregon MWESB Certification Number	Self-Identified or Other Certified	Initial Sub-Contract Value	Sub-Contract value billed within the fiscal year (July 1-June 30)	Final Sub-Contract Value	Minority-Owned	Women-Owned	Emerging Small Business

SECTION 01 1000

SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Watkins Geochemistry Isotope Lab CP12-128.

B. Owner's Name: University of Oregon.

C. The Project consists of the alteration of lab space on the second floor of Cascade Hall.

1.02 THIRD PARTY ENTITIES

A. Special inspections and testing.

B. Water and air balancing and testing.

C. Hazardous Material removal:

1. In the event the Contractor encounters material that is believed to be hazardous, asbestos containing, coated with lead-based paint, and /or oily debris the Contractor shall immediately stop work in the affected area and report the condition to the Facilities PM. At no time shall such material be handled or disposed of by the Contractor. The Contractor will cooperate with the Facilities PM, Facilities EH&S, and consultants, and abatement Contractors engaged by the UO.

1.03 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.

B. Owner intends to occupy the Project upon Substantial Completion.

C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

D. Schedule the Work to accommodate Owner occupancy.

1.04 CONSTRUCTION SCHEDULE MILESTONES

A. Substantial Completion to occur on or before August 30th, 2013.

B. Final Completion to occur on or before September 13th, 2013.

1.05 PERMIT FEES

A. Permit fees with the City of Eugene will be paid for by the University of Oregon.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Arrange use of site and premises to allow:

1. Owner occupancy.
2. Work by Others.
3. Work by Owner.

B. Provide access to and from site as required by law and by Owner:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
2. Do not obstruct roadways, sidewalks, or other public ways without permit.

C. Utility Outages and Shutdown:

1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
2. Do not disrupt or shut down utility services to the occupied spaces without 7 days notice to and coordination with Owner.
3. Prevent accidental disruption of utility services to other facilities.

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

1.02 SCHEDULE OF VALUES

A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

B. Forms filled out by hand will not be accepted.

C. Schedule of Values to be approved by the Architect and the Owner.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Form to be used: AIA G702, G703.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. Execute certification by signature of authorized officer.

F. All Contractor payment requests must be accompanied by all wage certificates for the billing period.

G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed .

H. Submit three copies of each Application for Payment.

I. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.04 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Price or Contract Time.
   2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 5 working days.

D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

E. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.

e. Credit for deletions from Contract, similarly documented.

2. Support each claim for additional costs with additional information:
   a. Origin and date of claim.
   b. Dates and times work was performed, and by whom.
   c. Time records and wage rates paid.
   d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

F. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Price.

H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

I. Promptly enter changes in Project Record Documents.

1.05 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7000.
   2. All keys checked out to Contractors must be returned to DPS and a receipt of return provided to Facilities PM by DPS.

END OF SECTION

SECTION 01 2600
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 DEFINITIONS

A. Request for Information (RFI): A written request from Contractor for an interpretation of Contract Documents. May be issued on Contractor's choice of forms. Architect will respond in writing as required.

B. Proposal Request (PR): A request from Architect to Contractor for changes to Contract Price and/or Contract Period for proposed changes to the Work.

C. Supplementary Instructions (SI): A written order, instruction, or interpretation to Contractor, executed on AIA Form G710, or other similar form designated by Architect, and signed by Architect, which authorizes minor changes in Work not altering Contract Price and/or Contract Period.

D. Construction Change Directive (CCD): A written order to Contractor, executed on AIA Form G714 and signed by Owner and Architect, which amends Contract Documents as described, and authorizes and requires Contractor to proceed with change affecting Contract Price and/or Contract Period, and for inclusion in subsequent Change Order.

E. Change Order: See General Conditions.

1.03 OWNER OR ARCHITECT INITIATED CHANGES

A. Proposal requests will include:
   1. Detailed description of change, including change location and products.
   2. Supplementary or revised Drawings and Specifications.
   3. When appropriate, projected time span for making change, and specific statement as to whether or not overtime Work is authorized.
   4. When appropriate, specific time period during which requested price will be considered valid.

B. Such request is for information only, and is not an instruction or authorization to execute the change or an order to stop Work in Progress.

C. The Architect may issue an Architect's Supplemental Instruction for issues not requiring an adjustment in Contract Price or time.

1.04 CONTRACTOR INITIATED CHANGES

A. Change Proposals shall include:
   1. Description of proposed change.
   2. Statement of reason for making change.
   3. Statement of effect upon Contract Price and Contract Period.
   4. Statement of effect upon Work of other Contractors.
   5. Statement of effect upon Work by Owner.
   6. Documentation supporting any change to Contract Price and/or Contract Period.

1.05 CONSTRUCTION CHANGE DIRECTIVE

A. Contractor to proceed with change in Work for subsequent inclusion in future Change Order.

B. Directive will describe Work changes with attachments of revised Contract Documents and the Contractor's proposal defining details of change, and designating any changes in Contract Price and/or Contract Period.

C. Owner and Architect will sign and date Construction Change Directive as authorization for Contractor to proceed with changes.

D. Contractor shall, if Contractor concurs, sign and date Construction Change Directive to indicate agreement with specified terms.

1.06 DOCUMENTATION OF PROPOSALS AND CLAIMS

A. Provide supporting documentation for the dollar value of each Proposal with sufficient substantiating data to allow Architect to evaluate proposal.

B. When requested by Architect, submit the following Cost and Time data:
   1. Labor required.
   2. Equipment required.
   3. Products required: Quantity required, Purchase source, Unit cost.
   4. Taxes, Insurance and Bonds.
   5. Credit for deleted Work similarly documented.
   6. Overhead and Profit.
   7. Amount of and justification for any change in Contract Period.

C. Support each claim for additional cost, and for Work done on time-and-material/force account basis with documentation as required for lump-sum proposal, plus the following information:
   1. Name of Owner's authorized agent who ordered Work, and date of order.
   2. Dates and times of Work performed, and by whom.
   3. Time records, including summary of hours worked, and hourly rates paid.
   4. Receipts and invoices for the following: Equipment used, including dates and time of use; Products used, including quantities; Subcontracts.

D. Notify Architect before proceeding with any Time & Material/Force Account Work. Obtain Architect's signature certifying the Time Sheets and Materials are accurate.

1.07 PREPARATION OF CHANGE ORDERS

A. Change Order will adjust Contract Price and/or Contract Period and may include more than one contract adjustment per Change Order.

1.08 LUMP-SUM/FIXED PRICE CHANGE ORDERS

A. Change Order contents will be based on, either:
   1. Architect's Proposal Request and Contractor's responsive Proposal as mutually agreed between Owner and Contractor.
   2. Contractor's Change Proposal as recommended by Architect, and as mutually agreed between Owner and Contractor.

B. Owner and Contractor will sign and date Change Order as authorization for Contractor to proceed with Changes.

1.09 TIME AND MATERIAL AND FORCE ACCOUNT (COST REIMBURSEMENT) CHANGE ORDERS

A. Architect and Owner will issue Construction Change Directive directing Contractor to proceed with changes.

B. At Change completion, Contractor shall submit itemized accounting of change with supporting data as specified above in "Documentation of Proposals and Claims."

C. Architect will determine allowable cost of such Work, as provided in Contract General Conditions.

D. Owner and Contractor will sign and date Change Order to indicate their agreement with specified terms.

1.10 CORRELATION OF CHANGE ORDERS WITH CONTRACTOR'S OTHER SUBMITTALS

A. Revise Schedule of Values and subsequent Request for Payment Forms to record each Change Order as separate item of Work, and to record adjusted Contract Price.

B. Revise Construction Schedule to reflect each change in Contract Period. Revise Subschedules to show changes for other items of Work affected by Changes.

C. Upon completion of Change Order Work, record pertinent changes in Record Documents.

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.
B. Progress meetings.
C. Construction progress schedule.
D. Submittals for review, information, and project closeout.
E. Number of copies of submittals.
F. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. General and Supplemental Conditions of the Contract between Owner and General Contractor.
B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
C. Section 01 7800 - Closeout Submittals: Project record documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Owner will schedule a meeting after Notice of Award.
B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.
C. Agenda:
   1. Designation of key personnel and complete list of sub-contractors with contact information.
   2. Construction schedule.
   3. Owner occupancy, schedule, and activities requiring accommodation and/or coordination.
   4. Site safety and access specific to project.
   5. Critical work sequencing and long-lead items.
   6. Procedures for processing field decisions, Change Orders, RFI's, testing & inspecting, applications for payment, submittals, etc.
   7. Distribution of Contract Documents as needed.
   8. Use of the site, campus premises, and existing building(s).
   9. Work restrictions.
   10. Temporary facilities and controls.
   11. Parking availability.
   12. Office, work and storage areas.
   13. Equipment deliveries and priorities.
   14. Site security.
   15. Progress cleaning.
   16. Submittal schedule.
   17. All shut-off locations.
   18. Define a plan to reduce impact to building users regarding application of finishes, paints, adhesives, etc.
   19. Facilities EH&S items:
      a. List of emergency contacts and contact information.
      b. Process for accessing emergency assistance.
      c. Process for spills and clean-up.

d. UO expectations regarding maintaining safe conditions for UO employees, students, visitors, construction workers, etc. including odors, egress, avoidance of fire alarms, etc.

D. Architect to record minutes and distribute electoronic copies within two days after meeting to participants and those affected by decisions made.

3.02 PROGRESS MEETINGS

A. Schedule and administer weekly progress meetings throughout progress of the Work.

B. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.

C. Agenda:
1. Review minutes of previous meetings.
2. Review of Work progress.
3. Owner schedule and activities requiring accommodation and/or coordination.
4. Field observations, problems, and decisions.
5. Site access & utilization and any changes due to construction or delivery activities.
6. Work hours and notification of evening or weekend events needing notification to campus.
7. Identification of problems that impede, or will impede, planned progress.
8. Review of submittals schedule and status of submittals.
9. 2 to 3 week detailed schedule of coming weeks activities and scheduled shutdowns.
10. Corrective measures to regain projected schedules.
11. Status of correction of deficient items.
12. Planned progress during succeeding work period.
13. Maintenance of quality and work standards.
14. Proposal Request progress, status, and outstanding questions / responses.
15. RFI progress, status, and outstanding questions / responses.
16. Change Order status and budget update(s).
17. Payment Request status.
18. Other business relating to Work.

D. Record minutes and distribute copies within two days after meeting to participants, with electronic copies to Architect, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

F. Construction Schedule to include the following:
1. All UO Owner (building users & neighbors, Facilities Services, etc.) activities and milestones are to be listed.
2. All OFCI and OFOI items, delivery dates, and completion dates are to be listed.
3. All required shutdowns must be requested by the Contractor to Facilities PM a minimum of 2 weeks in advance.
4. For all disruptive, noise, odor, etc. work within occupied buildings (or close to neighboring buildings) the Contractor must notify Facilities PM for distribution of such notice to campus a minimum of 48hrs prior to start of such work.
5. All commissioning activities and milestones are to be listed.

3.04 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - CLOSEOUT SUBMITTALS.

3.05 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.06 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

3.07 NUMBER OF COPIES OF SUBMITTALS

A. Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Extra Copies at Project Closeout: See Section 01 7800.

C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.08 SUBMITTAL PROCEDURES

A. Transmit each submittal with approved form.

B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

E. Schedule submittals to expedite the Project, and coordinate submission of related items.

F. Documents for Owner Concurrent Review:
   1. The following submittals are to be submitted for concurrent Owner Review and Approval prior to official submittal acceptance:
      a. Building controls
      b. Light fixtures
      c. Backflow devices
      d. Fire alarm systems
      e. Fire sprinkler components

G. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

H. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

I. Provide space for Contractor and Architect review stamps.

J. When revised for resubmission, identify all changes made since previous submission.

K. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

L. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01 3400
SHOP DRAWINGS, PRODUCT DATA, SAMPLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 DESCRIPTION

A. Submit to the Architect shop drawings, samples, and product data (such as Manufacturer's standard schematic drawings and other literature) when required by individual Specification sections.

B. Related work specified elsewhere:
   1. Instructions to Bidders
   2. General Conditions of the Contract.

1.03 QUALITY ASSURANCE

A. Process submittals in ample time for review, as applicable, so as to not delay the work. All submittals shall be received by the Architect within fourteen (14) days of the Award of Contract.

1.04 DEFINITIONS

A. The Architect will mark reviewed materials as follows:
   1. “No Exception Taken” - which means fabrication, manufacture, and/or installation may proceed.
   2. “Make Revisions Noted” - which means fabrication, manufacture, and/or installation may proceed with revisions as noted.
   3. “Revise and Resubmit” - which means fabrication, manufacture, and/or installation may not proceed.
   4. “Rejected” - which means do not proceed. Make arrangements to re-review the proposed work with the Architect as soon as possible.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Review submittals, make necessary corrections, and become familiar with the content of the submittals prior to turning the material over to the Architect. Mark each item with a stamp or by some other means to indicate that such is the case.

B. Accompany submittals with a transmittal letter bearing the project name, Contractor's name, number of items, and other pertinent data.

C. Mark or tag each submittal to show the date and the names of the project, Architect, Contractor, Origination Subcontractor, Manufacturer or Supplier, and Separate Detailer if pertinent. Also, identify the specification section where the particular item is specified in the project manual.

D. Keep one copy of each reviewed item on the job site at all times.

3.02 SPECIFIC REQUIREMENTS, SHOP DRAWINGS

A. Identify shop drawing details by reference to sheet and detail numbers shown on the Drawings.

B. Unless otherwise specified in an individual section, submit three prints of each shop drawing.
   1. PDF submittal will be accepted in lieu of prints at Contractor's option unless otherwise noted.

C. Be responsible for obtaining and distributing prints of shop drawings to the various suppliers, the Owner, and the Architect once approval is obtained. Make prints of revised shop drawings only from prints which carry the Architects appropriate stamp and endorsement.

3.03 SPECIFIC REQUIREMENTS, SAMPLES

A. Insure that samples are of sufficient size to indicate the general visual effect or color. Where samples must show a range of color, texture, finish, graining or other property, submit sets of pairs illustrating the full scope of this range.

B. One (1) sample or one (1) set of approved samples will be retained by the Architect. Final work will be measured against approved samples.

3.04 SPECIFIC REQUIREMENTS, PRODUCT DATA

A. Modify standard product data to delete information which is not applicable to this project. Supply additional data, if required, to show clearly what is intended.

B. Modify Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data to show the specific product application intended for the project.

C. Unless otherwise specified in an individual Specification Section, submit four (4) copies of each submittal item.

END OF SECTION

SECTION 01 4219
REFERENCE STANDARDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 QUALITY ASSURANCE

A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.

C. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations and procedures.

E. Procedures for Owner-supplied products.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 REFERENCE STANDARDS

A. 16 CFR 260 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; current edition.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Do not use products having any of the following characteristics:
   1. Made of wood from newly cut old growth timber.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Will provide the same warranty for the substitution as for the specified product.
   3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

D. Substitution Submittal Procedure:
   1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
   2. Substitution Request Form:
      a. During Bidding: CSI Form 1.5C
   3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   4. The Architect will notify Contractor in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

B. Transport and handle products in accordance with manufacturer's instructions.

C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Prevent contact with material that may cause corrosion, discoloration, or staining.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

Project: UO CP12-128
Watkins Geochemistry Isotope Lab

Substitution Request Number: _____

From: _____

To: _____

Date: _____

_____

A/E Project Number: _____

Re: _____

Contract For: _____

Specification Title: _____

Description: _____

Section: _____ Page: _____

Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

Form Version: November 2010
CSI Form 1.5C

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.
   6. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.
      d. Description of proposed work and products to be used.
      e. Effect on work of Owner or separate Contractor.
      f. Written permission of affected separate Contractor.
      g. Date and time work will be executed.

1.03 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.04 PROJECT CONDITIONS

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

D. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.05 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

G. Attachment to Existing Floor Slabs: The existing elevated concrete floor slab contains electrical conduit. Proper locations for attachment of required anchorage to the underside of the slab shall be determined by x-ray analysis of the area of attachment.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

D. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

G. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

H. Clean existing systems and equipment.

I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

J. Do not begin new construction in alterations areas before demolition is complete.

K. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-conforming work.

9. Infill penetrations left by abandonned services.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Notify Architect when work is considered ready for Substantial Completion.

C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.

D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.

E. Notify Architect when work is considered finally complete.

F. Complete items of work determined by Architect's final inspection.

END OF SECTION

SECTION 01 7700
CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 DESCRIPTION

A. The requirements specified in this section relate to all Contractors individually performing under these Contract Documents:
   1. Final Review and Payment.

B. Related work specified elsewhere:
   1. General Conditions.
   2. Section 01 3400, Shop Drawings, Product Data, Samples.

1.03 MANUFACTURER'S TECHNICAL SERVICES INSPECTION REPORT

A. After all work has been completed by the Contractor, if required by individual specification sections, technical service representatives of certain Manufacturers of materials shall inspect the installation of those materials and give final approval in writing.

1.04 FINAL REVIEW AND PAYMENT

A. Prior to completion, the Contractor shall inspect the work and make a “punch list” noting all items that are incomplete and/or incorrect.

B. The Contractor shall notify all subcontractors in writing of incomplete and/or incorrect items. Notify far enough in advance of the Completion Date that the work can be completed on schedule. Said work shall be immediately corrected.

C. Should conditions prevail which prohibit some elements of the work from being accomplished, but the work in place will perform the primary function, the Contractor shall record the reason with this “punch list” item requesting temporary delay in completion from the Architect in writing.

D. Notify the Architect in writing that all items are completed and ready for final review or else that the work product is fully useable, but some listed deficiencies remain to be completed. Submit all Record Documents at this time.

E. The Architect will review all documents. When the documents include a Contractor's request for delay in completion, the Architect will review all work which is certified as complete to the best knowledge of the Contractor. The Architect will also review the listed incomplete work and assign a value to such uncompleted work.

F. The Architect will review the work for conformance. If the work is found to be in nonconformance, the Architect will notify the Owner of the nonconforming items. Nonconforming items not affecting the weather protection capabilities of the roof and having no effect on the Roofing Manufacturer's Warranty will enable the Architect to recommend Owner “Occupancy”, which indicates completed work elements will be accepted but requiring retainage of monies and a Contract Change Order to ensure the Contractor will complete all work by a specific date as stated on the Change Order.

G. The Contractor shall make the required corrections to the work expeditiously. Upon Owner Occupancy, sufficient retainage monies will be held to pay for uncompleted work, should the contractor fail to perform. A letter will be addressed to the Contractor informing the Contractor of the project status and the monies available for a semi-final payment upon receipt of billing. The Contractor may be back-charged for reviews of the work that are requested, but discovered to be in nonconformance.

H. The contractor has two (2) weeks from issue of the Punch List to make all required corrections. All related administrative cost accrued beyond the two (2) week limit will be transferred to the contractor.

I. When Contract closeout procedures are completed and all punch list items have been corrected, final acceptance by the Owner will be documented. The Contractor will receive written notice of acceptance of the Work and notification that final payment may be billed and released.

J. Upon Contractor's receipt of final acceptance by the Owner, the Contractor shall have two (2) weeks within which to present a final billing to the Owner. All related administrative cost accrued beyond the two (2) week limit will be transferred to the contractor.

K. All guarantees shall commence and become effective beginning on the date of Final Acceptance by the Owner.

PART 2 PRODUCTS

PART 3 EXECUTION

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit 3 sets of revised final documents in final form within 10 days after final inspection.

C. Record Drawings: Submit (1) set of marked-up Record Prints

D. Record Specifications: Submit (2) copies of Project's Specifications, including addenda and contract modifications.

E. Permit Set: Submit original permit set with all sign-offs.

F. Digital files: Submit (2) electronic disks with the following ditigal files on each:
   1. Record Drawings: pdf
   2. Record Specifications: pdf
   3. Operations and Maintenance Data: pdf
   4. As-Built Drawing File: AutoCAD

G. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.

2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Changes made by Addenda and modifications.

F. Record Drawings : Legibly mark each item to record actual construction including:
1. Field changes of dimension and detail.
2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

C. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

D. Provide servicing and lubrication schedule, and list of lubricants required.

E. Include manufacturer's printed operation and maintenance instructions.

F. Include sequence of operation by controls manufacturer.

G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

H. Additional Requirements: As specified in individual product specification sections.

3.05 OPERATION AND MAINTENANCE MANUALS

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

B. Prepare data in the form of an instructional manual.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

B. Abandonment and removal of existing utilities and utility structures.

C. Selective demolition of concrete floors.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permit.
   6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

D. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

3.02 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.03 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

D. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

E. Verify that areas of elevated concrete floor slabs or other concrete construction selected for core drilling or other selective demo are void of utilities or critical structural reinforcement prior to demolition. Verification shall be done by x-ray analysis. Other means of assessment must be approved by the architect and owner prior to use.

3.04 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

D. Contractor may not use Owner's dumpsters.

END OF SECTION

SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Structural steel framing members, support members and struts.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc.; 2005.

B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 2005.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

2.03 FINISH

A. Leave structural steel members un-primed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.03 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

B. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

C. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

B. Product Data: Provide data on product characteristics, performance ratings, and limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
   3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. With minimum 3 years documented experience installing work of this type.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 FIRESTOPPING - GENERAL REQUIREMENTS

A. Firestopping: Any material meeting requirements.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction.

C. Install labeling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9005
JOINT SEALERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Sealants and joint backing.

1.03 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants; 2010.

B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2011.

C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2011a.

D. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating sealant chemical characteristics.

1.05 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

PART 2 PRODUCTS

2.01 SEALANTS

A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
   1. Color: Match adjacent finished surfaces.
   2. Applications: Use for: Locations that are not exposed to the interior of the Cleanroom.
      a. Interior wall and ceiling control joints.
      b. Joints between door and window frames and wall surfaces.
      c. Other interior joints for which no other type of sealant is indicated.

C. Silicone Sealant: ASTM C920, Grade NS, Class 25, Uses NT, A, G, M, O; single component, solvent curing, non-sagging, non-staining, fungus resistant, non-bleeding.
   1. Color: Match adjacent finished surfaces.
   2. Applications: Use for:Locations exposed to the interior of the Cleanroom.
      a. Joints betweeen finish systems.
      b. Joints between door/window frames and finish systems.

2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Install bond breaker where joint backing is not used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Tool joints concave.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

END OF SECTION

SECTION 08 1613
FIBERGLASS DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Fiberglass reinforced plastic (FRP) doors.

B. Frames for fiberglass reinforced plastic doors.

C. Glazing.

1.03 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Other door hardware.

B. Section 08 8000 - Glazing.

1.04 REFERENCE STANDARDS

A. ANSI A250.4 - American National Standard Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings; 2001.

B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2010.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard details, installation instructions, and hardware and anchor recommendations.

C. Shop Drawings: Show layout and profiles; include assembly methods.
   1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
   2. Indicate wall conditions, door and frame elevations, sections, materials, gages, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on Drawings to identify details and openings.

D. Selection Samples: Submit two complete sets of color charts, illustrating manufacturer's available finishes, colors, and textures.

E. Maintenance Data: Include instructions for repair of minor scratches and damage.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in installing products of the type specified in this section with not less than three years of documented experience.

C. Source limitations: Obtain fiberglass reinforced plastic doors and resin transfer molded fiberglass frames through one source fabricated from a single manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

B. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
   1. Store at temperature and humidity conditions recommended by manufacturer.
   2. Do not use non-vented plastic or canvas shelters.
   3. Immediately remove wet wrappers.

C. Store in position recommended by manufacturer, elevated minimum 4 inches (102 mm) above grade, with minimum 1/4 inches (6 mm) space between doors.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Warranty all fiberglass doors and frames for a period of 25 years against failure due to corrosion. Additionally, warranty all fiberglass doors and frames on materials and workmanship for a period of 10 years, including warp, separation or delamination, and expansion of the core.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Molded Fiberglass Doors and Frames:
   1. ChemPruf Door Company, Ltd : www.chem-pruf.com.
      a. No known equivalent.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOOR AND FRAME ASSEMBLIES

A. Door and Frame Assemblies: Factory-fabricated, prepared and machined for hardware.
   1. Mechanical Durability: Tested to ANSI A250.4 Level A (1,000,000 cycles), minimum; tested with hardware and fasteners intended for use on project.
   2. Screw-Holding Capacity: Tested to 900 psi (6200 kPa), minimum.
   3. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less; when tested in accordance with ASTM E84.
   4. Flammability: Self-extinguishing when tested in accordance with ASTM D635.
   5. Clearance Between Door and Frame: 1/8 inch (3 mm), maximum.
   6. Clearance between bottom of door and finished floor (or threshold where applicable): 3/4 inch.

2.03 COMPONENTS

A. Doors: Through-color gel coating on fiberglass reinforced polyester resin construction with reinforced core.
   1. Thickness: 1-3/4 inches (44 mm), overall.
   2. Door Construction: Molded in one piece including gel coating on all sides; manufacturer's standard subframe, core and faces fused during cure in mold; hardware reinforcements
   3. Core Material: Polyproplylene plastic honeycomb core with a non woven polyester veil.
   4. Subframe and Reinforcements: #2SFP of sufficient amount to adequately support required hardware and function of same..
   5. Door plate weight shall not be less than 0.97 lbs per square foot at a ratio of 30/70 glass to resin.
   6. Waterproof Integrity: All edges, cut-outs, and hardware preparations factory fabricated of fiberglass reinforced plastic; provide cut-outs with joints sealed independently of glazing or louver inserts or trim.
   7. Hardware Preparations: Factory reinforce, machine, and prepare for all hardware including field installed items; provide solid blocking for each hardware item; make field cutting, drilling or tapping unnecessary; obtain manufacturer's templates for hardware preparations.
   8. Gel Coating: Ultraviolet stabilized polyester, with smooth Semi-Gloss final finish.
   9. Gel Coating Thickness: Minimum 25 mils (0.63 mm) wet, plus/minus 3 mils (0.07 mm).
   10. Gel Coating Color: FDA White.

11. Window openings shall be provided for at time of manufacture and shall be completely sealed so that the interior of the door is not exposed to the environment

B. Frames: Profiles and dimensions as indicated on drawings; same type and construction used in mechanical durability test for doors.
   1. Construction for Non-Fire-Rated Doors and Windows:
      a. Molded fiberglass with gel-coating matching doors.
         1) Frames shall be manufactured using the resin transfer method creating one solid piece (non voids) with complete uniformity in color and size
         2) Core Material for frames: 2 psf polyurethane foam.
   2. Frame Profile: Basis of Design:
      a. Door frame: Chempruf Style 4
      b. Door sidelites: Chempruf Style 5
      c. Window frames: Chempruf Style 5
   3. Corner Joints: Seamless.
   4. Internal Reinforcement: Continuous within the structure to allow for mounting of specified hardware. Reinforcing material shall be a dense matrix of cloth glass fibers and premium resin with a minimum hinge screw holding value of 1000 lbs per screw. All reinforcing materials shall be completely encapsulated. Documented strength of frame screw holding value after third insert must be submitted. Dissimilar materials, such as steel, will be deemed unacceptable as reinforcement for hardware attachment.
   5. Frame Anchors: Stainless steel, Type 304; provide 3 anchors in each jamb for heights up to 84 inches (2130 mm) with one additional anchor for each additional 24 inches (610 mm) in height.
      a. Exposed surfaces of anchors are to be epoxy coated.

C. Hinge and Hardware Fasteners: Stainless steel, Type 304; wood screws.
   1. Exposed surfaces of fasteners are to be epoxy coated.

2.04 ACCESSORIES

A. Glazing stops: Resin transfer molded fiberglass.
   1. Doors: non-removable pharmcuetical window retainer flush with face of door.
   2. Windows: standard type recommended by manufacturer.

B. Glazing: As specified in Section 08 8000.

C. Hardware: As specified in Section 08 7100.

D. Thresholds:
   1. See door schedule for locations.
   2. Resin transfer molded fiberglass provided by same door manufacturer.
   3. ADA compliant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.

C. In stud walls, install frames prior to building walls; anchor frames to studs using concealed anchors.

3.03 ADJUSTING

A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.

B. Adjust hardware for smooth and quiet operation.

C. Adjust doors to fit snugly and close without sticking or binding.

3.04 CLEANING

3.05 PROTECTION

A. Protect installed products from damage during subsequent work.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Ceiling access door and frame units.

1.03 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

B. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

PART 2 PRODUCTS

2.01 ACCESS DOOR AND PANEL APPLICATIONS

A. Fire Rated Ceilings: See drawings for ceiling fire ratings.
   1. Material: Steel.
   2. Size: 18x18 inches (____ mm), unless otherwise indicated.
   3. Standard duty, hinged door.
   4. Tool-operated spring or cam lock; no handle.

2.02 WALL AND CEILING UNITS

A. Manufacturers:
   1. Acudor Products Inc; Product ____: www.acudor.com.
   2. Cendrex, Inc: www.cendrex.com.
   3. Karp Associates, Inc; Product ____: www.karpinc.com.
   4. Milcor by Commercial Products Group of Hart & Cooley, Inc; Product ____: www.milcorinc.com.

B. Access Doors: Factory fabricated door and frame units, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.
   1. Style: Exposed frame with door surface flush with frame surface.
   2. Door Style: Single thickness with rolled or turned in edges.
   3. Frames: 16 gage, 0.0598 inch (1.52 mm), minimum.
   4. Units in Fire Rated Assemblies: Fire rating as required by applicable code for the fire rated assembly in which they are to be installed.
      a. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.
   5. Steel Finish: Primed.
   6. Primed Finish: Polyester powder coat; manufacturer's standard color.
   7. Hardware:
      a. Hardware for Fire Rated Units: As required for listing.
      b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
      c. Latch/Lock: Screw driver slot for quarter turn cam latch.
      d. Number of Locks/Latches Required: As recommended by the manufacturer for the size of the unit.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings. Secure rigidly in place.

C. Position units to provide convenient access to the concealed work requiring access.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Hardware for FRP doors.

B. Weatherstripping, seals and door gaskets.

1.03 RELATED REQUIREMENTS

A. Section 08 1613 - Fiberglass Doors.

1.04 REFERENCE STANDARDS

A. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2010.

B. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Door hardware to be Contractor Furnished Contractor Installed (CFCI) unless noted to be Owner Furnished Contractor Installed (OFCI) within specific hardware groups.

B. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.

C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.

C. Keying Schedule: Submit for approval of Owner.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   1. Submit manufacturer's parts lists and templates.

F. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Hinges: 25% of installed quantity rounded up to the next whole unit for each hinge type.

1.07 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 DOOR HARDWARE - GENERAL

A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.

B. Provide all items of a single type of the same model by the same manufacturer.

C. Provide products that comply with the following:

1. Applicable provisions of federal, state, and local codes.
2. Fire-Rated Doors: NFPA 80.
3. All Hardware on Fire-Rated Doors : Listed and classified by UL as suitable for the purpose specified and indicated.
4. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.
5. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

D. Electrically Operated and/or Controlled Hardware: Provide all power supplies, power transfer hinges, relays, and interfaces required for proper operation; provide wiring between hardware and control components and to building power connection.

E. Finishes: Identified in schedule.

2.02 LOCKS AND LATCHES

A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
1. Hardware Sets indicate locking functions required for each door.
2. If no hardware set is indicated for a swinging door provide an office lockset.
3. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
4. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

D. Mounting heights for hardware from finished floor to center line of hardware item:
1. For FRP doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."

3.03 ADJUSTING

A. Adjust work under provisions of Section 01 7000.

B. Adjust hardware for smooth operation.

3.04 CLEANING

A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.05 PROTECTION

A. Protect finished Work under provisions of Section 01 7000.

B. Do not permit adjacent work to damage hardware or finish.

3.06 SCHEDULE - ATTACHED.

HARDWARE SETS

4.01 GROUP 1: SWING DOOR, CLASSROOM FUNCTION

A. Cleanroom, Non Fire-rated: Door 214A-1
1. Butts: (3) ea Stanley Concealed Bearing CB1960R (32D)

2. Lockset, Classroom: Schlage ND Series Rhodes with interchangeable Core Function, Classroom Lock ND70JD, 626.
3. Closer: LCN 4041, Reg. Duty Arm, 689.
4. Stop: Ives, Ives 411R-W Wall Bumper (Non-Metal)

4.02 GROUP 2: SWING DOOR, PUSH/PULL

A. Cleanroom, Non Fire-Rated: Doors 214B-1, 214C-1
   1. Surface Hinges: (4) ea Nylon Lightweight Self-Closing Spring Hinge.
      a. McMaster-Carr: Part No. 2133A42
      b. Color: Black
   2. Push Plate: Ives 8200 4" x 16".
      a. Finish: Epoxy Coated, Color to be selected by architect from standard color options for epoxy coatings.
   3. Pull Plate: Ives 8301-6 4" x 16" x Type G Mounting.
      a. Finish: Epoxy Coated, Color to be selected by architect from standard color options for epoxy coatings.
   4. Stop:
      a. Door 214B-1: Ives FS18S Floor Stop (No exposed metal)
      b. Door 214C-1: Ives 411R-W Wall Bumper (Non-metal)

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Glass.

1.03 RELATED REQUIREMENTS

A. Section 08 1613 - Fiberglass Doors and Frames

1.04 REFERENCE STANDARDS

A. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.

B. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 2012.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 50 degrees F (10 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

PART 2 PRODUCTS

2.01 GLAZING TYPES

A. Type S-1 - Single Vision Glazing:
   1. Applications: All interior glazing unless otherwise indicated.
   2. Type: Annealed float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch (6 mm).

B. Type S2 - Single Safety Glazing: Non-fire-rated.
   1. Applications: Provide this type of glazing in the following locations:
      a. Glazed lites in doors, except fire doors.
      b. Glazed sidelights to doors, except in fire-rated walls and partitions.
      c. Other locations required by applicable federal, state, and local codes and regulations.
      d. Other locations indicated on the drawings.
   2. Type: Fully tempered float glass as specified.
   3. Tint: Clear.
   4. Thickness: 1/4 inch (6 mm).

2.02 GLASS MATERIALS

A. Float Glass: All glazing is to be float glass unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
   2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

3.03 MANUFACTURER'S FIELD SERVICES

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.04 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.05 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Gypsum wallboard.

E. Joint treatment and accessories.

1.03 REFERENCE STANDARDS

A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)

B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).

C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2011a.

D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2011.

E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2011.

F. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2011.

G. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.

H. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2010a.

I. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2011.

J. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2010.

K. GA-600 - Fire Resistance Design Manual; Gypsum Association; 2009.

L. ICC (IBC) - International Building Code; 2012.

M. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. ICC IBC Item Numbers: Comply with applicable requirements of ICC IBC for the particular assembly.
   2. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
   3. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL Fire Resistance Directory.

2.02 METAL FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf (240 Pa).
   1. Studs: "C" shaped with flat or formed webs with knurled faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C shaped.

B. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.

C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

2.03 BOARD MATERIALS

A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   3. Thickness:
      a. Vertical Surfaces: 5/8 inch (16 mm).
      b. Ceilings: 5/8 inch (16 mm).

B. Backing Board For Wet Areas: Water-resistant gypsum backing board as defined by ASTM C 1396/C 1396M; sizes to minimum joints in place; ends square cut.
   1. Application: Vertical surfaces behind sinks and at walls adjacent to safety shower locations.
   2. Type X Thickness: 5/8"
   3. Edges: Tapered

C. Shaftwall and Coreboard: Type X; 1 inch (25 mm) thick by 24 inches (610 mm) wide, beveled long edges, ends square cut.
   1. Paper Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.

2.04 ACCESSORIES

A. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated.
   1. Types: As detailed or required for finished appearance.

B. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.

C. Screws for Attachment to Steel Members Less Than 0.03 inch (0.7 mm) In Thickness, to Wood Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type; cadmium-plated for exterior locations.

D. Screws for Attachment to Steel Members From 0.033 to 0.112 inch (0.8 to 2.8 mm) in Thickness: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.

B. Shaft Wall Liner: Cut panels to accurate dimension and install sequentially between special friction studs.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members at 12 inches (300 mm) on center.

C. Studs: Space studs as permitted by standard.
   1. Extend partition framing to structure where indicated and to 6" above ceiling plane in all other locations..
   2. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Blocking: Install mechanically fastened steel sheet blocking for support of:
   1. Wall mounted cabinets.

3.04 BOARD INSTALLATION

A. Comply with ASTM C 840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

3.06 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Resilient base.

1.03 REFERENCE STANDARDS

A. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

PART 2 PRODUCTS

2.01 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and as follows:
   1. Height: 4 inch (100 mm).
   2. Thickness: 0.125 inch (3.2 mm) thick.
   3. Finish: Satin.
   4. Color: Color as selected from manufacturer's standards.
      a. Room 210G and V214: Match adjacent RCB in 210G
      b. At base of Laboratory Cabinets: To be selected by Architect from standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

3.02 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.03 RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.04 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's instructions.

END OF SECTION

SECTION 09 6700
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Fluid-applied flooring and base.

1.03 REFERENCE STANDARDS

A. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2010.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available; and _____.

C. Samples: Submit two samples, 3x3 inch (____x____ mm) in size illustrating color and pattern for each floor material for each color specified.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing work of this section with minimum 3 years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

1.07 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F (13 degrees C).

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Resinous Flooring:
   1. Basis of Design Manufacturer: Subject to compliance with requirements, provide systems manufacturered by Stonhard or comparable product by one of the following:
      a. Stonhard (Basis of Design); www.stonhard.com
      b. Dudick; www.dudick.com
      c. Dur-A-Flex; www.dur-a-flex.com
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Epoxy Flooring System: Basis of Design: StonChem 602 Novolac Epoxy Resin System
   1. Primer: Two-component epoxy primer recommended by manufacturer.
   2. Mortarcoat: Three-component system including novolac epoxy resin, curing agent and finely divided mineral composite aggregate and a highly impermeable, mineral composite, novolac epoxy topcoat.
   3. Total thickness: 40 mil

4. Tensile Strength: 4,400psi (ASTM D-638)
5. Flexural Strength: 12,000psi (ASTM C-580)
6. Hardness: 85-90 (ASTM C-2240, shore D)
7. Bond Strength: >400psi (ASTM D-4541)
8. Abrasion Resistance: .07 gm max. weight loss (ASTM D-4060, CS-17)

2.03 ENGINEERING DETAILS

A. Joints and Cracks:
   1. Control joints shall be treated by lining manufacturer to assure bridging of potential cracks and to maintain monolithic protection.
   2. Cold joints or construction joints shall be treated by lining manufacturers to assure bridging potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.
   3. Vertical and horizontal expansion/contraction joints shall be honored by installing backer rod and compatible sealant after lining is installed. Sealant shall be sufficient to handle traffic conditions and chemical exposures in area.
   4. Cracks in vertical or horizontal concrete substrates shall be treated by lining manufacturer to assure bridging of cracks and to maintain monolithic protection.

2.04 ACCESSORIES

A. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to sub-floor surfaces.

3.02 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness required by manufacturer.

C. Finish to smooth level surface.

D. Cove at vertical surfaces where scheduled.

3.03 PROTECTION

A. Protect in accordance with manfacturer's recommendations.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, varnishes, and other coatings.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically so indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "drop" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Samples to be provided to architect for verification of match in color to adjacent existing wall finishes.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.05 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Provide all paint and coating products from the same manufacturer to the greatest extent possible.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
   1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each coating material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content:
   1. Provide coatings that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

D. Colors: As indicated in Color Schedule

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - All Interior Surfaces Indicated to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, plaster, uncoated steel, shop primed steel, galvanized steel, and aluminum.
   1. Two top coats and one coat primer.
   2. Top Coat(s): MPI Institutional Low Odor/VOC Interior Latex; MPI #143-148.
   3. Primer(s): As recommended by manufacturer of top coats.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Plaster and Stucco: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

H. Plaster Surfaces to be Painted: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finished coatings until completion of project.

B. Touch-up damaged coatings after Substantial Completion.

3.06 SCHEDULE - COLORS

A. Entry Vestibule V214:
   1. North, west and south walls - Match wall color of room 210G.

B. Main Lab 210G:
   1. West wall - Match adjacent wall color.

C. Typical Wall and Ceiling Color for Lab Spaces: Benjamin Moore 'China White'; 1412-0110 White Tint; 1402 Dolux or 1412 Ultra-Hide; 4 3yy 81/150.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.03 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2010.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguisher Cabinets and Accessories:
   1. CATO; Product 405-10 W: www.CATO2007.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Extinguishers: 2A10BC. Located as indicated on drawings.

2.03 FIRE EXTINGUISHER CABINETS

A. Construction:
   1. Polypropylene Cabinet: .15" thickness, white
   2. Acrylic Viewing Pane: .080" thickness
   3. Hinge: Stainless Steel

B. Type: Semi-Recessed

C. Inside Box Dimensions:
   1. 23-1/4" x 8-1/2" x 5-5/8"

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

C. Place extinguishers and accessories in cabinets.

END OF SECTION

SECTION 11 5300
LABORATORY EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vertical Laminar Flow Workstation

B. Base Cabinets for Laminar Flow Workstation

1.02 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide equipment dimensions and construction, equipment capacities, physical dimensions, utility and service requirements and locations, point loads .

C. Shop Drawings: Indicate equipment locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Laboratory Equipment:
   1. Salare, Inc; salareinc.com
      a. No known alternative manufacturer.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COMPONENTS

A. Vertical Laminar Flow Workstation:
   1. Product: VLF Series, Countertop Vertical Laminar Flow Filtering/Non-Ducted Work Station.
   2. Size: 4ft wide.
   3. Materials:
      a. Enclosure and Interior Surfaces: all white stress-relieved polypropylene, all heat seam welded and tested.
      b. Worksurface: 1/2" thick polypropylene reinforced to prevent deflection.
      c. Sash: Polycarbonate.
      d. The interior of the unit must be completely metal-free.
      e. All metal components (including fasteners) shall be replaced to the greatest extent possible with non-metal alternatives. Where it is not feasible to replace metal components in the construction, the components shall be coated or otherwise contained in a manner in which they do not contaminate the room environment.
   4. Features:
      a. Top located filtration system with a HEPA filter. The filter shall have an efficiency of 99.997% (H-14) down to 0.3 micron particle size, to achieve a class 100 environment at the work sruface.
      b. The filtration shall draw room air first through a 90% top located pre-filter and into a postiively pressurized plenum.
      c. A blower speed control devise shall be incorporated to allow adjustment of the clean air velocity.
      d. A minihelic pressure gauge shall indicatethe pressure drop across the main filter and helps determine the filter life
      e. Unit shall be supplied with a fluorescent light fixture sealed behind an polycarbonate lens.
      f. A hinged polycarbonate sash shall be secured with all plastic hardware with all edges smooth and beveled.

g. The unit shall be fabricated with a 5 inch deep double wall on the right side for services.
h. The unit meets and exceeds the current Federal Standard 209-E.
i. The main HEPA filter shall be accessed via a front removable access panel.
j. Electrical requirement is 120VAC, 60Hz, 2.1 Amps. Other voltages are available upon request.
k. Unit shall be provided with a corded electrical connection at the top of the unit.
    1) Minimum cord length: 6ft.
l. Unit shall be provided with a digital airflow monitor.

5. Integral Base Cabinet:
    a. Material: Polypropylene
    b. Width: match Vertical Laminar Flow Workstation.
    c. Height: provide hieght that locates worksurface of Vertical Laminar Flow Workstation at 34" Above Finish Floor.
    d. Reinforce per manufacturer's reccommendations to support weigh of Vertical Laminar Flow Workstation.
    e. Doors: as indicated in drawings.
    f. Comply with Section 12 3553.23 for fabrication requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with standards required by authority having jurisdiction.

C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

END OF SECTION

SECTION 11 5310
LABORATORY FUME HOODS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 RELATED SECTIONS

A. Section 20 10 00 – General Mechanical Provisions

B. Section 23 09 00 – Controls

1.03 SECTION INCLUDES

A. Chemical fume hoods.

B. Corrosive/acid storage cabinets.

C. Plumbing fixtures and valves.

1.04 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table. Operation & Maintenance Information required as indicated in the Product Table.

B. Operation & Maintenance Information requirements indicated by number designation as follows.
.

1. Shop Drawings (submittal data)
2. Product Data (submittal data)
3. Manufacturer's Operation Manuals
4. Manufacturer’s Service and Lubrication Requirements
5. Service Contracts and Field Start-up Reports
6. Cleaning, Certification, and Test Reports
7. System Information
8. Warranties

PRODUCT TABLE

0 & M INFORMATION	1	2	3	4	5	6	7	8
Fume Hoods	x	x	x			x		x
Plumbing Fixtures and Valves	x	x	x	x				x

1.05 DESCRIPTION OF WORK

A. Laboratory hoods, hood bases, cup sinks and plumbing fixtures as specified herein shall be furnished, installed, tested and factory pre-wired for single point connection by Owner's contractors. Furnish fume hoods with plumbing fixtures installed and pre-piped to outside of hood ready for connection by Owner's contractor.

1. Pre-pipe service fittings to single point connection for each service at 6 inches (150mm) above top of hood or as otherwise shown.
2. Pre-wire all electrical devices to junction box at top of hood. Provide wire terminal blocks and terminal identification.

B. Exhaust Requirements

1. Fume hoods and exhaust devices shall be designed to operate safely within the values indicated in the reference drawings. The airflow values provided on the reference drawings represent the total airflow through the fume hood or exhaust device, including the airflow through the sash or work opening, airfoil, bypass, and leakage, respectively, as they apply to particular devices. Exhaust devices shall operate at specified face velocity within total airflow scheduled.

2. Proposed modifications or corrections shall be reviewed and approved by Owner, Architect and Mechanical Engineer for any device that requires adjustment to operate within specified design requirements.

C. Accessibility for the Physically Disabled
1. Fume hoods shall be furnished to be installed in a manner to make them accessible to the disabled in accordance with the Americans with Disabilities Act and any state or local building code or regulation having jurisdiction. The height of the highest point of access to the work surface above finished floor shall not exceed 34 inches.

1.06 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of equipment with Owner to allow installation of hoods to fit project schedule times.

B. Protect finished surfaces from soiling or damage during handling and installation.

1.07 SEISMIC ANCHORING

A. Fume hoods shall be provided with seismic bracing such that they may be be seismically braced using a steel brace anchored to wall structural framing. Fume hood superstructure to be anchored to base cabinets.

B. Size of bracing members and anchors required shall be designed and drawings stamped by an Engineer registered in the State Of Oregon.
1. Fume hoods shall be designed and anchored in accordance with IBC Seismic Design requirements.

C. Restraint system and components shall be designed and installed to resist lateral loads in accordance with the current adopted State of Oregon Structural Specialty Code.

D. Seismic anchoring shall be achieved in a manner that does not expose metal surfaces to the interior of the room. Exposed anchors and fasteners shall be non-metallic, epoxy-coated, concealed, or otherwise encased to prevent metal exposure.

1.08 SUBMITTALS

A. Submit as specified herein and under provisions of Division 1 of the specifications.

B. Product Data: Submit manufacturer's data for each component and item of laboratory equipment specified. Include component dimensions, configurations, construction details, joint details, and attachments, utility and service requirements indicating location, size and service requirements for each utility connection.

C. Shop Drawings:
1. Submit complete shop fabrication and installation drawings, including plans, elevations, sections, dimensions, materials and metal gauge sizes, details, fittings, duct connections, schedules, and steam table piping and vents from cabinets below where applicable. Show relationship to adjoining materials and construction. Identify all connection points, locations and sizes to building services and systems. Provide clear identification where equipment requirements deviate from the service/utility provisions in the Construction Documents. Shop Drawings shall be in the form of reproducibles or photocopies, not to exceed 11 inches by 17 inches (A3) in size. Blueline prints are not acceptable.
2. Coordinate shop drawing submittals of both this Section and Section 12 35 53 so that each recognizes and incorporates each others products.

D. Finish: Submit 2 samples of manufacturer's standard colors of metal finish for hoods and other pre-finished equipment and accessories specified for selection by the Owner's Representative.

E. Certification: Submit certification by an independent testing company stating that equipment is installed per applicable and referenced codes and standards, adjusted and balanced for design operations, and is complete and ready for intended function.
1. Certify that fume hoods will not exceed design maximum at specified operating conditions.

F. Test Data: Submit test reports on each size and type of chemical fume hood verifying point of manufacture conformance to standards of ASHRAE-110-2006. Evaluation of manufacturer's

standard product shall take place in manufacturer's own test facility, with testing personnel, samples, apparatus, instruments, and test materials supplied by the manufacturer at no cost to the Owner.

G. Submit detailed anchorage and attachment drawings and calculations provided by a licensed Structural Engineer complying with the applicable Building Code seismic restraint requirements

H. Closeout Submittals:
   1. Operations/Maintenance Manuals: Accompanying certification, submit for Architect's review and Owner's use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, component parts list, wiring diagrams, and closest factory representative for components and service.

1.09 QUALITY ASSURANCE

A. Coordinate work of this Section with Section 12 35 53.23 Solid-Plastic Laboratory Casework.

B. Hoods and Cabinets shall be fully compliant with UL1805 Standard for Laboratory Hoods and Cabinets.

C. Provide interface products of style, material, finish, and color in order to produce a homogenous installation.

D. Single Source Responsibility: Laboratory fume hoods and laboratory equipment included in this specification section shall be manufactured or furnished by a single factory authorized laboratory supplier. Proposals from independent brokers or multiple suppliers will not be accepted.

E. The supplier for work in this section shall use established organizations with production facilities including test facilities in the manufacturing plant, tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of equipment specified, with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to complete an installation of this size and type within the required time limits:
   1. Ten years or more experience in manufacture of laboratory and equipment of type specified.
   2. Ten installations of equal or larger size and requirements within the last five years.

1.10 REFERENCES

A. SEFA Standard 2.2, Laboratory Hoods (Current Version).

B. SEFA Standard 8, Laboratory Casework (Current Version).

C. ASHRAE-110, latest edition, Method of Testing Performance of Fume Hoods.

D. American National Standards Institute/American Industrial Hygiene Association (ANSI/AIHA) Z9.5 "Standard for Laboratory Ventilation."

E. ASTM D580-98 (2010) e1, Standard Test Method for Water Absorbtion of Plastics.

F. ASTM D638-10 Standard Test Method for Tensile properties of Plastics.

G. ASTM D695-10, Standard Test Mehod for Compressive Properties of Plastics.

H. ASTM D790-10, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

I. ASTM D4101-10a, Standard Specification for Polypropylene Injection and Extrusion Materials.

J. ASTM E162-09, Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

K. National Fire Protection Association (NFPA) 45 "Standard on Fire Protection for Laboratories Using Chemicals."

L. Occupational Safety and Health Administration, Federal Register 29 CFR Part 1910, "Occupational Exposures to Hazardous Chemicals in Laboratories."

M. American Conference of Government Industrial Hygienists (ACGIH) "Industrial Ventilation."

PART 2 - PRODUCTS

2.01 CHEMICAL FUME HOODS

A. Manufacturers:
   1. Basis of Design Manufacturer: Subject to compliance with specified requirements, provide systems manufacturered by LabAire Systems or comparable product by one of the following:
      a. LabAire Systems (Basis of Design); www.labairesystems.com
      b. TFI Inline; www.tfiinlinedesign.net
      c. Salare, Inc.; www.salareinc.com
   2. Substitutions are not permitted.

B. UL LISTING
   1. Fume hoods shall be UL subject 1805 classified. Label shall be attached to the face of each fume hood indicating classification to the UL 1805 standard for Laboratory Fume Hoods.

C. MATERIALS AND FINISHES
   1. Unless otherwise specified, all main components of the hood and base cabinet are to be constructed of Unplasticized Polyvinylchloride (uPVC).
   2. Work Surface: uPVC
   3. Sash: Clear Polycarbonate 1/4"
   4. Sash Counterweight Connection: Kevlar-Reinforced Polyurethane Belt or equivalent assembly with no exposed metal.
   5. Adhesives/Sealants: 100% Silicone
   6. Fasteners: Manufacturer's standard recommended fasteners.
      a. Polypropylene screws
      b. Where steel screws/bolts are required for adequate fastening, anchorage or function of the equipment, they shall be encapsulated within gasketed non-metal enclosures or coated to fully seal off exposed metal surfaces from the room environment.
   7. Lighting: fixture fully encapsulated in gasketed non-metal plastic enclosure.
   8. Plumbing Fixtures:
      a. Provide polypropylene valves. Where metal components are required for function of valve these components shall be encapsulated within non-metal gasketed enclosures or coated such that metal surfaces are not exposed.

D. FUME HOOD TYPES
   1. High Performance/Low Velocity Chemical Fume Hoods:
      a. Basis of Design: LabAire Systems DynamicFlo Fume Hood, or equal as specified herein.
      b. Depth: Manufacturers standard depth. Approx. 33.5 inches exterior, nominal.
      c. Width: See schedule
      d. Design:
         1) Bypass Type for Constant Volume
            (a) Constant volume type with built-in automatic compensating bypass to maintain constant exhaust volume regardless of sash position.
            (b) Bypass: Positive in action and controlled by the sash operation.
            (c) low resistance opening at top of front lintel panel. Bypass shall provide a smooth down flow effect.
            (d) As sash is lowered to 6", bypass design shall limit the increase in face velocity to maximum of three times the average face velocity with the sash full open.
         2) Design fume hoods for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20 percent of the average face velocity at any designated measuring point as defined in this section.

(a) Fume hoods shall be designed to operate safely at face velocities of 60 feet per minute at 28.5" sash opening and 100 feet per minute at an 18" sash opening.
(b) Static pressure under the above listed operating face velocities shall not exceed 0.40 inches.

e. Noise Criteria: Test data of octave band analysis verifying hood is capable of a 50 NC value when connected to a 50 NC HVAC source. Reading shall be taken 3' in front of an open sash, 5' off the floor at 100 fpm face velocity.
f. Downdraft bypass: Low resistant type. All bypass air shall enter top of bypass chamber and enter hood in a downflow direction. Chamber shall protect user from expelled particulate in the event of an adverse internal reaction.
g. Airfoil: The airfoil shall allow ample room for electrical hospital grade cords to fit beneath the airfoil. Bottom horizontal foil shall provide nominal 1 inch (25.4mm) bypass when sash is in the closed position. Bottom foil shall not be removable without use of special tools.
h. Fume hood sash (Vertical): Full-view, frameless type with clear, unobstructed, side-to-side view of fume hood interior and service fixture connections.
i. Counter balance system: Single weight, counter balance system to prevent sash tilting and permit ease of operation at any point along full width pull. Design system to hold sash at any position without creep and to prevent sash drop in the event of chain failure. Sash shall open and close against rubber bumper stops.
1) Sash shall lower automatically to the operating position when released from any position above 18 inches (457mm).
j. Constant volume (Field convertible to variable volume).

E. FUME HOOD CONSTRUCTION
1. General: The main assembly shall be constructed of 1/2" thick white uPVC. Seams to be fully welded forming the rigid internal structure, with removable, white uPVC panels to enclose utilities and inner components. Panels shall be sized to accommodate ease of use and function. Standard overall dimensional tolerances shall be plus-or-minus 1/8".
2. Joints:
a. Welded joints shall be watertight.
b. Exterior welds shall be shaved flush with construction material to create a uniform surface.
3. Structure: The unit shall be constructed with the inner walls as the main support structure. Walls shall contain access ports to the utility areas, which shall be secured with white polypropylene screws. Ports shall be flush with the surrounding walls with lipped construction to reduce the potential of leakage. External walls shall be removable and shall be secured with white polypropylene screws.
4. Airfoil: The airfoil shall be constructed from white uPVC with additional bracing and mounting brackets spaced along the length of it.
5. Work Surface: The work surface shall be dished to accommodate additional spill retention. The surface shall be reinforced on the underside to add structural rigidity.
6. Viewing Panel and Sash: The front viewing panel shall be supported with a white uPVC frame. The sash shall be suspended with a counterweight that is encapsulated in plastic. The sash shall be attached with a kevlar-reinforced polyurethane belt and suspended a from polypropylene pulley system or an equivalent system utilizing non-metal components or adequate encapsulation of required metal components.
7. Electrical devices shall be contined in UL-listed PVC device boxes connected by PVC conduit. Device boxes shall be sealed and gasketed.
8. Provide PVC flange at the termination of the fume hood collar. Coordinate flange size and bolt pattern with the mechanical division contractor to ensure the external exhaust duct flange will mate with the collar flange. The elevation of the flange shall not exceed 92" AFF to allow 4" of clearance from the ceiling to allow the flange connection to be made.
9. Closure Panels: Provide additional panels to enclose the upper sections of the hood to the ceiling above and both sides of the hood from the room.

F. Basis of Design Hood Performance:
   1. Fume hood shall be designed to minimize static pressure loss with adequate slot area and exhaust collar configuration. Maximum average static pressure loss shall not exceed the following, at the design airflow and vertical sash height noted. The fume hood shall meet the following airflow and pressure loss requirements:
      a. High Performance Hood:

Manufacturer	Hood Size	Exhaust Air	Face Velocity/ Sash Hieght	Measured S.P.L. (W.G.)
LabAire	4ft Standard	440 CFM	100 F.P.M./18"	.30 inches
LabAire	6ft Standard	740 CFM	100 F.P.M./18"	.40 inches
TFI Inline	4ft Standard	500 CFM	100 F.P.M./18"	*
TFI Inline	6ft Standard	820 CFM	100 F.P.M./18"	*
Salare	4ft Standard	470 CFM	100 F.P.M./18"	.31 inches
Salare	6ft Standard	770 CFM	100 F.P.M./18"	.31 inches

   1. * Verification required by TFI Inline of shop verified compliance with minimum Static Pressure Loss requirements Section 2.01 D1 d, 2b.

G. FUME HOOD BASE CABINETS
   1. Vented Base Cabinets: Acid/Base cabinet storage cabinets for each hood as shown on the Fume Hood Elevation Drawings.
   2. Construction:
      a. Provide integrated venting of cabinets up through worksurface behind baffle. Venting shall provide approximately 10 air changes per hour in each cabinet.
      b. Construct base cabinets in compliance with Section 123553.23 Solid-Plastic Laboratory Casework.
      c. Cabinet Material: uPVC, color to match hood.
      d. Cabinet Dimensions:
         1) Full width and depth of hood.
         2) Height of cabinet shall place work surface of hood at 34" AFF.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the Work of this Section, carefully inspect the installed Work specified in other sections and verify that all such Work is complete to the point where this installation may properly commence.

B. Verify that all Work has been installed in complete accordance with the original design, received submittals, and the manufacturer's recommendations.

C. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 INSTALLATION

A. Work in this Section requires close coordination with Work specified in Divisions 22, 23, 25 and 26, as well as installation by Owner of Owner furnished components. Coordinate all Work to ensure an orderly process in the Project, without removal of previously installed Work, and so as to prevent damage to finishes and products.

B. Install all equipment in accordance with manufacturer’s written instructions, applicable codes and regulations, accepted Shop Drawings, and as necessary for a complete operating system. .

C. Install equipment plumb, square, and straight with no distortion and securely anchored as required.

D. Seismically anchor hoods to wall framing in accordance with manufacturer provided details.

3.03 TESTING AND ADJUSTING

A. Check and adjust sash operation by moving sash through its full travel. Verify that sash operation is smooth and easy, and that vertical rising sash shall hold at any height without creeping up or down.

B. Repair, remove and replace defective work, as directed by Engineer or Owner's Representative upon completion of installation.

C. Adjust sash, stops, fixtures, accessories, and other moving or operating parts to function smoothly.

3.04 CLEANING

A. Clean equipment, touch up as required.

3.05 PROTECTION

A. Protect all units before, during, and after installation. Damaged materials due to improper protection shall be cause for rejection.

3.06 SCHEDULE

A. Hood 1:
   1. Width: 48"
   2. Vertical Sash
   3. Services:
      a. Gas
      b. (2) duplex outlets at front
      c. Light/Switch
   4. Prewire to top
   5. Prepipe to top
   6. Seismic bracing details and calculations by supplier.
   7. Work counter height to be 34" AFF.
   8. Vented Base Cabinets:
      a. Qty: 1
      b. Doors: 2

B. Hood 2:
   1. Width: 72"
   2. Vertical Sash
   3. Services:
      a. Gas
      b. (2) duplex outlets at front
      c. Light/Switch
   4. Prewire to top
   5. Prepipe to top
   6. Seismic bracing details and calculations by supplier.
   7. Work counter height to be 34" AFF.
   8. Vented Base Cabinets:
      a. Qty: 2 total
      b. Doors: 2 ea

END OF SECTION

SECTION 12 3553.23
SOLID-PLASTIC LABORATORY CASEWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Polypropylene cabinets and plastic hardware.

B. Polyvinylchloride cabinets and plastic hardware.

C. Countertops.

1.03 RELATED REQUIREMENTS

A. Section 11 5300 - Laboratory Equipment.

B. Section 11 5310 - Laboratory Fume Hoods.

1.04 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches (1.066 m) above finished floor, tops of cases less than 72 inches (1.82 m) above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches (1.828 m) above finished floor and bottoms of cabinets more than 30 inches (762 mm) but less than 42 inches (1.066 m) above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches (762 mm) above finished floor.

1.05 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

C. ASTM D580-98 (2010) e1, Standard Test Method for Water Absorbtion of Plastics.

D. ASTM D638-10 Standard Test Method for Tensile properties of Plastics.

E. ASTM D695-10, Standard Test Mehod for Compressive Properties of Plastics.

F. ASTM D790-10, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

G. ASTM D4101-10a, Standard Specification for Polypropylene Injection and Extrusion Materials.

H. ASTM E162-09, Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

I. SEFA 2.3 - Installation of Scientific Laboratory Furniture and Equipment; 2010.

J. SEFA 8 P - Laboratory Grade Polypropylene Casework; (Current Version).

1.06 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Vented Base Cabinets beneath fume hoods specified in section 11 5310 must also comply with the requirements for solid-plastic casework of this section.

C. Service Fixtures: Coordinate location and characteristics of service connections.

1.07 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Component dimensions, configurations, construction details, joint details, attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.

C. Shop Drawings: Casework locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required, and utility locations, if any.

D. Samples:
   1. Not less than (two) 4" square pieces of cabinet material stock used in the general construction of the casework, in color specified.
   2. One of each door and drawer hardware item to be utilized in the casework construction.

E. Maintenance Data: Manufacturer's recommendations for care and cleaning.

1.08 QUALITY ASSURANCE

A. Manufacturer: A firm with undivided responsibility for the fabrication of the casework with fabrication preformed at a single location.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of experience.

C. Installer: The manufacturer or an installer authorized by the manufacturer to install laboratory casework, with at least ten years of successful experience in installing casework similar to that specified.

D. Chemical and physical resistance of exterior finish of casework shall conform to SEFA minimum standards.

1.09 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle casework using means and methods that will prevent damage, deterioration, and loss, including theft and vandelism. Comply with manufacturer's written instructions.
   1. Deliver casework to Project site in an undamaged condition in manufacturer's original sealed containers or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   2. Inspect casework on delivery to determine compliance with the Contract Documents and to determine that the products are undamaged and properly packaged.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid-Plastic Laboratory Casework
   1. Basis of Design Manufacturer: Subject to compliance with requirements, provide systems manufacturered by Stonhard www.stonhard or comparable product by one of the following:
      a. LabAire Systems (Basis of Design); www.labairesystems.com
      b. NuAire; www.nuaire.com
      c. Salare, Inc; www.salareinc.com
      d. TFI Inline Design Corp.; www.tfiinlinedesign.net
      e. ProPlastic Technologies Inc.; 480-545-8792, Chandler, AZ
   2. No substitutions allowed.

2.02 MANUFACTURERED UNITS

A. Casework:
   1. Face Style: Flush overlay; door and drawer faces cover cabinet fronts with only enough space betwee faces for operatng clearance.
   2. Cabinet Style: Face Frame.

B. Materials:

1. General: No metal shall be allowed to be exposed on the exposed, semiexposed or concealed surfaces of the casework. Where metal is required for attachment or structural integrity of the casework, exposed metal surfaces shall be minimized and coated with epoxy to fully seal the exposed metal surfaces.
2. Fire Resistance: Class C (ASTM E84)
3. Laboratory Casework: Polypropylene (PP) unless otherwise specified.
4. Vented Casework: Unplasticized Polyvinylchloride (uPVC)
   a. uPVC casework is scheduled only for vented base cabinets beneath fume hoods. These cabinets are to be provided by the fume hood manufacturer (Owner Furnished Contractor Installed).
5. Worksurfaces: Epoxy (See Countertop Specification)
6. Adhesives/Sealants: 100% Silicone
7. Fasteners: Manufacturer's standard fasteners to match casework material, unless otherwise recommended by manufacturer. If metal fasteners are required, exposed surfaces shall be epoxy coated to completely seal off metal from exposure.

C. Hardware:
1. Hinges: polypropylene semi-concealed knuckle hinges.
2. Pulls: Manufacturer's standard recessed polypropylene pulls.
3. Catches: Manufacturer's standard magnetic catch with magnet surfaces fully encapsulated in non-metal material.
4. Drawar slides: Manufacturer's standard all-plastic slides; polyethylene (UHMW).
5. Shelf Standards and Supports: Adjustable (on 2" min centers) all-plastic pins or clips at front and rear of ends of shelf.
6. General: for vented uPVC cabinets specified in Section 11 5310 replace polypropylene hardware components with PVC components to the greatest extent possible.

D. Other Furnishings:
1. Polypropylene Lab Coat Hooks:
   a. Basis of Design: G2 (www.g2automatedtechnologies.com) lab coat 6 hook unit.
   b. Hooks: 6
   c. Dimensions: 24" x 4"
   d. Material: Polypropylene
2. Cubby Workstations: Custom Benchtop Shelving Enclosures.
   a. As detailed in the Drawings.
   b. Material: 1/4" Clear Polycarbonate
   c. Construction:
      1) Fully welded seams
      2) Edges smooth and eased
      3) Fasteners: Fiberglass
         (a) drill and tap epoxy countertop to secure.
3. Mounting Board for Water Purification Equipment:
   a. Material: 3/4" thick polypropylene
   b. Color: White
   c. Size: 3'-2" wide by 3'-6" tall
   d. Attachment:
      1) Fasteners: #10 stainless steel pan head sheet metal screws
      2) 1'-0" O.C. vertical spacing, (3) fasteners per wall stud, min. attachment to (2) wall studs.
      3) Minimum clearance from fastener to edge of panel is 4".
      4) Fasteners shall be countersunk and holes covered with flush white plastic hole caps.
   e. Location: See Drawings for equipment location.

E. Fabrication:
1. General:

a. Fabricate laboratory casework and furnishings to dimensions, profiles and details indicated.
b. Use manufacturer's standard detailing for internal bracing and connections in accodance with SEFA standards.
c. Assemble individual units in the shop in as large of components as practical to minimize field jointing.
d. Use all-welded joinery, unless otherwise specified here-in.

2. Hardware: Install hardware uniformly and precisely prior to shipping insofar as practical; ship remainder of hardware loose, for installation in the field.
   a. Adjust and align hardware so that moving parts operate freely and contact points meet accurately. Allow for final field adjustment after installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of support framing and anchors.

B. Verify that service connections are correctly located and of proper characteristics.

3.02 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions and with SEFA 2.3.

B. Use anchoring devices to suit conditions and substrate materials encountered.

C. Set casework items plumb and square, securely anchored to building structure.
   1. Shim as required using concealed plastic shims.

D. Base Cabinets: set cabinets straigh, plumb and elvel. Adjust sub-tops within 1/16" of a single plane. Fasten each individual cabinet to floor at toe space, with fasteners spaced 24" O.C. Bolt continuous cabinets together. Align similar adjoining doors and drawers to a tolenrance of 1/16".

E. Wall Cabinets: Securely fasten to solid supporting material, e.g. blocking within wall cavity, or direct to metal studs. Anchor, adjust, and align wall cabinets as specified for base cabinets.

F. Align cabinets to adjoining components, install filler panels where necessary to close gaps; seal joints between cabinets and countertops and adjacent construction.

G. Replace units that are damaged, including those that have damaged finishes.

3.03 ADJUSTING

A. Adjust casework and hardware so that doors and drawers operate smoothly without warp and bind. Lubricate operating hardware as recommended by manufacturer.

3.04 CLEANING

A. Clean all components.

3.05 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Repair damage that occurs prior to Substantial Completion, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Countertops for solid-plastic laboratory casework

B. Sinks molded into countertops.

C. Epoxy resin sinks.

1.03 RELATED REQUIREMENTS

A. Section 12 3553.23 - Solid-Plastic Laboratory Casework

B. Section 22 4000 - Plumbing Fixtures: Sinks.

1.04 REFERENCE STANDARDS

A. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2010.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

C. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

D. SEFA 3 - Worksurfaces (2010)

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

D. Shop Drawings: Indicate seam locations in plan view with adjacent casework seams also identified.

E. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOP ASSEMBLIES

A. Epoxy Resin Countertops: Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.
   1. Flat Surface Thickness: 1 inch (25 mm), nominal.
   2. Chemical Resistance: Provide products that resist the following chemicals with not more than Slight Effect when tested in the same manner as specified in NEMA LD 3:
      a. Hydrofluoric Acid 48%
      b. Hydrochloric Acid 37%
      c. Nitric Acid 70%
   3. Flammability: Self-extinguishing, when tested in accordance with ASTM D635.
   4. Surface Finish: Smooth, non-glare.
   5. Color: To be selected by Architect from standard available colors..
   6. Exposed Edge Shape: 1/8 inch (3 mm) bevel chamfer.
   7. Drip Edge: Drip groove 1/8 inch (3 mm) wide and deep, located 1/2 inch (12 mm) back from edge on underside of all exposed edges.
   8. Back and End Splashes: Same material, same thickness; separate for field attachment.
   9. Sinks: Same material, same color; molded in one piece with sloped rabbeted lip sealed to countertop; bottom sloped to outlet; molded outlets; drain outlet located in back corner.
      a. Sides and Ends: 1/2 inch (12 mm) minimum thickness.
      b. Bottoms: 5/8 inch (16 mm) minimum thickness.
      c. Interior Corners: 1 inch (25 mm) minimum radius.
      d. Clamping collars for 1-1/2 or 2 inch (38 or 50 mm) diameter waste pipe, for sealed but not permanent connection.
         1) All-plastic construction
      e. Size: Basis of Design: Durcon standard drop-in Model No. D50C
         1) 24" x 16" x 8" deep
   10. Manufacturers:
      a. Durcon, Inc.: www.durcon.com.
      b. Thermo Scientific: www.thermoscientific.com.
      c. Prime Industries, Inc: www.primeindustriesinc.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORY MATERIALS

A. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

B. Joint Sealant: Mildew-resistant silicone sealant, color to be selected at time of countertop color selection.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
   4. Locate seams according to manufacturer's best practise standards and SEFA guidelines.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches (102 mm), unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using non-metal fasteners or sealant approved by casework and countertop manufacturers.

B. Attach epoxy resin countertops using compatible adhesive.

C. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.

B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.

C. Field Joints: 1/8 inch (3 mm) wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 13 2020
CLEANROOM FURRED WALL SYSTEM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. This Section specifies all requirements necessary to furnish and install a complete furring modular cleanroom wall system including, but not limited to the following:
   1. 0.56" thick furring cleanroom wall system, non-loadbearing, completely demountable, non-progressive, as indicated on the Drawings, including all installation attachments.
   2. Edge-free cleanroom wall panel material including paint, coating, or finish.
   3. Extrusions, fasteners, trim finishing strips and non-outgassing type gasketing necessary to maintain wall system structural integrity and airtight installation.
   4. Product design.

B. All building areas must be inspected by cleanroom wall installer prior to installation for any job condition that will alter the layout or the details. Coordinate installation with other trades to avoid conflicts.

1.03 RELATED REQUIREMENTS

A. In the event of conflict regarding requirements for furring modular cleanroom wall systems between this Section and any other sections, the provisions of this Section shall govern.

1.04 REFERENCES

A. Refer to Porta-Fab Modular Cleanroom Wall System Specifications website for technical data, design requirements and additional information.

1.05 SUBMITTALS

A. See Section 01 3000 - Administration Requirements, for submittal procedures.

B. Submit the following in addition to the standard requirements.
   1. Manufacturer's literature, specifications, details, and installation instructions for each cleanroom wall component proposed for use, including certification and other technical data as may be required to show compliance with the specifications.
   2. Submit dimensioned layout of panels within each cleanroom for coordination with wall mounted items and through-wall utility connections.
   3. One sample of wall system components with specified finish, substrate, gasketing, and connectors. Include any other components as necessary to illustrate a completed wall assembly.
   4. One set of samples of each finish and color required. Provide 12-inch square samples. Samples will be reviewed for color and finish only. Compliance with all other requirements is the exclusive responsibility of the Subcontractor.

1.06 QUALITY ASSURANCE

A. Manufacturer:
   1. Like items of materials provided hereunder shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in their original, unopened packages.

B. Wall system panels shall be delivered with an approved clear PVC film. Wall system shall be packaged to prevent transit and construction dust from contaminating surfaces. Stripping of packaging and coatings to be done after installation of wall panels.

C. Exercise extreme care in handling all cleanroom wall system components to prevent damage.

D. Store materials within the building in the space designated for cleanroom component storage. Store materials in such manner as to prevent damage or intrusion of foreign matter. Conspicuously mark "Rejected" on materials, which have been damaged, and remove from the job-site.

PART 2 PRODUCTS

2.01 CLEANROOM FURRED WALL SYSTEM

A. Basis of Design Manfacturer: Subject to compliance with requirements, provide systems manufacturered by Gordon, Inc. or comparable product by one of the following:
   1. Porta-Fab Corporation; www.portafab.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. The wall system shall have the capability to be finished flush on one side and minimize the need for field cutting.

C. Cleanroom Wall Support System:
   1. Framing Components - General:
      a. All battens shall be 6063-T5 aluminum extrusions. Batten shall fasten tightly against an existing wall or strut creating a sealed joint connection and secure alignment of panels. The batten fastens against an existing wall or strut. A removable enclosure cap conceals fasteners of the batten. Battens shall allow wall panels to be installed or removed easily without disturbing adjacent wall panels or ceiling.
   2. Materials:
      a. Metal Framing: Aluminum 6063-T5 alloy.
      b. Fittings: ASTM-A36 or ASTM-A635.
   3. Finish for Aluminum Extrusions and Caps: Epoxy Coat White.

D. Cleanroom Wall Panel - General:
   1. Panel Constructions - Standards:
      a. 0.032" smooth, white, fiberglass reinforced plastic on 1/2" gypsum board.
      b. Panel shall comply with Class 10,000 cleanroom certification requirements.
      c. FRP finish shall comply with Class C fire resistance (ASTM E-84).
      d. Color: Color to be selected by architect from manufacturer's standard white options.

2.02 FABRICATION

A. Metal Framing Requirements:
   1. Section shall be as required.
   2. Thickness: 0.56" maximum for complete component system.

B. Metal framing shall conform accurately to the shape and dimensions as shown on the Drawings.

C. Cut edges shall be true to line and free from projections.

D. Clear away chips and filings from cut extrusion prior to handling to reduce damage to the raw surfaces.

PART 3 EXECUTION

3.01 INSTALLATION

A. Partition components shall assemble into a rigid structure with tight straight-line joints. Completed installation shall be free of exposed bolts, nuts, rivets, and fasteners within the cleanroom area and shall interface with all mechanical and electrical work in a clearly preplanned and craftsman-like installation.

3.02 CONDITIONS OF SURFACES

A. Examine substrates and adjoining construction and conditions under which work is to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.03 INVENTORY

A. Inspect all materials upon arrival to job-site to ensure correct quantity, finishes, and quality of product. Report, in writing, any conditions to the materials that appear to have failed in general durability or any other form of apparent deterioration.

3.04 ERECTION

A. Verify dimensions of supporting structure by field measurements so that cleanroom wall will be accurately designed, fabricated, and fitted to the structure.

B. Coordinate cleanroom wall work with the work of related sections and provide items to be placed during installation of other work at the proper time to avoid delays in the work.

C. Erect all component parts of the cleanroom wall in accordance with the manufacturer's written instructions and recommendations.

D. Erection Tolerances:
   1. Erect all component parts within the following tolerances - variations form plumb of angle shown: 1/8" maximum variation in height or 10' length, noncumalitive.
   2. Offsets in end-to-end or edge-to-edge alignment of consecutive members: 1/16" maximum offset in any alignment, noncumalitive.

E. Cutting and Trimming of Components Parts:
   1. Cut and trim component parts of the cleanroom wall during erection only with the approval of the manufacturer or fabricator and in accordance with their recommendations. Restore finish completely to protect material and remove all evidence of cutting and trimming. All cutting and trimming to be done outside the cleanroom area.

F. Do not erect members which are observed to be warped, bowed, deformed or otherwise damaged or defaced to such as to impair strength or appearance. Remove and replace members damaged in the process of erection.

G. Set units level, plumb and true to line with uniform joints. Support and secure in place by bolting to clip angles and similar supports anchored to supporting structure.

3.05 CLEANING

A. Provide cleaning methods required for each component part as recommended by the respective manufacturers.

B. Cleaning methods shall be carefully selected, applied and maintained so that finishes will not become uneven or otherwise impaired.

C. The nature of the project requires special attention to minimizing potential contamination of the fully developed cleanroom environment. Daily cleanup and vacuuming of the work area is essential to an ongoing control of contaminants, especially as the cleanroom fit-up progresses.

3.06 PROTECTION

A. Protect the cleanroom wall system throughout the construction period in a clean and properly protected condition so that it will be without any indication of use or damage at the time of substantial completion.

B. All work must be protected during shipment, storage, erection and construction so as to avoid development of nonconformity of appearance or other deleterious effects in the work.

C. Protection should be removed when requested by the construction manager for inspection of finishes.

D. Remove protection when no longer required. Any materials found to be defective or improperly installed shall be replaced.

END OF SECTION

SECTION 13 2113
CLEANROOM CEILING SYSETM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Specifications, and general provisions of the Contract, including General and Supplimentary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Aluminum ceiling grid: As specified in this Section.

B. Blank ceiling panels: As specified in this Section

C. Gasket: As specified in this Section.

D. Threaded rod and turnbuckle: As specified in this Section.

E. Support rods and anchors.

F. Sealing of all penetrations including sprinklers, electrical conduit, etc.

1.03 RELATED REQUIREMENTS

A. Intermediate steel framing: As specified in Division 5.

B. Air Filter Systems and Equipment: As specified in Division 15.

C. Lay-in and/or surface mounted light fixtures: As specified in division 16

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components.

D. Samples: Submit two samples each, 8 inches long, of suspension system main runner.

1.05 PERFORMANCE

A. Completed ceiling system shall be capable of providing Cleanroom Classification Rating as required and indicated for area installed.

1.06 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

B. Suspension System Installer Qualifications: Company specializing in the installation of the products specified in this section with minimum of three years documented experience.

PART 2 PRODUCTS

2.01 GASKETED CEILING GRID AND SUSPENSION

A. Basis of Design Manufacturer: Subject to compliance with requirements, provide systems manufacturered by Gordon, Inc. or comparable product by one of the following:
   1. Portafab; www.portafab.com
   2. Substitutions: See Section 01 6000 - Product Requirements

B. Ceiling Support Materials and Systems
   1. Basis of Design: DS-38 2" Gasket-Seal Ceiling Grid and Suspension
   2. DS- 38 Gasket Seal Grid – The grid system shall be manufactured of 2” extruded aluminum alloy 6063, temper T5. Grid profile shall have a continuous integral screw boss within the web for attachment of intersection connectors at any point along the grid members, and to facilitate ease of field installation. Cross tees to have square cut ends to create a fully non-progressive installation.
      a. Finish: Cleanroom White Powder Coat

3. Grid shall allow the insertion of FlexHead fire sprinkler components specified elsewhere without the disruption of adjacent removable blank panels or other elements within the grid (fan units, grills, etc.)
4. Gasket – The gasket tape shall be ¼-inch thick x 5/8-inch wide black, low off-gassing microcellular urethane. The gaskets shall be factory-applied, with precision cut ends, extended on grid members to ensure an airtight seal at all intersections.
5. Suspension system
   a. Model G-38 grid connectors – Heavy duty steel connectors shall be used at grid intersections and to suspend the grid system via 3/8-16 threaded rods. ¼-20 hex head cap screws are used to fasten the connectors to the extruded aluminum grid members.
   b. Threaded Starter Rod and Turnbuckle– ASTM rated LH/RH, 9” long, zinc plated, 3/8-16 threaded rod and 4” body zinc plated steel turnbuckle spaced on a 48-1/2” x 49" module or as required by grid spacing.
   c. Threaded main support rods and seismic anchoring - zinc plated, 3/8-16 threaded rod.
6. Ceiling system should be level overall within 0.10” and shall be level within 0.062” in 10’-0”.
7. Grid shall use a 24-1/2" by 48-1/2" typcial spacing module.

2.02 BLANK PANELS

A. 1/4" Thick, Smooth, White, Polypropylene Sheet

2.03 ACCESSORIES

A. Wall Angle:
   1. 2"x2" Aluminum Wall Angle.
   2. Match Color and Finish of Grid.

B. Integrated Fire Sprinklers:
   1. See Fire Sprinkler Specification.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that the layout of rods and hangers will not interfere with other work.

3.02 INSTALLATION

A. Wall Angle Installation:
   1. Position wall angle at proper ceiling height on center of wall using laser leveling tool and attach with fasteners appropriate for existing wall type. Continue installing toward the corners and then around the room until complete. Corner can be field cut with a power miter saw using a carbide tipped blade. All joints must fit tight with no gaps.

B. Steel Support Rod Installation:
   1. Position support rods as required for suspension of grid per local code requirements.
   2. Refer to Division 01 7000 for requirements for locating in-slab conduit prior to installation of anchors.

C. Grid Installation:
   1. Position main tees at 48 ½”, or as required. Attach threaded rod from steel structure to turnbuckle and rod attached to connectors on grid.
   2. Attach cross tees at 24 1/2", or as required, perpendicular to main tees and as indicated on the drawings.
   3. Level entire ceiling to within 0.10” overall and/or 0.06” in any 10’ length.
   4. Brace grid for seismic conditions when required by local code. Install in accordance with UBC Standard No.47.18 and ICBO No 1461 for aluminum grid.
   5. Peel backing off overhanging ends on gasket tapes and carefully affix to the grid member across the intersection seam and compressing into the gasket tape on the main runner. A tight fitting gasket intersection will assure the most airtight seal.

D. Blank Panel Installation:
   1. Install Polypropylene Blank Panels such that all edges and seams are fully supported and gasketed against the grid system.
   2. All penetrations through blank panels shall be sealed. Use a gasket where applicable. All other penetrations shall be sealed from the backside of the penetration using specifed sealant.

E. General Installation:
   1. Install Cleanroom Ceiling System in accordance with manufacturer's instructions.
   2. Coordinate all work with other trades to be performed in or on ceiling system including light fixtures, HVAC equipment, sprinkler systems and wall partition systems.

END OF SECTION

SECTION 20 10 00

GENERAL MECHANICAL PROVISIONS

PART 1 GENERAL

1.01 CONTRACT CONDITIONS

A. Work of this Division is bound by the Provisions of Division 1 bound herewith, in addition to these Specifications and accompanying Drawings.

B. Work of this Division shall conform to published installation and materials standards of the University of Oregon specifically applicable to Divisions 20, 21, 22 and 23, available online at http://campusops.uoregon.edu/cc/cc-standards, which are incorporated herein by reference.

1.02 SECTION INCLUDES

A. General requirements specifically applicable to Division 20, 21, 22 and 23 sections, which apply in addition to Division 1 - General Requirements.

1.03 DRAWINGS AND SPECIFICATIONS

A. The Drawings and Specifications are complimentary, and what is called for by one shall be as binding as if called for by both.

B. Use of the word "Provide" shall be equivalent to "Furnish and Install."

C. Use of singular or plural in article, paragraph, and subparagraph headings does not indicate numbers of products required. Example: The heading "Chiller" does not necessarily mean there is only one chiller required.

D. Abbreviations:
1. ADA: Americans with Disabilities Act
2. AASHTO: American Association of State Highway and Transportation Officials
3. ASTM: American Society for Testing and Materials
4. AWWA: American Water Works Association
5. ANSI: American National Standards Institute
6. NEMA: National Electrical Manufacturers' Association
7. ASME: American Society of Mechanical Engineers
8. UL: Underwriters' Laboratories
9. IAPMO: International Association of Plumbing and Mechanical Officials
10. Fed. Spec.: Federal Specifications
11. MSS: Manufacturers' Standardization Society of the Valve and Fitting Industry
12. WOG: Non-shock Water-Oil-Gas maximum working pressure rating
13. NFPA: National Fire Prevention Association
14. FM: Factory Mutual
15. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association
16. ARI: Air Conditioning and Refrigeration Institute
17. AMCA: Air Movement and Control Association
18. TIMA: Thermal Insulation Manufacturers' Association
19. ASHRAE: American Society of Heating, Refrigerating, and Air Conditioning Engineers
20. AABC: Associated Air Balance Council
21. NEBB: National Environmental Balancing Bureau

E. For products specified by listing one or more manufacturers, followed by "Similar to" and one manufacturer's model number, the following requirements apply:
1. Approval of each listed manufacturer is contingent upon that manufacturer having a product which meets the specification, fits the available space, and is comparable to the listed model.

2. Electrical requirements, duct connections, pipe connections, and space requirements indicated on Drawings are based on the listed model. Provide revisions required to accommodate the model actually furnished.

F. For products specified by listing one or more manufacturers, followed by a model number for each manufacturer, the following requirements apply:
   1. Provide one of the listed model numbers or an approved substitution.
   2. Electrical requirements, duct connections, pipe connections, and space requirements indicated on Drawings are based on one of the listed models, and may not be suitable for all models listed. Provide revisions required to accommodate the model actually furnished.

1.04 PERMITS, FEES, AND GOVERNING AGENCIES

A. Obtain permits and pay fees required by governing agencies.

B. Minimum requirements not otherwise stated herein shall meet governing codes and standards.

C. Arrange and pay for inspections and tests required by applicable codes and ordinances.

1.05 SITE VISITATION AND FIELD MEASUREMENTS

A. Examine site of proposed Work to verify conditions. Beginning of Work means acceptance of conditions.

B. If conditions differ substantially from conditions indicated on Drawings, notify Architect before commencing Work.

1.06 SUBSTITUTIONS

A. Substitution requests will not be considered unless they are submitted in writing, in accordance with Division 0 and Division 1.

B. Substitution requests will not be considered unless they include the following:
   1. Model numbers of proposed substitutions.
   2. Options that are required to make the proposed substitution comply with Specifications.
   3. Summary of modifications of the Work that are required to accommodate the proposed substitution.

1.07 OWNER FURNISHED ITEMS

A. Refer to Division 1.

1.08 ALTERNATES

A. Refer to Division 1.

1.09 PROJECT MANAGEMENT AND COORDINATION

A. General: Provide Work to coordinate mechanical, electric and plumbing effort with the work of other Divisions.

B. Project Management and Coordination:
   1. Provide coordination for the Work of Divisions 20, 21, 22 and 23 in accordance with Division 1.
   2. Locations shown on Drawings are approximate and are not intended to fully coordinate the Work of all Sections. Plan exact locations based on field measurements of field conditions and the Work of other Sections.
   3. Drawings do not show all required duct and pipe offsets and fittings. Provide offsets and fittings as required to coordinate with the Work of other Sections and with field conditions.
   4. Locate equipment, piping, valves, dampers, etc. to provide adequate space for normal operating and maintenance activities.

1.10 CUTTING AND PATCHING

A. Provide cutting and patching for the Work of Divisions 20, 21, 22 and 23 in accordance with Division 1 unless this is identified be provided in the Division 1 documents.

1.11 SHOP DRAWINGS AND PRODUCT DATA

A. Provide shop drawings and product data for the Work of Divisions 20, 21, 22 and 23 in accordance with Division 1. Refer to each Section for required shop drawings and product data submittals.

B. Acceptable Submittal Formats: Hard-Copy, or Electronic. If Electronic format is selected, at least one Hard-Copy of the information must be submitted with the Electronic copies to the Engineer (the Hard-Copy will not be returned).

C. Submittal formats shall conform with the following requirements:
   1. Each hard-copy Submittal package shall be formatted as follows:
      a. Use three-ring loose leaf binders.
      b. Provide index referencing specification section and page.
      c. Tab individual sections.
   2. Each Electronic Submittal package shall be formatted as follows:
      a. The full extent of the submitted data shall be presented in a single electronic file on a CD-ROM.
      b. File Format Type: Adobe PDF, or universally readable equivalent.
      c. Scanned information: Minimum 400 dpi.
      d. Provide index referencing specification section and page.
      e. Bookmark individual sections.
      f. One file per CD-ROM.
         1) Format CD-ROM for use in PC compatible hardware.
         2) Format CD-ROM so that additional files may be written to it (read-write).

D. Contractor may provide one (1) early submittal for items with long lead times as determined by the Contractor. The submittal shall be clearly identified as “Long Lead Time Item Submittal”.

E. The remainder of the shop drawings and product data shall be submitted as a single Project Submittal, except:
   1. Control system shop drawings and product data may be provided as a single, separate submittal package prior to beginning of control work on site.
   2. Fire Sprinkler Shop Drawings and Product Data may be provided as a single, separate submittal package before or after the project submittal.
   3. Seismic Restraint Shop Drawings, and Product Data may be provided as a single, separate submittal package before or after the Project Submittal.

F. The Project Submittal must be submitted no more than three (3) weeks after the Long Lead Time Item Submittal. If the Project Submittal is found to be incomplete, it will be rejected and returned. The Project Submittal shall then be completed by the Contractor and resubmitted in its entirety.

G. Definitions of comments used in submittal review:
   1. "No Exception Taken" The meaning and intent of this statement is that the Engineer finds no objection (except those noted thereon or in correspondence) to inclusion of items or Work indicated in construction provided that it:
      a. Complies with Contract Drawings and Specifications as to quantities, space requirements, and dimensions.
      b. Does not interfere with other trades.
      c. Is not the cause of union tradesmen disputes.
      d. Does not infringe on patent rights.
      e. Is not the cause of injury or damage to persons or property.
      f. Complies with OSHA regulations.

2. "Rejected" The meaning and intent of this statement is that the submitted material does not conform to plans and specifications. Resubmittal of a different product or shop drawing is required.
3. "Revise and Resubmit" This statement is used when the general product line is acceptable, but the submitted material varies in dimension, accessories, etc. from what is required. Resubmittal is required.
4. "Make Corrections Noted" This statement is used as an alternative to "Revise and Resubmit" when resubmittal is not required.
5. Said review does not relieve Contractor of any Contractual responsibilities.

1.12 TEMPORARY FACILITIES AND CONTROLS

A. Refer to Division 1.

B. Use of Project equipment for temporary service during construction is acceptable in accordance with requirements and limitations listed herein, and in accordance with requirements referenced in Division 1.
   1. General Requirements:
      a. Contractor shall notify Owner's Representative and the Engineer of intention to utilize Project equipment for temporary service. Indicate in writing what equipment will be utilized and indicate the start of use date for each.
      b. Equipment start up shall comply with manufacturer's requirements. Where Factory startup is required, it shall be completed before equipment is used for temporary service.
      c. Provide temporary control of equipment as necessary. Safety limits (non-freeze, low limit, etc.), and safety operating interlocks must be functional prior to use of the equipment.
      d. Use of equipment for temporary service during construction shall not shorten or otherwise modify the warranty the Owner receives. Starting date for warranties shall remain in accordance with Division 1 and Divisions 20, 21, 22 and 23 stipulations.

1.13 SCHEDULING

A. Schedule the Work of Divisions 20, 21, 22 and 23 in accordance with Division 1.

B. Schedule Work at such a time, and in such a manner, to minimize interference and inconvenience to the Owner.

C. Work in existing operating laboratories and offices that causes disruptions of existing services shall be coordinated with the Owner. Provide a minimum of 72 hour notice prior to any shutdown of existing services.

1.14 OPERATION AND MAINTENANCE MANUALS

A. Provide operation and maintenance manuals for the Work of this Division in accordance with Division 1 and Section 20 2000.

1.15 MATERIAL AND EQUIPMENT

A. Comply with Division 1.

B. Similar products shall be of the same manufacturer.

C. Comply with manufacturer's printed instructions, in addition to requirements of the Contract Documents, regarding storage, handling, installation, operation, and adjustment of materials and equipment.

D. Protect ductwork, piping, outlets/inlets, equipment, and mechanical appurtenances from damage. Provide temporary covers as necessary to prevent accumulation of dust and debris.

E. Notify the Architect (or authorized representative) immediately of conflicts between manufacturer's instructions and Contract Documents. Resolve such conflicts before proceeding with the work.

1.16 CONTRACT CLOSEOUT

A. Comply with Division 1.

1.17 FINAL CLEANING

A. Provide cleaning for the Work of Divisions 20, 21, 22 and 23 in accordance with Division 1.

1.18 RECORD DOCUMENTS

A. Provide Record Documents for the Work of this Division in accordance with Division 1.

B. Record Drawings shall include:
   1. Contract Drawings
   2. Fire Suppression System Shop Drawings
   3. Seismic Restraint Shop Drawings

1.19 INSTRUCTION OF OPERATING PERSONNEL

A. Provide instruction of Owner's operating personnel associated with the Work of Divisions 20, 21, 22 and 23 in accordance with Division 1.

B. Instruct Owner's designated operating personnel in the operation and maintenance of all systems.

C. Record instruction sessions and submit on DVDs.

D. Submit written certificate from Owner that Instruction of Operating Personnel has been performed.

1.20 WARRANTIES

A. Provide and document warranties applicable to the Work of Divisions 20, 21, 22 and 23 in accordance with Division 1 and Section 20 2000.

1.21 DEMOLITION

A. Provide demolition for the Work of this Division in accordance with Division 2.

B. Where items are to be salvaged for relocation or retained by the Owner, removal shall cause no damage to these items. Move in accordance with manufacturer's instructions.

1.22 PAINTING

A. Provide painting for the Work of Divisions 20, 21, 22 and 23 in accordance with Division 9.

B. Provide cleaning and surface preparation for products specified in Divisions 20, 21, 22 and 23 that have finishes specified in Division 9.

C. Paint the following items with one coat of primer and two coats of oil-based enamel:
   1. Uninsulated black steel pipe which is not concealed within walls or above ceilings.
   2. Steel supports, stands, and brackets which are not galvanized or factory painted.
   3. Pipe rollers, hangers, and hanger rods which are not galvanized.
   4. Additional items noted on Drawings or in Divisions 20, 21, 22 and 23.

D. Colors shall be approved by Architect.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 20 20 00

MECHANICAL OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General and specific requirements for Operation and Maintenance Manuals applicable to Division 20, 21, 22 and 23 sections. Requirements apply in addition to Division 1 requirements. Contractor shall provide Operation and Maintenance Manual for the Work of this Division.

1.02 SHOP DRAWINGS AND PRODUCT DATA

A. Submittals required for the following, in accordance with Section 20 1000:
   1. Table of Contents (TOC) for the Operation and Maintenance Manual. Provide one complete TOC with Project Submittal.

1.03 CONTRACT CLOSEOUT

A. Submittals required for the following, in accordance with Section 20 1000:
   1. Operation and Maintenance Manual. Provide 3 complete sets.
   2. Valve diagrams and directories. Provide laminated copies in addition to those included in O&M Manuals.

PART 2 PRODUCTS

2.01 GENERAL

A. The requirements listed herein apply to one full set of the Operation and Maintenance Manual. Provide multiple copies of the set in accordance with requirements listed under Part 1 of this Section.

B. Information provided in the Operation and Maintenance Manuals shall be customized for the specific equipment provided for, and as applied to, this Project.

2.02 PRESENTATION

A. Format:
   1. Manufacturer's literature shall be pre-printed.
   2. Documents generated specifically for this project shall be machine printed on white paper, or typed.
   3. Hand written material is not acceptable unless specifically noted herein.
   4. Internally subdivide binder contents with permanent page dividers in accordance with the organizational format described herein. Tab titles shall, as a minimum, be legibly printed and inserted into reinforced laminated plastic tabs.
   5. Separate copies of valve directories and diagrams shall be laminated and mounted with chains in Mechanical Room. Specific location to be verified with Owner or Architect.

B. Binding:
   1. In three-ring (D-side ring style) loose leaf plastic or cloth side binders. Paper report binders, or bend-tab thesis covers are not acceptable.
   2. 8-1/2 inch x 11 inch format.
   3. Ring size as necessary to contain the information for this project. Minimum ring size: 1 inch. Maximum ring size: 4 inch.
   4. Provide sheet lifters, front and back, in each notebook.
   5. Provide multiple binders where required to accommodate the data. Each binder maximum 80% full.

6. Label each binder with typed, permanently adhered, labels on the front cover and the spine. Minimum Label information:
    a. Project Name
    b. Project Location
    c. Project Owner
    d. Project Engineer
    e. Volume (notebook no.) of (number of notebooks in one set of O&M Manuals)

C. Provide a plastic page cover for each occurrence of the following pages:
1. Cover Sheet
2. Table of Contents
3. Nameplate Directory
4. Valve Directory
5. Service and Dealer Directory

2.03 ORGANIZATION AND CONTENT OF MANUAL

A. Include in the front of EACH Notebook of the Operation and Maintenance Manual:
1. Cover Sheet
2. Table of Contents:
    a. List the contents of the full manual.
    b. List full extent of major and minor divisions (tabs).

B. Include the following information in the Project Operation and Maintenance Manual:
1. Directories, including:
    a. Equipment and Nameplate Directory
    b. Itemized Service and Maintenance Directory
    c. Service and Dealer Directory
    d. Warranties Directory
    e. Valve Directory
2. Material and Equipment Information (with Individual Tabs by Divisions 20, 21, 22 and 23 Section Number and Name), including:
    a. Shop Drawings and Product Data
    b. Manufacturer's Printed Operation and Maintenance Manuals
    c. Service Contracts and Field Start-up Reports
3. Cleaning, Certification, and Test Reports:
    a. Domestic water system disinfections report and test results
    b. Combination Fire/Smoke Damper Operational Certification
    c. Copy of Testing, Adjusting, and Balancing (TAB) Report from Owner’s TAB Contract.
    d. Copy of Commissioning Report from Owner’s Commissioning Contract.
4. System Information (with Individual Tabs by Divisions 20, 21, 22 and 23 Section Number and Name), including:
    a. Operation instructions
    b. Record drawings (reduced size set)
    c. Controls operation and maintenance Information

2.04 DESCRIPTION OF MANUAL CONTENT

A. Cover Sheet, listing:
1. Project name and location
2. Architect
3. Engineer
4. General Contractor
5. Mechanical Contractor
6. Electrical Contractor

B. Table of Contents, listing:
   1. Volume number.
   2. Section title
   3. Items included under each section (e.g., equipment name and number, parts list, service instructions, etc.)

C. Directories (with Individual Directory Specific Tab):
   1. “Equipment Nameplate Directory”. This is a summary of the equipment included in the Project with a nameplate designation (code), such as “AHU-1", including:
      a. Mechanical equipment type
      b. Nameplate designation
      c. Manufacturer's nameplate data
         1) Data as read from the nameplate for the actual equipment provided
      d. Installed location
         1) List room name and number
      e. Area served
      f. Control switch normal position
   2. “Itemized Service and Maintenance Directory”. Obtain information from the manufacturer. This is an itemized summary listing of service and inspection requirements. Itemize by Nameplate Designation (i.e.; AHU-1, CH-1, etc.). include:
      a. Service and lubrication schedule:
         1) Filter, size, number of, performance, clean pressure drop, and recommended change-out.
         2) Bearing type, recommended lubricant, and frequency.
      b. Inspection Requirements:
         1) Inspection type (e.g., belt wear, refrigerant charge, etc.), frequency, recommended actions.
   3. “Service and Dealer Directory”. This is a summary of the equipment and material suppliers for the Project, including:
      a. Company name for authorized service and parts
      b. Physical address
      c. Phone number, fax number, e-mail, and web site address (if available)
      d. Summary listing of applicable equipment and materials
   4. “Warranties”. In addition to the warranty statement, include:
      a. Project name as shown on the Project Manual
      b. The equipment (nameplate designation and description) and/or system to which the warranty applies
      c. Effective date of the warranty
      d. Expiration date of the warranty
      e. Extent of the warranty
      f. Company name, address, telephone number, and contact person for the issuer of the warranty
   5. “Valve Directory”. This is a sequential, ascending, summary of the numbered valves in the Project, separated by system, including:
      a. Valve number
      b. Valve Type
      c. Valve Size
      d. Installed location
      e. Valve function
      f. Valve normal position
   6. “Valve Diagram.” This is a graphic, diagrammatic (not to scale) chart showing valves with rooms and sections of piping served by each valve, separated by system, including:
      a. Valve number
      b. Piping type
      c. Valve function (shutoff, throttling, sectionalizing, etc.)

D. Material and Equipment Information (under individual material or equipment specification specific tabs):
   1. Shop Drawings and Product Data for items reviewed, approved, and provided for this Project.
   2. Manufacturer's Printed Operation and Maintenance Manuals, including:
      a. Manufacturer's parts list.
      b. Information for starting, adjusting, and maintaining each item in continuous operation for long periods of time.
      c. Dismantling and reassembling of the complete units and sub-assembly components with illustrations including “exploded” views showing and identifying each separate item.
      d. Identification of special tools and instrument requirements.
      e. Detailed explanation of function and control of each piece of equipment, component, or accessory.
      f. Precautions for operation of equipment and reason for each precaution.
      g. Troubleshooting guide.
   3. Service Contracts and Field Start-up Reports:
      a. Provide for fans, boilers, chillers, etc.
      b. Include list of inspection requirements to be completed prior to end of warranty.

E. Cleaning, Certification, and Test Reports:
   1. Backflow Prevention Devices Inspection and Testing. Coordinate with requirements listed in Section 22 4100.
   2. Piping Systems Cleaning, Disinfection, and Chemical Treatment Report. Coordinate with requirements listed in Section 22 5400.
   3. Written certification of combination fire/smoke damper testing. Coordinate with requirements listed in Section 20 9100.
   4. Air and Water Balance Report. Coordinate with requirements listed in Section 20 9100.
      a. When an Air and Water Balance Report is provided in a separate notebook (three-ring binder), reference the notebook as a volume of the Project Operation and Maintenance Manual set. Label the notebook accordingly.
   5. Seismic restraint system installation report certifying that seismic restraints are installed in conformance with approved shop drawings and no additional restraints are necessary based on field conditions. Include the written authorization, from seismic restraint system Engineer, of the designated representative.
   6. Commissioning Report. Coordinate with Owner’s separate Commissioning Contract.
      a. Where Commissioning Report is provided in a separate notebook (three-ring binder), reference the notebook as a volume of the Project Operation and Maintenance Manual set. Label the notebook accordingly.

F. System Information:
   1. Operation Instructions. Under individual system specific tab. Provide complete, detailed guidance for the operation of each system (e.g., Hydronic System, etc.)
      a. Information shall include:
         1) Start-up
         2) Routine and normal operation
         3) Adjustment and regulation
         4) Chemical treatment
         5) Testing
         6) Detection of malfunction
         7) Shut-down
         8) Cleaning
         9) Summer and winter operations
         10) Emergency operation
   2. Record Drawings. Provide an 11 inch by 17 inch set (print-to-fit) bound in a separate pressboard report cover with reinforced top hinges. Label front of report cover in accordance with previously listed notebook labeling requirements.

3. Controls Operation and Maintenance Information. Coordinate with controls requirements listed in Division 23.
    a. Where controls information is provided in separate notebook(s) (three-ring binder), reference the notebook(s) as volume(s) of the Project Operation and Maintenance Manual set. Label the notebook(s) accordingly.

PART 3 EXECUTION

3.01 GENERAL

A. Information provided in the Operation and Maintenance Manuals shall be specific to actual equipment, materials, and systems provided under the Work of this project.

B. Pre-printed Parts lists, service instructions, equipment data manuals, etc., shall be marked to indicate the model number of the corresponding item provided under the Work of this project.
    1. Use an arrow stamp to designate the pre-printed model numbers for Products applicable to this Project. Arrow shall be of a reproducible color (i.e.; red or black).
    2. Where the corresponding model number is not shown on a pre-printed sheet, hand write the model number, and associated data, in ink using legible block style lettering.

END OF SECTION

SECTION 20 42 00

SEISMIC RESTRAINTS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

1.02 SCOPE OF WORK

A. Provide seismic restraints in accordance with ASCE Standard 7-05 requirements for piping, ductwork, and mechanical equipment.

B. Provide engineering for seismic restraint system, assemblies, and components.

C. Provide shop drawings and installation instructions for seismic restraint system.

D. Provide final inspection and report for installed restraint system acceptance.

E. Seismic bracing of coils installed in-line in ducts and with piping connections.

F. DEFINITIONS AND STANDARDS

G. Referenced Standards:
   1. ASCE Standard 7-05: American Society of Civil Engineers / Structural Engineering Institute, Standard 7-05, Minimum Design Loads for Buildings and Other Structures

H. Design Criteria:
   1. Occupancy Category: ASCE 7-05 Occupancy Category designation, Table 1-1.
   2. Site Classification: ASCE 7-05 Site Classification designation, Table 20.3-1.
   3. Peak Spectral Response Acceleration (SS): ASCE 7-05 Figure 22-1 - Maximum Considered Earthquake Ground Motion of 0.2s spectral response acceleration, Site Class B.
   4. Design Spectral Response Acceleration (SDS): ASCE 7-05, Eqs. 11.4-1 and 11.4-3.
   5. Seismic Design Category: ASCE 7-05 Seismic Design Category designation, Tables 11.6-1 and 11.6-2.
   6. Component Importance Factor (IP): ASCE 7-05, Section 13.1.3.

I. Custom Engineered Assembly: Anchorage and seismic restraint assembly, comprised of standard or proprietary components, designed and applied to system by the Seismic Engineer.

J. Pre-Engineered Assembly: Previously designed anchorage and seismic restraint assembly selected and applied to system by the Seismic Restraint System Engineer.

K. Seismic Restraint System Engineer: Registered Professional Engineer currently licensed in Oregon as a structural, civil, or mechanical engineer. Responsible for designing, applying, and inspecting pre-engineered seismic restraint assemblies and components in accordance with applicable codes and component manufacturer's published recommendations.

L. Seismic Engineer: Professional engineer currently licensed in Oregon as a structural, civil, or mechanical engineer. Responsible for designing, applying, and inspecting custom seismic restraint components in accordance with applicable codes.

M. Equipment:
   1. Includes but not limited to HEPA fan filter units installed in a seismically braced clean room ceiling system to be evaluated for seismic bracing.
   2. Equipment referred to by type is typical. Equipment not specifically listed here is still subject to the requirements listed herein.
   3. Weight: Installed operating weight of equipment as reported by equipment manufacturer.

N. Ductwork and Piping:
   1. Duct Run: A length of duct without change in direction.
   2. Piping Run: A length of pipe without change in direction.
   3. Component Weight: Calculated installed (operating) weight of component.
   4. Longitudinal Bracing: Restraints applied to limit motion parallel to the centerline of the pipe or duct.
   5. Transverse Bracing: Restraints applied to limit motion perpendicular to the centerline of the pipe or duct.

1.03 PROJECT DESIGN CRITERIA

A. Restraint system, assemblies, and components shall be designed and installed to resist lateral loads in accordance with the current adopted State of Oregon Structural Specialty Code.

B. Seismic Design Criteria:
   1. Occupancy Category: II
   2. Site Classification: B
   3. Peak Spectral Response Acceleration (Ss) = 0.81
   4. Design Spectral Response Acceleration (SDs) = 0.540.54
   5. Seismic Design Category: D
   6. Maximum Allowable Lateral Loads and Anchorage Requirements: See Structural Drawings.
   7. Component Importance Factors (IP): 1.0, except where otherwise noted below:
      a. IP = 1.5:
         1) Piping Systems: Heating water, Acid Waste, Acid Vent, Natural Gas and Fire Protection Systems.
         2) Duct Systems: Fume Hood Exhaust Ducts.

1.04 SYSTEM ENGINEERING AND QUALITY ASSURANCE

A. Seismic restraint system shall be engineered to comply with criteria stated and referenced herein.

B. Seismic restraints and related engineering for HVAC, plumbing, and piping systems to be provided by a single vendor.

C. Application of Pre-engineered Assemblies by Seismic Restraint System Engineer:
   1. Application of Custom Engineered and/or Pre-Engineered Assemblies, as applicable to this project, and as follows:
      a. Application of restraints for floor or roof-mounted equipment.
      b. Application of restraints for curb mounted equipment including unit-to-curb and curb-to-structure attachments.
      c. Application of seismic restraint assemblies for vibration isolated and suspended equipment.
      d. Application of seismic restraint assemblies for piping and ductwork.
   2. Submittal packages shall bear the stamp of only the responsible Seismic Restraint System Engineer.
   3. Approved Pre-engineered Assembly and Application Services: Mason Industries, Kinetics, or an independent professional engineer meeting qualifications listed herein as Seismic Restraint System Engineer.

D. Custom Engineered Assemblies:
   1. System engineering shall include design and Application of Custom Engineered Assemblies, as applicable to this project, and as follows:
      a. Design and Application of seismic restraint assemblies for piping and ductwork.
   2. Engineering shall be performed by, or under the direct supervision of, a Seismic Engineer meeting the qualifications listed herein. Submittal packages shall bear the signed seal of only the Seismic Engineer.

E. For anchorage requirements and allowable lateral loads at attachment to building structural system, provide structural analysis and report from an independent Registered Structural Engineer currently licensed in the State of Oregon.

1.05 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Pre-submittal:
   1. Included within project Mechanical Submittals, submit attached letter outlining how the seismic requirements for this project will be met (i.e., Pre-engineered Assemblies, Custom Assemblies). In the letter state what companies will be providing the services and the qualifications of the responsible individuals.

B. Shop drawings shall be submitted as one complete package inclusive of all mechanical systems and equipment.

C. Submit the following in accordance with Section 20 1000 (Reference isolated equipment as numbered in Contract Documents):
   1. Seismic Restraint Location Plan: Full or half size copies of ductwork and piping plans from the Contract Documents, showing locations and type of seismic restraint assemblies to be used.
      a. Drawings shall consist of mechanically reproduced copies of the Contract Documents, or custom drafted specifically for the Work of this Project and bear only the seal of the Seismic Restraint System Engineer or Seismic Engineer. All other seals shall be eradicated from drawings prior to submittal.
      b. Provide separate drawings for ductwork and piping systems.
      c. Each drawing shall be printed on a single sheet. Drawings pieced together from multiple copies are not acceptable.
   2. Seismic Restraint Assembly Installation Details: Pre-Engineered or Custom Engineered assembly details showing required components, dimensions, and method of connection to supporting structure.
   3. Calculations For System Application: Calculations shall indicate maximum forces anticipated at each restraint assembly, method of determining forces, and selection of restraint assemblies.
      a. For Pre-Engineered Assemblies, include documentation of design conditions, maximum load capacity of assembly, and maximum forces at anchorage points.
      b. For Custom Engineered Assemblies, submit calculations identifying maximum load capacity of assembly, maximum forces on each component, sizing/selection of each component, and maximum forces at anchorage points.

D. The entire submittal package comprised of drawings, details, and calculations for mechanical ductwork, piping, and equipment shall be stamped and signed in accordance with the requirements listed under 1.05 SYSTEM ENGINEERING AND QUALITY ASSURANCE in this specification section.

E. At seismic restraint system installation completion, submit three (3) copies of report from seismic restraint system Engineer, or the Engineer's representative, certifying that seismic restraints are installed in conformance with approved shop drawings and no additional restraints are necessary based on field conditions. Include written authorization, from Seismic Restraint System Engineer, of the designated representative.

F. Prior to Contract Closeout submit Operation and Maintenance information required as indicated in Section 20 2000.

PART 2 PRODUCTS

2.01 PRE-ENGINEERED ASSEMBLIES

A. Anchorage and seismic restraint assemblies, comprised of standard or proprietary components, capable of application to restraint system and supporting structure.

B. Acceptable Proprietary Manufacturers: Mason Industries or Kinetics. No substitutions.

PART 3 EXECUTION

3.01 GENERAL

A. Seismic restraint system shall be installed in strict accordance with the manufacturer's written instructions and certified submittal data.

B. Conflicts with other trades that result in rigid contact with the equipment or piping due to inadequate space or other conditions shall be coordinated with the Seismic Restraint Engineer and corrected.

C. Attach restraints and anchors to a common structural element plane and within a common structural system.

D. For non-isolated suspended equipment, piping and ducts, install solid braces or taut flexible cable restraints.

E. Provide supplementary support steel for equipment, piping, and ductwork required for the work of this Section.

3.02 REHEAT COILS INSTALLED IN-LINE WITH DUCTWORK WITH PIPING CONNECTIONS

A. Depending on the weight of the equipment, method of attachment to overhead structure, Ip factor and ceiling space available, seismically braced the equipment depending on weight and other factors. Provide flexible hose V-Loops at the connection of the piping to the coil. Flexible hose V-loops with a high pressure rating are specified in Section 22 1100 Piping.

B. Seismic bracing and hoses shall not block access to the equipment valve train.

C. The seismic engineer shall size the appropriate length if flexible hose needed.

3.03 DUCTWORK AND PIPING SEISMIC RESTRAINT

A. Provide minimum of two transverse supports and one longitudinal support on each pipe or duct run. Transverse bracing shall be installed at each turn and at each end of a run with a minimum of one brace at each end. Where a pipe or duct run is shorter than the minimum interval between braces, provide braces at each end.

B. Where restraints are attached to clevis style pipe hangers, the cross bolt must be reinforced.

END OF SECTION

SECTION 20 4200 - SEISMIC RESTRAINT SYSTEM ENGINEERING PRE-SUBMITTAL

PROJECT:_____
(Project Title)

The Undersigned states the following:

- Seismic restraints for the work of Divisions 22 and 23 for this project will be provided as required in Section 20 4200.
- Application of Pre-Engineered Restraint Assemblies will be provided by Seismic Restraint System Engineer meeting qualifications of Section 20 4200.

  Seismic Restraint System Engineer: _____

  Firm Name: _____

  Authorized Representative: _____

  (Name of representative authorized to act on Engineer's behalf)

- Design for Custom Engineered Restraint Assemblies will be provided by Seismic Engineer meeting qualifications of Section 20 4200.

  Seismic Engineer: _____

  Firm Name: _____

  Authorized Representative: _____

  (Name of representative authorized to act on Engineer's behalf)

- Upon completion of seismic restraint system installation the Engineers listed above, or the designated representative listed, will inspect and certify that seismic restraints are installed in conformance with approved shop drawings and, based on actual field conditions, no additional restraints are necessary to comply with applicable codes.

Submitted by: _____ Signature: _____

Firm: _____

Address: _____

Telephone: _____ E-mail:_____

Date: _____

SECTION 20 60 00

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

1.02 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
   1. Shop Drawings (submittal data)
   2. Product Data (submittal data)
   3. Manufacturer's Operation Manuals
   4. Manufacturer's Service and Lubrication Requirements
   5. Service Contracts and Field Start-up Reports
   6. Cleaning, Certification, and Test Reports
   7. System Information
   8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Pipe Labels		X						
Control and Equipment Nameplates		X						
Regulatory Signage	X	X						
Pipe Union Labels	X	X						

1.03 REFERENCES

A. ANSI A13.1 (American National Standards Institute) - Scheme for the Identification of Piping Systems, latest edition.

B. NFPA 99 (National Fire Protection Association) - Standard for Health Care Facilities, latest edition.

PART 2 PRODUCTS

2.01 PIPE LABELS

A. Pipe Labels:
   1. Type: Preformed plastic or adhesive-backed vinyl, with factory printed legend on colored background.
   2. Letter Size: Conform to ANSI A13.1 1981.
   3. Background Color: Conform to ANSI A13.1 1981.
   4. Flow Direction Arrow: At each pipe label.
   5. Legend Wording:
      a. Match the pipe description shown in Symbols List on Drawings.
      b. Steam piping: Include nominal pressure (e.g. 60psi or 20psi).
   6. Manufacturer: Seton, Brady, MSI, or approved.

2.02 CONTROL AND EQUIPMENT NAMEPLATES

A. Nameplates:
   1. Type: Laminated plastic, with engraved white letters on black background.
   2. Letter Size: 1/2 inch tall.

B. Provide nameplates for mechanical equipment -- including air handling units, fans, pumps, terminal units, heat exchangers, expansion tanks etc. Wording to match equipment designations on Drawings.

C. Nameplate of each mechanical equipment shall include "area served" or "system served". See Drawing Schedules for description of area or system served.

D. Provide nameplates for control panels and major control components.

E. Attach nameplates with rivets or screws; adhesive only fastening not permitted. Provide weather-proof sealant for outdoor applications where screws penetrate casing.

F. At room thermostats and temperature sensors, write the name of the unit served on the inside of cover in permanent ink.

2.03 REGULATORY SIGNAGE

A. Non-Potable Water Signs:
   1. Type: 60 mil thickness, press-polished vinyl plastic rectangular sign with rounded corners. Sign shall be factory configured with one mounting hole in each corner.
   2. Size: 10 inches wide by 7 inches tall.
   3. OSHA Header: “Caution”.
   4. Warning Language: NONPOTABLE WATER. DO NOT DRINK.
   5. Colors:
      a. Background - Yellow
      b. Lettering - Black
   6. Manufacturer: Seton or approved.

2.04 MISCELLANEOUS LABELS

A. Pipe Union Labels:
   1. Material: White vinyl, self-adhesive, permanent.
   2. Red lettering, minimum 1/2 inch tall.
   3. Labels at unions and die-electric unions read “UNION”.
   4. Manufacturer: Seton, Brady, MSI, or approved.

PART 3 EXECUTION

3.01 PIPE LABELS

A. Provide labels for piping.

B. Labels shall be oriented to be visible from the normal access side of the pipe.

C. Locate pipe labels as follows:
   1. Within 3 feet of each valve.
   2. Within 3 feet of each equipment connection.
   3. Within 3 feet of each wall, floor, or ceiling penetration.
   4. Within 3 feet of each branch.
   5. At intervals along the pipe, not to exceed 20 feet on center.
   6. In Tunnels, or Utilidors as indicated previously except:
      a. Maximum 100 feet on center.
      b. On each side of an accessway, within 5 feet of the opening.

D. Prior to label installation; clean pipe or insulation surfaces according to label manufacturer's recommendations.

E. Review pipe labeling with Owner during construction, prior to application. Labeling shall be as approved by Owner (University Construction Project Manager) and per Owner's published construction standards. Refer to http://campusops.uoregon.edu/cc/cc-standards.

3.02 REGULATORY SIGNAGE

A. Sign location and mounting shall be in accordance with OSHA Requirements.

B. Wall mount one Non-potable water sign immediately adjacent to each fixture with water service from a Non-potable lab water distribution system.

C. Signs shall be secured to the wall with screws. Provide suitable accessories for the wall type where each sign is mounted.

D. Sign location shall be adjusted such that a clear and unobstructed view is provided. Final placement of each sign shall be approved by the Owner's Representative.

3.03 PIPE UNION LABELS

A. Provide label for each union and die-electric union concealed inside pipe insulation. Orient label parallel with pipe run and position to be visible from the normal access side of the pipe.

B. Prior to label installation, clean surfaces in accordance with label manufacturer's instructions.

END OF SECTION

SECTION 20 91 00

TESTING, ADJUSTING, AND BALANCING PROVIDED BY OWNER

PART 1 GENERAL

1.01 GENERAL NOTE

A. This Section provided as a reference for other Sections in the project. The Testing and Balancing Contractor will be provided by the owner.

1.02 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

C. Section 23 0900 - Controls

D. Section 23 0910 - Controls - Sequence Of Operation

1.03 SECTION INCLUDES

A. Testing, adjusting, and balancing (TAB) of air systems.

B. Testing, adjusting, and balancing (TAB) of water systems.

C. Measurement of final operating conditions of HVAC equipment.

1.04 QUALIFICATIONS

A. Work of this Section shall be performed by a firm currently certified by the National Environmental Balancing Bureau (NEBB) in the following categories:
   1. Certification for Performance of both Air and Hydronic TAB
   2. Certification for Sound and Vibration Testing

B. Work of this section shall be accomplished under the on-site supervision of a NEBB Certified supervisor assigned full time to an office in the State of Oregon. The NEBB certified person designated in writing to NEBB (for the purpose of NEBB Certification of the firm) shall be the supervisor who will represent the firm. The NEBB certified supervisor shall be responsible for the supervision of on-site TAB work and the setup/review of the balancing report.

1.05 QUALITY ASSURANCE

A. Work of this Section shall be done in accordance with the current edition of the NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

B. Maintain and calibrate measuring instruments in accordance with NEBB standards.

1.06 SUBMITTALS

A. Submittals required for the following, in accordance with Division 1 requirements, Section 20 1000 and Section 20 2000:
   1. Final Balancing Report:
      a. Copies: Provide 4 copies of report with one copy directly to Mechanical Engineer. Insert remaining copies into Mechanical Operation and Maintenance Manuals submitted per Section 20 1000.
      b. Binding: Bind report in 3-ring binder with indexed tabs.
      c. Content:
         1) Cover sheet: Provide cover sheet with each report containing:
            a) Project name and location
            b) Architect
            c) Engineer

d) Mechanical Contractor
e) Testing, Adjusting and Balancing Firm

2) Table of Contents: Indexed to tabs.
3) Content:
   a) Data required by this Section
   b) Reduced copies of Drawings relating reference points to outlet logs, including room numbers.
   c) Note discrepancies between design and actual data.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Check the following and report to Contractor for necessary corrections:
   1. Drafts, noise and vibration.

3.02 SCOPE OF WORK

A. HEPA Filter Fan Units:
   1. Record fan CFM, motor operating speed and initial filter pressure drop. Reset factory speed settings via remote wall mounted Control Console to meet airflow and room pressure requirements.

B. Balance supply and exhaust outlets and inlets noted on the drawings, including labs outside the clean room spaces.

C. Hydronic Systems:
   1. Test, adjust and record water flow at reheat coil.
   2. List inlet and outlet water temperatures at full water flow through each coil.
   3. List air temperature measurements simultaneous with water measurements.

D. Room Sensors and Thermostats:
   1. Check and report setpoints and room temperature after all adjustments have been made with the HVAC system operating under automatic control.

E. Fume Hoods:
   1. Balance fume hood exhaust airflow to the air quantity shown on the drawings depending on which fume hood manufacturer is installed, with the sash set at an operating height of 18" and 100 fpm face velocity through the sash opening.

F. Room Pressurization:
   1. Record differential pressure between each clean room spaces relative to each other and the adjacent Lab/Entry Alcove.
   2. Adjust room general exhaust CFM at Terminal Unit and balancing dampers to ensure a positive differential pressure between the spaces and adjacent corridor as shown in the Room Pressurization Schedule on the drawings.

G. See Section 23 10 100 Controls - Sequence Of Operation for additional work required with control contractor to set space pressurization in the spaces.

H. Clean Room Cleanliness Certification:
   1. Certify the clean room meets the acceptance criteria for ISO cleanliness Class 7 (Class 10,000 per FED STD 209E) using NEBB Procedural Standards for Certified Testing of Cleanrooms.
   2. Test will be limited to a floor count with air samples taken by a particle counter at a height of 32" to 40" above the floor (sample times and air volume typically are 1 minute and 1 CFM).

END OF SECTION

SECTION 21 10 00

FIRE PROTECTION

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

C. Section 20 4200 - Seismic Restraints

1.02 SCOPE OF WORK

A. Provide complete design and engineering, shop drawings, and installation of a complete fire protection system for full coverage of the remodel area.

B. The fire protection system shall fully comply with the latest adopted edition of NFPA 13 - Installation of Sprinkler Systems.

C. Provide seismic restraints in accordance with NFPA 13, the 2007 Oregon Structural Specialty Code, and The Project Design Criteria in Section 20 4200.

1.03 DESCRIPTION OF SYSTEMS

A. Modify and add to existing wet pipe sprinkler system.

B. Demolish existing sprinklers and piping within the remodel area as required to accommodate new clean room ceiling system and new air distribution system.

C. Connect to existing sprinkler piping and provide new sprinkler system coverage of full remodel area.

D. Project includes new cleanroom ceiling system. Piping shall be above ceiling with sprinklers located in the proprietary ceiling grid system. See Division 1 specification of ceiling grid system. Coordinate sprinkler head installation with ceiling grid system design.

1.04 SYSTEM ENGINEERING AND QUALITY ASSURANCE

A. Fire Protection engineering and design shall be performed by, or under the direct supervision of, a currently licensed Oregon Professional Engineer. Submittal packages (drawings, calculations) shall bear the signed seal of the supervising engineer.

B. The Fire Protection System engineer/designer:
   1. Shall be familiar with and comply with documented standards and ordinances required by the local authority having jurisdiction.
   2. Shall be responsible for verifying design and field conditions prior to submitting shop drawings for preliminary approval. Field conditions include, but are not limited to, available ceiling space, and obstructions such as ducts and structural elements.

1.05 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
   1. Shop Drawings (submittal data)
   2. Product Data (submittal data)
   3. Manufacturer's Operation Manuals

4. Manufacturer's Service and Lubrication Requirements
5. Service Contracts and Field Start-up Reports
6. Cleaning, Certification, and Test Reports
7. System Information
8. Warranties

PRODUCT TABLE	Operation & Maintenance Information							
	1	2	3	4	5	6	7	8
Pipe, fittings, hangers, and joining systems.		X						
Sprinkler Heads. Indicate head response type and listed coverage area.		X						
Specialties		X						
Prepare a complete set of system drawings showing: (1) System Type(s) and sizing method(s) used. (2) Pipe runs, pipe sizes, valves, flow switches, and drains. (3) Schedule of proposed products for each pipe size, fire protection system type, and area served. (4) Hydraulic reference points and remote design areas, referenced to calculations. (5) List of symbols and abbreviations used. (6) Head locations and types in relationship to structure, lights, diffusers, speakers, and other architectural elements. Include head types lights, diffusers, speakers and other architectural elements in Symbols List. (7) Supply riser location and detail. (8) Location and height of fire department connections. (9) Flexible assemblies and seismic loops at pipes crossing building expansion and seismic joints. (10) Manufacturer's model number and location of equipment.	X							
Hydraulic Calculations for Pipe Sizing: (1) For calculated pipe sizes, submit hydraulic calculation worksheets. (2) Worksheets shall include a list of all abbreviations used. (3) Worksheets shall include hydrant flow and test data with location, date, and testing agency. (4) Worksheets shall include information listed in NFPA 13.	X							

C. Submit Shop Drawings as follows:
   1. Submit system drawings to Architect for preliminary review and comments.
   2. If comments are received, make noted changes and resubmit to Architect for review.
   3. Following Architect final review, submit final drawings to the local/state Fire Marshal for approval.
   4. After receiving approval from the local/state Fire Marshal, submit the drawings with Fire Marshal's approval stamp to the Architect.

PART 2 PRODUCTS

2.01 GENERAL

A. Products shall be UL listed and FM approved for the purpose and system specified.

2.02 PIPE AND FITTINGS

A. Sprinkler Systems:
   1. Pipe and fittings shall conform to NFPA 13.
   2. Proprietary pipe, listed and installed in accordance with NFPA 13, shall be limited to the following products:
      a. Allied Dyna-Flo / Super Flo
      b. Allied Dyna-Thread / Super-40.

2.03 SPRINKLER HEADS

A. General:
   1. Sprinklers shall be quick response.
   2. Provide proper temperature rating in accordance with NFPA 13.

B. Upright:
   1. Application: Concealed spaces and areas with no ceilings.
   2. Fusing Element: Solder link.
   3. Finish: Standard brass.
   4. Manufacturer: Viking, Tyco, Standard, Reliable, or approved.

C. Wet Pendant (Metal Free Clean Room):
   1. Application: Remodel areas with cleanroom ceiling system.
   2. Sprinkler Head Location: Sprinkler head location shall be limited to installation in the ceiling grid support member and not the ceiling tile.
   3. Fusing Element: Glass bulb.
   4. Special Coating: Electroless Nickel PTFE (ENT) applied to all sprinkler head components. cULus Listed as corrosion resistant.
   5. Manufacturer: Viking or approved. Similar to Viking Microfast with ENT coating.

2.04 SPECIALTIES

A. Flexible Cleanroom Sprinkler Connections:
   1. Description: FM approved assembly for connecting sprinklers located in cleanroom ceiling grids.
   2. Ceiling Grid Compatibility: Verify cleanroom ceiling system grid manufacturer and provide sprinkler connections which are compatible with that particular system.
   3. Flexible Hose: Stainless steel, 3 feet long.
   4. Sprinkler Drop: Stainless steel, 1/2"NPT threads to receive sprinkler, factory connected to flexible hose, O-ring seal at penetration of ceiling grid, brackets for bolting to grid.
   5. Pressure Rating: 175 psi.
   6. Manufacturer: FlexHead Industries or approved. Similar to FlexHead CRX series.

2.05 PIPE SUPPORTS

A. Ring Hangers for Pipe Sizes 3 inch and smaller:
   1. Type: Carbon steel band, adjustable, with knurled swivel nut.
   2. Finish:
      a. Indoors: Zinc plated.
      b. Outdoors or Wet Areas: Hot dip galvanized.
   3. Approvals: UL and FM.
   4. For uninsulated copper piping: Equivalent to model specified, with addition of copper plating, neoprene coating, or PVC coating.
   5. Manufacturer:
      a. Anvil Fig. 69.
      b. B-Line Fig. B 3170.
      c. Super Strut C-727.
      d. PHD Model 151.
      e. Erico/Michigan Model 100.
      f. Tolco Fig. 2, Fig. 200 for sizes 2” and smaller.

B. Clevis Hangers for Pipe Sizes 4 inch and larger:
   1. Type: Adjustable clevis.
   2. Material: Carbon Steel.
   3. Finish:
      a. Indoors: Zinc plated.
      b. Outdoors or Wet Areas: Hot dip galvanized.
   4. Approvals: UL and FM.

5. Manufacturers:
   a. Anvil Fig. 260.
   b. B-Line Fig. B 3100.
   c. Super Strut C-710.
   d. PHD Model 450.
   e. Erico/Michigan Model 400.
   f. Tolco Fig. 1.

C. Hanger Rods:
   1. Materials: Carbon Steel.
   2. Finish:
      a. Indoors: Zinc plated.
      b. Outdoors or Wet Areas: Hot dip galvanized.
      c. Diameter: Meet or exceed NFPA requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install pipe plumb, parallel, and true to building structural system. Where possible, use full 20 ft. lengths.

B. Install hangers at branch line connections to cross mains and as required by NFPA 13.

C. Provide metal box suitable for wall hanging containing six spare heads of each type used and a head wrench.

D. Coordinate piping and head locations with structure, ductwork, plumbing, lighting, and other electrical work.

E. Coordinate sprinkler head locations with architectural reflected ceiling plans.

3.02 INSPECTION AND TESTS

A. Arrange and pay for inspection and tests required by the authorities and agencies to obtain complete and final acceptance of system.

B. Provide certificate in duplicate of Fire Marshal's acceptance.

END OF SECTION

SECTION 22 11 00

PIPING

PART 1 GENERAL

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

C. Section 21 1000 - Fire Protection: Fire sprinkler piping above grade

1.02 TRENCHING, BACKFILLING, AND COMPACTION

A. Provide trenching, backfilling, and compaction for the Work of this Section.

B. Trenching, backfilling, and compaction shall comply with requirements referenced in Section 20 1000, in addition to requirements specified in this Section.

1.03 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
   1. Shop Drawings (submittal data)
   2. Product Data (submittal data)
   3. Manufacturer's Operation Manuals
   4. Manufacturer’s Service and Lubrication Requirements
   5. Service Contracts and Field Start-up Reports
   6. Cleaning, Certification, and Test Reports
   7. System Information
   8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Lab Waste and Vent Pipe and Fittings		X						
Piping Specialties		X						
Flexible Pipe Connections		X						
Pipe Supports		X						

1.04 QUALITY ASSURANCE

A. Qualification of Welders:
   1. Welders performing the Work of this Section shall have been certified within the last five years. Upon request, the Contractor shall provide the Owner with the names of welders employed in the Work, together with certification that each of these welders has passed qualification tests as prescribed by the National Certified Pipe Welding Bureau, or by other approved agency.
   2. Welders installing piping connected to a boiler shall be qualified based on the Contractor's welding procedures and shall be boiler maker or steam fitter certified. In addition, at least one of the following is required:
      a. National Board "R" stamp certificate.
      b. "O" stamp certificate.
      c. ASME Code shop with appropriate stamp.

PART 2 PRODUCTS

2.01 PLUMBING PIPING

A. Domestic Water (CW, HW, HWR):
   1. Pipe: Type L copper, hard drawn, ASTM B-88.
   2. Fittings: Wrought copper, ANSI B-16.22.
   3. Joints:
      a. 2-1/2 inch diameter & smaller: Lead-free 95-5 tin-antimony solder or silver/copper-alloy brazed.
      b. 3 inch diameter & larger: Silver/copper-alloy brazed.

B. Non-Potable Industrial Water (ICW, IHW)
   1. Pipe: Type L copper, hard drawn, ASTM B-88.
   2. Fittings: Wrought copper, ANSI B-16.22.
   3. Joints: Lead-free 95-5 tin-antimony solder or silver/copper-alloy brazed.

C. Lab Waste and Vent (LW, LV):
   1. Pipe: Schedule 40, flame-retardant polypropylene.
   2. Fittings: Flame-retardant polypropylene, standard DWV patterns.
   3. Joints:
      a. Above Ground: Mechanical.
      b. Buried: Thermal fusion.
   4. Transition Couplings: Approved for use with systems to be joined.
   5. Pipe, Fitting, and Coupling Manufacturer: Ipex (Enfield) Lab Line to match owner's standards.

2.02 HYDRONIC PIPING

A. Heating Water (HS, HR), 2-1/2 inch diameter and smaller:
   1. Option #1:
      a. Pipe: Type L copper, hard drawn, ASTM B-88.
      b. Fittings: Wrought copper, ANSI B-16.22.
      c. Joints: Lead free 95-5 tin-antimony solder or approved.
   2. Option #2:
      a. Pipe: Schedule 40 black steel, ASTM A-53, Grade B.
      b. Fittings: Malleable iron, class 150, ANSI B-16.3.
      c. Joints: Screwed.

2.03 LAB GAS AND VACUUM PIPING

A. Compressed Air (A):
   1. Pipe: Type L copper tubing, hard drawn, ASTM B819, factory cleaned and sealed, marked for oxygen service.
   2. Pipe Seals: Factory-installed rubber plugs.
   3. Fittings: Wrought copper, factory cleaned and bagged for oxygen service.
   4. Joints: Brazed, using copper-phosphorus brazing filler alloy, without flux.
   5. Manufacturer: Mueller or approved.

B. Natural Gas (G):
   1. Pipe: Schedule 40 black steel, ASTM A-53, Grade B.
   2. Fittings: Malleable iron, class 150, ANSI B-16.3.
   3. Joints: Screwed.

C. Vacuum (VAC):
   1. Pipe: Type L copper, hard drawn, ASTM B-88.
   2. Fittings: Wrought copper, ANSI B-16.22.
   3. Joints: Lead-free 95-5 tin-antimony solder or silver/copper -alloy brazed.

D. Nitrogen (N):
   1. Inside Clean Room:
      a. Pipe: ABS blend, with co-extruded nylon liner, with impact resistance and ductility rated for compressed air applications.
      b. Fittings: Material and manufacturer to match pipe.
      c. Joints: Solvent cement, manufacturer to match pipe.
      d. Manufacturer:
         1) IPEX Duraplus ABS Air-Line pipe and fittings.
         2) IPEX Blue Duraplus ABS Air-Line solvent cement.
   2. Outside Clean Room:
      a. Option #1: IPEX Duraplus ABS specified above for piping "Inside Clean Room".
      b. Option #2:
         1) Pipe: Type L copper tubing, hard drawn, ASTM B819, factory cleaned and sealed, marked for oxygen service.
         2) Pipe Seals: Factory-installed rubber plugs.
         3) Fittings: Wrought copper, factory cleaned and bagged for oxygen service.
         4) Joints: Brazed, using copper-phosphorus brazing filler alloy, without flux.
         5) ABS/Copper Connections: Composite Union – Socket x Male BSPT fitting.
         6) Manufacturer: Mueller or approved.

2.04 FLEXIBLE PIPE CONNECTIONS

A. Reheat Coil Flexible Hose Connections - Vee Loop:
   1. Application: Pipe connections to coils installed In-line with ducts.
   2. Description: Factory assembled unit consisting of two flexible sections of hose and braid, connected with elbows and/or return bend in a "V" configuration.
   3. Flexible Hose: Corrugated 304 stainless steel hose, 304 stainless steel braid and 304 stainless steel braid band.
   4. Nipples and Elbows: Schedule 40 carbon steel welded to hose with NPT connection.
   5. Return Bend: With air release/drain connection and support bracket.
   6. Relative Movement: Minimum 4 inches in all directions.
   7. Maximum Rated Pressure: 700 psig at 70 deg F for a size 3/4" x 24" end to end hose, with 15" in live length and 94 corrugations.
   8. Minimum Burst Pressure: Four times the Rated Pressure.
   9. Dielectric Unions: Brass or Bronze unions required at connection to copper piping.
   10. Manufacturer: Mason VMN, or approved.

2.05 PIPING SPECIALTIES

A. Flange Gaskets:
   1. Domestic Water service:
      a. Type: Full faced or flat ring, to suit flange facings.
      b. Material: EPDM, listed for potable service.
      c. Temperature and Pressure: 150 psig, 275 degrees F.
      d. Conform to: ASTM D2000, NSF 61.
      e. Thickness: 1/16 inch.
      f. Manufacturer: Garlock Style 98206 or approved.

B. Escutcheons:
   1. General Purpose:
      a. Construction:
         1) 2” diameter opening and smaller: Cast brass, nickel-plated with set screw.
         2) Over 2” diameter opening: Chrome plated stamped steel.
      b. Size: Sufficient to cover sleeves and openings.
   2. Exposed Inside Clean Room:
      a. Construction: Plastic or metal free material.

C. Strainers:
   1. Body:
      a. At steel pipe, iron or steel.
      b. At copper pipe, bronze or brass.
   2. Rated Working Pressure:
      a. High pressure steam: 250 psig minimum.
      b. All others: 125 psig minimum.
   3. Pattern: Self-cleaning Y with blow-off connection.
   4. Basket:
      a. 2-1/2 inch and larger: 0.045 inch perforated, type 304 stainless steel.
      b. 2 inch and smaller: 20 mesh monel.
   5. Manufacturer: Fabrotech, Sarco, Hoffman, Keckley, Meuller, Armstrong, Hayward, Wheatley, Streamflow, Victaulic, or approved.

D. Unions for steel pipe:
   1. Body: Iron
   2. Seat: Brass.
   3. Rated Working Pressure:
      a. Domestic Water: 125 psi minimum.
      b. Hydronic: 250 psi minimum at 210 degrees F.
      c. Steam: 300 psi in MPS and MPCS, 150 psig in LPS, MPC, LPC and PC.
   4. Connection: Screwed or flanged to match pipe.

E. Unions for copper pipe:
   1. Body: Bronze.
   2. Seat: Brass.
   3. Rated Working Pressure:
      a. Domestic Water: 125 psi minimum.
      b. Hydronic: 250 psi minimum at 210 degrees F.
   4. Connection: Screwed, brazed, or flanged to match pipe.

F. Unions for connecting copper pipe to steel pipe, 2-1/2 inch and smaller:
   1. Description: Red brass body and seat. Gasketed dielectric unions will not be permitted by owner's standards.
   2. Rated Working Pressure: 250 psig minimum at 210 degrees F.
   3. Connection: Screwed or brazed, to match pipe.

2.06 PIPE SUPPORTS

A. General: Notwithstanding other finish requirements herein, provide Pre-Galvanized, Hot-Dip Galvanized, or Stainless Steel support components as scheduled for support of the work of other Divisions in Part 3 of Section 05 4300, with fasteners as follows:
   1. Hot-dip galvanized supports: Provide stainless steel fasteners and fittings.
   2. Pre-galvanized supports: Provide zinc-plated fasteners and fittings.

B. Ring Hangers for Pipe Sizes 3 inch and smaller:
   1. Type: Carbon steel band, adjustable, with knurled swivel nut.
   2. Finish:
      a. Indoors: Zinc plated.
      b. Outdoors or Wet Areas: Hot dip galvanized.
   3. Approvals: UL and FM.
   4. For uninsulated copper piping: Equivalent to model specified, with addition of copper plating, neoprene coating, or PVC coating.
   5. Manufacturer:
      a. Anvil Fig. 70
      b. B-Line Fig. B 3170
      c. Super Strut C-727
      d. PHD Model 151

e. Erico/Michigan Model 100

C. Clevis Hangers for Pipe Sizes 4 inch and larger, Except Steam, Condensate, and Heating Water Pipe:
1. Type: Adjustable clevis.
2. Material: Carbon steel.
3. Finish:
   a. Indoors: Zinc plated.
   b. Outdoors or Wet Areas: Hot dip galvanized.
4. Approvals: UL and FM.
5. For uninsulated copper piping: Equivalent to model specified, with addition of copper plating, neoprene coating, or PVC coating.
6. Manufacturer:
   a. Anvil Fig. 260
   b. B-Line B 3100
   c. Super Strut C-710
   d. PHD Model 450
   e. Erico/Michigan Model 400

D. Hanger Rods:
1. Material: Carbon steel.
2. Finish:
   a. Indoors: Zinc plated.
   b. Outdoors or Wet Areas: Hot dip galvanized.

E. Insulated Pipe Shields for Use at Pipe Supports:
1. Type: Preformed pipe insulation with an insulation shield.
2. Insulation (Pipe sizes 1-1/4 inch through 3 inch), except steam and steam condensate piping:
   a. Type: Rigid, polyisocyanurate foam, preformed to fit pipe size.
   b. Conductivity ("k"): Not to exceed 0.19 at 75 degrees F mean temperature.
   c. Thickness: To match adjacent pipe insulation. See Section 22 1410.
   d. Length: To match insulation shield.
   e. Manufacturer: Dow “Trymer 2000".
3. Insulation (Pipe sizes 4 inch and larger and steam and steam condensate piping):
   a. Type: Rigid, hydrous calcium silicate, premolded to fit pipe size.
   b. Density: 14 pounds per cubic foot.
   c. Conductivity ("k"): Not to exceed 0.36 at 75 degrees F mean temperature.
   d. Temperature Rating: 1200 degrees F.
   e. Manufacturer:
      1) Manville "Thermo-12"
      2) Owens Corning "Kaylo 10"
4. Insulation Jacket:
   a. Type: .016 inch thick aluminum, preformed to fit pipe.
   b. Finish: Stucco embossed pattern.
   c. Moisture Barrier: Kraft or polyethylene.
5. Insulation Shield:
   a. Type: Galvanized steel, 2 overlapping pieces, full 360 degree.
   b. Minimum Thickness:
      1) Pipe Sizes 1-1/4 to 2 inch: 24 gauge
      2) Pipe Sizes 2-1/2 to 3 inch: 20 gauge
   c. Minimum Length: 12 inch.
6. Manufacturer: E.J. Bartells, ISSI Product Inc., Pipe Shields Inc., Erico/Michigan, or field fabricated with components specified herein.

F. Riser Clamps:
   1. Type: 2 bolt.
   2. Material: Carbon steel.
   3. Finish:
      a. Indoors: Zinc plated.
      b. Outdoors or Wet Areas: Hot dip galvanized.
   4. For uninsulated copper piping: Equivalent to model specified, with addition of copper plating, neoprene coating, or PVC coating.
   5. Manufacturer:
      a. Anvil Fig. 261
      b. B-Line Fig. B 3373
      c. Super Strut C-720
      d. PHD 550
      e. Erico/Michigan Model 510

G. Wall Supports & Trapeze Assemblies:
   1. Description: Field fabricate of manufactured channel components.
   2. Channels: Pre-Galvanized, Hot-Dip Galvanized, or Stainless Steel channel strut components as specified in Section 05 4300. Coordinate with Section 05 4300 for single manufacturer.
   3. Pipe Supports: U-bolt, U-strap, or roller type components in accordance with those specified herein and compatible with manufactured channel system.
   4. Trapeze Size: As published by manufacturer for span and total weight supported. Provide sizing criteria with product data submittal.
   5. Manufacturer: Refer to Section 05 4300.

2.07 SLEEVES AND SEALS

A. Sleeves:
   1. Material: Galvanized steel.
   2. Minimum Gauge: 20 gauge minimum.
   3. Minimum Size: 1/2 Inch larger than diameter of pipe, including insulation.

PART 3 EXECUTION

3.01 GENERAL

A. Install products in accordance with manufacturer's recommendations.

B. Install piping plumb and parallel true to building structural system.

C. Where possible, use full 20 foot lengths.

D. Install branch piping to allow for expansion with offsets and swing joints as necessary to prevent undue strain.

E. Do not use bushings and close nipples.

F. Do not penetrate structural members.

G. Screwed joints shall have less than two percent of threads showing.

H. Ream pipes to full inside diameter prior to making up joints.

I. Comply with applicable IAPMO Installation Standard for each particular piping material.

J. Make branches and elbows with fittings specified herein. "Pulled tees", saddle taps, and field fabricated fittings are not acceptable.

K. Testing of Piping Systems:
   1. Advise Architect or authorized representative when testing will be performed.
   2. Test before concealing pipe joints and welds.

3. Before testing, isolate all equipment or components which are not rated for test pressures.
4. Record temperature at start and finish of test. Pressure readings at finish of test shall be adjusted to account for temperature change of medium during the test.
5. Test pressures shall be as specified herein for each type of piping system.
6. Comply with testing requirements of authorities having jurisdiction, in addition to requirements specified herein.
7. Piping systems shall hold test pressure for a minimum of one hour with no leakage.

3.02 HYDRONIC PIPING

A. Conform to applicable portions of ANSI/ASME B31.9 Building Services Piping.

B. Make connections between steel and copper pipe in accessible locations, using red brass unions or isolation flanged connections, as determined by pipe size.

C. Install piping level, using eccentric reducers as required to have and even plane on top for venting air.

D. Provide manual air vents at system high points and where shown on Drawings.

E. At low points of systems, provide ball valves with caps for drainage.

F. Test Pressure: Fill system with water and pressurize to 150 psig.

3.03 FUEL PIPING

A. Natural Gas Piping:
   1. Install and test in accordance with NFPA 54 and applicable local codes.
   2. For threaded fittings, couplings and other threaded connections use liquid thread sealant, Jomar, Rectorseal, Form-a-gasket or approved. Teflon tape is not permitted.

3.04 PIPING SPECIALTIES

A. Escutcheons:
   1. Install on exposed pipe through walls, floors, or ceilings.
   2. Secure escutcheon to pipe and wall.
   3. Escutcheons not required in mechanical rooms.

B. Strainers:
   1. Install upstream of each control valve, automatic valve, steam trap, solenoid valve, and where shown on Drawings.
   2. Strainer shall be same size as pipe.
   3. For water and condensate piping, install strainer with "Y" pointing down.
   4. For steam piping, install strainer with "Y" horizontal, to allow condensate to drain.
   5. Provide clearance for basket removal.

C. Unions for steel pipe:
   1. Provide unions as follows:
      a. Where indicated on Drawings.
      b. At each automatic control valve.
      c. As required for removal of pumps, steam traps, and equipment with piping connections.

D. Unions for copper pipe:
   1. Provide unions as follows:
      a. Where indicated on Drawings.
      b. At each automatic control valve.
      c. As required for removal of pumps, steam traps, and equipment with piping connections.

E. Unions for connecting copper pipe to steel pipe, 2-1/2 inch and smaller:
   1. Provide unions as follows:
      a. Where indicated on Drawings.
      b. At connection points between copper and steel pipe.
      c. Not required at heating and cooling coil connections.
      d. Install in accessible locations.

3.05 PIPE SUPPORTS

A. General:
   1. Refer to Section 22 1410 to determine pipe insulation requirements.
   2. Supports for the following shall bear directly on the pipe:
      a. Uninsulated pipe.
      b. 1 inch and smaller domestic hot water and heating water pipe.
   3. Size hangers to fit outside of pipe insulation, except where hangers shall bear directly on the pipe.
   4. Provide pipe support shoe welded to pipe at each roller hanger.
   5. Comply with applicable IAPMO Installation Standard for particular piping material.
   6. Channel Strut supports: Provide channel strut with finishes corresponding to the location of the strut as scheduled in Part 3 of Section 05 4300.

B. Insulated Pipe Shields:
   1. Provide insulated pipe shield at each support, except as follows:
      a. Pipe sizes 1 inch and smaller.
      b. Where supports are permitted to bear directly on the pipe.
      c. Where support shoes are required.
   2. Secure insulation with 16 gauge stainless steel wire, stainless steel bands, or nylon tape as recommended by insulation manufacturer.
   3. Cover pipe insulation with aluminum jacket and preformed fitting covers.
   4. For cold pipe installations, seal seams and joints in jacket with vapor barrier mastic or tape, to provide a continuous positive vapor barrier.

C. Steel Pipe, Horizontal:
   1. Support within 2 feet of each direction change.
   2. Maximum spacing of supports:

Pipe Size	Rod Diameter	Maximum Spacing
1 inch and smaller	3/8 inch	7 feet 0 inches
1-1/4 inch - 2 inch	3/8 inch	10 feet 0 inches
2-1/2 inch - 3-1/2 inch	1/2 inch	10 feet 0 inches
4 inch	5/8 inch	12 feet 0 inches
5 inch and larger	3/4 inch	12 feet 0 inches

D. Copper Pipe, Horizontal:
   1. Support within 2 feet of each direction change.
   2. Maximum spacing of supports:

Pipe Size	Rod Diameter	Maximum Spacing
1-1/2 inch and smaller	3/8 inch	6 feet 0 inches
2 inch and larger	3/8 inch	10 feet 0 inches

E. Cast Iron Pipe, Horizontal:
   1. For joints less than 4 feet o.c.: Support at every other joint.
   2. For joints 4 feet or greater o.c.: Support at every joint.
   3. Support at every horizontal branch.
   4. Maximum spacing of supports: 10 feet o.c.

F. Plastic Pipe, Horizontal:
   1. Support 4 foot maximum on center or provide a continuous angle support under pipe per manufacturer's recommendations.
   2. Support to permit axial movement.

G. Vertical Pipe Supports:
   1. Provide riser clamp at each floor.
   2. Provide wall supports, in addition to riser clamps, as follows:
      a. For plastic pipe where spacing between riser clamps is greater than 6 feet.
      b. For copper pipe where spacing between riser clamps is greater than 10 feet.
      c. For cast iron and steel pipe where spacing between riser clamps is greater than 12 feet.

H. Steel Pipes Through Floors in Finished Rooms:
   1. Place slip-on steel flange on pipe above floor penetration.
   2. Tack weld flange in four places, 1 inch long.
   3. Anchor flange to floor, using bolts and lead anchor inserts.

I. Copper Pipes Through Floors in Finished Rooms:
   1. Place slip-on cast bronze flange on pipe above floor penetration.
   2. Braze flange to copper pipe.
   3. Anchor flange to floor, using bolts and lead anchor inserts.

3.06 SLEEVES AND SEALS

A. Install sleeves and seals at pipe penetrations through walls and floors. Insulation shall be continuous through penetrations. Coordinate with pipe insulation requirements in Section 22 1410.

B. Caulk between pipe and sleeve at penetrations of walls and floors which are not fire-rated.

END OF SECTION

SECTION 22 13 00

VALVES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

1.02 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
1. Shop Drawings (submittal data)
2. Product Data (submittal data)
3. Manufacturer's Operation Manuals
4. Manufacturer’s Service and Lubrication Requirements
5. Service Contracts and Field Start-up Reports
6. Cleaning, Certification, and Test Reports
7. System Information
8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Ball Valves		X						
Drain Valves		X						
Gas Valves		X						

PART 2 PRODUCTS

2.01 BALL VALVES

A. Ball Valves, Heating Water Size 2 Inch and Smaller:
1. Type: Full port, 2-piece body with stainless steel trim.
2. Body: Bronze.
3. Rated Working Pressure: Minimum of 150 psig steam; 600 psig WOG.
4. Handle:
   a. Uninsulated Pipe: Standard lever handle.
   b. Insulated Pipe: Extended lever handle.
5. Ends: Threaded.
6. Stem and Ball: 316 stainless steel.
7. Seat and Seals: PTFE, TFE, or Buna-N.
8. Standard: MSS SP-110.
9. Manufacturer: Apollo, or approved. Similar to Apollo 70-140 (threaded)

B. Ball Valves: Plumbing, Metal Piping:
1. Type: Full port, 2-piece body, lever handle, threaded ends.
2. Body: Bronze.
3. Rated Working Pressure: Minimum of 150 psig steam; 400 psig WOG.
4. Stem and Ball: Stainless steel.
5. Seat and Seals: PTFE.

6. Manufacturer: Apollo or approved. Similar to Apollo 77-140.

C. Ball Valves, Plumbing, ICW Isolation Valve At Clean Rooms Sinks:
   1. Body: Schedule 80 PVC, once piece molded, approved for water service.
   2. Seats: PTFE.
   3. Rated for 150 PSI water service at 73°F and 50 PSI service at 140°F.
   4. Connection: Threaded.
   5. Manufacturer: Nibco/Chemtrol, or approved

D. Ball Valves in Lab Gas Piping, Nitrogen (N):
   1. Type: Full port, three piece, double seal, cleaned and bagged for oxygen service.
   2. Body: Bronze or brass.
   3. Ball: Chrome plated brass.
   4. Seats, Seals, Lubricants, and Materials: Suitable for oxygen service.
   5. Maximum Allowable Pressure: 600 psig at 100 deg F.
   6. Tube Extensions: Type K copper with gauge port with brass plug.
   7. Manufacturer: Beacon Medaes, Allied Healthcare, Hill-Rom or approved.

2.02 DRAIN VALVES

A. Drain Valves:
   1. Type: 3/4 inch bronze ball valve, as previously specified, with 3/4 inch male hose thread adapter screwed into valve body, brass cap screwed onto hose thread adapter, and cap retainer chain.

PART 3 EXECUTION

3.01 GENERAL

A. Valves shall be full line size, except where noted otherwise.

B. Install valves in locations which are accessible without damage to finished walls and ceilings.

C. Where possible, position valve operator towards access opening.

END OF SECTION

SECTION 22 14 10

PIPING INSULATION

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

C. Section 22 1100 - Piping: Pipe Supports, Insulated Pipe Shields

1.02 QUALITY ASSURANCE

A. Products shall have flame spread and smoke developed ratings based on test procedures in accordance with NFPA-255 and UL-723. Ratings shall be indicated on the product or on the shipping cartons.

B. Unless otherwise specified herein, products shall have flame spread ratings not to exceed 25 and smoke developed ratings not to exceed 50.

C. Products shall comply with the requirements of Oregon Revised Statute (ORS) 453.005 (7) (e), effective January 1, 2011. The referenced statute limits the use of three types of brominated fire retardant chemicals, which are defined as hazardous substances.

1.03 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Operation & Maintenance Information required for the products listed in the Product Table, indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
   1. Shop Drawings (submittal data)
   2. Product Data (submittal data), including documentation of ORS 453.005 (7) (e) compliance.
   3. Manufacturer's Operation Manuals
   4. Manufacturer’s Service and Lubrication Requirements
   5. Service Contracts and Field Start-up Reports
   6. Cleaning, Certification, and Test Reports
   7. System Information
   8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Pipe Insulation		X						
Jackets and Fitting Covers		X						
Accessories		X						

PART 2 PRODUCTS

2.01 PIPE INSULATION

A. Preformed Fiberglass (FG):
   1. General: Preformed to fit pipe size, with factory applied vapor barrier facing.
   2. Conductivity ("k"): Not to exceed 0.24 at 75 degrees F mean temperature.

3. Vapor Barrier Facing:
   a. General: Factory applied glass fiber reinforced aluminum foil laminate.
   b. Permeability: Not to exceed 0.02 perms.
   c. Closure System: Self-sealing pressure sensitive lap.
4. Manufacturer and Model: Owens Corning "Evolution Paper-free ASJ", or approved.

B. Polymer Foam (PF):
1. Type: Flexible, flexible engineered polymer foam, pre-slit tubing.
2. Joining System: Pre-slit, pre-glued, with peel-off release liner.
3. Conductivity ("k"): Not to exceed 0.24 at 75 degrees F mean temperature.
4. Manufacturer: Nomaco K-Flex "Imcolock", Thermacell or approved.

2.02 JACKETS AND FITTING COVERS

A. Polyvinyl Chloride Jackets and Fitting Covers (PVC):
1. Type: White PVC, preformed to fit pipe and fittings, UV-resistant.
2. Shapes: Elbows, tees, valves, reducers, flanges, and end caps; in various sizes including Zest-on Flanged Gate Valve Fitting Covers or similar style cover sized to provide complete coverage of balancing valves and flow control valves.
3. Thickness:
   a. Indoors: Minimum 20 mils (.020 inches, 0.75 mm).
   b. Outdoors: Minimum 30 mils (.030 inches, 0.75 mm).
4. Manufacturer:
   a. Johns Manville "Zeston 2000"
   b. Certain-Teed "Snap Form"
   c. Ceel-Co "Ceel-Tite 300"
   d. Knauf "PVC Fitting Covers

2.03 INSULATION PADS

A. Type: Removable pad, tailored to fit the size and type of valve or fitting to be insulated.

B. Temperature Rating: 500 degrees F.

C. Cover:
1. Material: Non-combustible, Teflon-treated or silicone-treated fiberglass cloth. Minimum 12 ounces per square yard.
2. Manufacturer: Zetex, Alpha, or approved.

D. Fill:
1. Material: 1 inch thick glass fiber or ceramic fiber mat.
2. Manufacturer: Thermal Ceramics, Manville, Lewco, Alpha, or approved.

E. Fasteners: Hooks and stainless steel lacing or fiberglass straps with stainless steel buckles.

2.04 ACCESSORIES

A. Insulating Cement: Comply with ANSI/ASTM C195.

B. Finishing Cement: Comply with ASTM C449.

C. Mastic, Coatings, Tapes, and Adhesives: Comply with Manufacturer's installation instructions for each type of insulation.

PART 3 EXECUTION

3.01 DEFINITIONS

A. Above Ground:
1. Includes:
   a. Items inside buildings, except direct-buried below slab-on-grade floors.
   b. Items inside tunnels and buried pipe chases.

B. Exposed in Finished Spaces:
   1. Includes:
      a. Items inside buildings.
   2. Does not include:
      a. Items concealed by permanent ceilings, floors, or walls.
      b. Items in tunnels.
      c. Items in mechanical rooms

C. Hot Pipe: Piping, fittings, equipment, or accessories handling media at design temperatures above 105 degrees F.

D. Cold Pipe: Piping, fittings, equipment, or accessories handling rain water, potable cold water, and media at design temperature of 60 degrees F or below.

3.02 GENERAL

A. Install products in accordance with Manufacturer's instructions.

B. Install products in accordance with MICA (Midwest Insulation Contractors Association) - National Commercial & Industrial Insulation Standards.

C. Insulate new pipe, fittings, valves, and specialties for each piping system included under APPLICATION TO PIPING SYSTEMS.

D. Insulate pipe, fittings, valves, and specialties where existing insulation is removed to facilitate the remodel work.

E. Insulate pipe, fittings, valves, and specialties where insulation was previously removed under separate abatement contracts.

F. Where insulated piping is to be removed, report any portions which appear to be existing friable insulation to Architect. Repair and removal of asbestos are not part of this work.

G. Verify piping has been tested and approved before installing insulation.

H. Clean and dry piping before installing insulation.

I. Piping with electric heating cable:
   1. General: Verify that electric heating cable, if required, has been installed and tested, prior to installation of insulation.
   2. Thickness:
      a. For nominal pipe sizes 1/2 inch - 1 inch provide 1 inch thick insulation.
      b. For nominal pipe sizes 1-1/4 inch - 2 inch provide 1-1/2 inch thick insulation.
      c. For nominal pipe sizes 2-1/2 inch and larger provide 2 inch thick insulation.
   3. Sizing: For pipe sizes 1-1/4 inch and smaller, use 1/4 inch larger diameter insulation to allow room for installation over cable.

J. On exposed piping, locate insulation seams in least visible location.

K. Insulation shall be continuous through walls, floors, ceilings, sleeves, and other penetrations. Where penetrations through non-structural framing members would require openings larger than allowed by the Oregon Structural Specialty Code or Oregon Mechanical Specialty Code (Section 302), fill maximum allowable size annulus with polyurethane expanding foam sealer. Trim foam sealer flush with framing member, butt insulation tight to foam, and seal vapor barrier to framing member.

L. Label insulation that covers unions. Refer to Section 20 6000 for labeling requirements.

M. Fill joints, cracks, seams, and depressions with canvas and finishing cement to form smooth surfaces.

3.03 TEMPERATURE-SPECIFIC REQUIREMENTS

A. Cold Pipe Installation Requirements:
   1. Seal seams and joints in vapor barrier facings, fitting covers, and insulation jackets with vapor barrier mastic or tape, to provide a continuous positive vapor barrier.
   2. At interruptions in insulation, seal ends of insulation to provide a continuous vapor barrier. For insulation with vapor barrier, seal with canvas or fiberglass cloth sealed with vapor barrier mastic. For insulation with PVC or aluminum jacket, seal ends with reducer endcaps, same material as jacket, tight to pipe surface and seal to pipe surface with vapor barrier mastic.
   3. For Cold Pipe do not insulate the following:
      a. Exposed supplies at plumbing fixtures
      b. Pressure reducing valves
      c. Reduced pressure backflow preventers located in mechanical rooms
      d. Water hammer arresters
      e. Trap primer valves
      f. Vacuum breakers
      g. Pressure relief valves
      h. Strainer access covers
      i. Control valve actuators
      j. Test plugs
      k. Air vents

B. Hot Pipe Installation Requirements:
   1. In addition to tape system, staple insulation vapor barrier laps with outward clinch monel staples, 4 inches on center.
   2. In addition to tape, secure fitting covers with serrated stainless steel tacks.
   3. At interruptions in insulation, seal ends of insulation to cover exposed insulation. For insulation with vapor barrier, seal with canvas or fiberglass cloth sealed with mastic. For insulation with PVC or aluminum jacket, seal ends with reducer endcaps, same material as jacket, tight to pipe surface and seal to pipe surface with mastic.
   4. For Hot Pipe, do not insulate the following:
      a. Water hammer arresters
      b. Vacuum breakers
      c. Pressure relief valves
      d. Strainer access covers
      e. Steam traps 1 inch or smaller
      f. Control valves 1 inch or smaller
      g. Control valve actuators
      h. Test plugs
      i. Air vents
      j. Flow control valves 1 inch or smaller
      k. Balancing valves 1 inch or smaller

3.04 INSULATION AT PIPE SUPPORTS

A. Refer to Section 22 1100 for insulated pipe shields at pipe supports. At insulated pipe shields, lap insulation vapor barrier over cover of pipe shield and seal with factory approved vapor barrier tape. Seal longitudinal seams of pipe shield cover with vapor barrier tape or mastic. For piping where PVC or aluminum jacket is required, jacket shall be continuous over insulated pipe shields.

B. Refer to Section 22 1100 for pipe support shoes at pipe supports. At pipe support shoes, fully insulate pipe around support shoe. Fill support shoe cavity with unfaced fiberglass insulation. For piping where PVC or aluminum jacket is required, jacket shall be continuous over support shoes.

C. For heating water, condenser water, and domestic hot water pipes on ring hangers and clevis hangers where supports bear directly on the pipe per Section 22 1100, insulation shall cover the hanger, with cutout at the top of hanger. Fill hanger cutout with unfaced fiberglass insulation and seal vapor barrier with pressure sensitive tape to match vapor barrier facing.

D. For heating water and domestic hot water pipes on channel strut where supports bear directly on the pipe per Section 22 1100, insulation shall be butted or trimmed tight to the side of the channel strut.

3.05 FIBERGLASS PIPE INSULATION (FG)

A. General:
   1. Secure longitudinal laps in insulation vapor barrier with factory applied pressure sensitive tape system and outward clenching staples.
   2. Secure butt joints in insulation vapor barrier with pressure sensitive tape to match vapor barrier.
   3. Insulate fittings and valves (unless noted otherwise) with fiberglass fitting inserts and PVC Fitting Covers.

3.06 ENGINEERED POLYMER FOAM PIPE INSULATION (PF)

A. Seal pre-glued longitudinal seams with factory approved seam roller.

B. Seal butt joints with manufacturer approved contact adhesive or fuse seal system.

C. Insulate fittings with oversize pipe insulation or miter-cut pieces of pipe insulation, joined with manufacturer approved contact adhesive or fuse seal system, to provide a continuous positive vapor barrier.

D. For piping through studs with plastic or nylon stud inserts cut insulation 1/4” longer than stud space for tight fit.

3.07 JACKETS AND FITTING COVERS

A. General:
   1. Provide Fitting covers as follows:
      a. On piping where type FG insulation is required provide fitting covers at pipe fittings, valves, and piping accessories.
      b. On steam and steam condensate piping provide fitting covers at pipe fittings, valves, and piping accessories.
      c. Insulated piping in areas “Subject to Damage.”
      d. Insulated piping located outside building above ground.
      e. Valves where adjacent piping has jackets.
      f. Balancing Valves and Flow Control Valves, where adjacent piping has jackets.
   2. Provide Jackets as follows:
      a. Insulated piping Exposed in Finished Spaces.
      b. Insulated piping in areas “Subject to Damage.”
      c. Insulated piping located outside building above ground.
      d. On steam and steam condensate piping.
      e. On piping where type CG insulation is required.
   3. Where jackets and fitting covers are required, use the following types:
      a. For Type FG insulation indoors: PVC (except where noted otherwise).
      b. CW piping 4” and over: AL.
      c. On steam and steam condensate piping: AL.
      d. Outdoors above ground: AL.
      e. On piping where type CG insulation is required: Type BL.
      f. Fitting covers shall be same material as jackets, except at Contractor’s option Type EF insulation may be used as fitting covers on type FG insulation at flanged connections and grooved couplings.

B. Installation:
   1. General:
      a. Overlap seams 2 inches minimum and as indicated herein.
      b. Seal per manufacturer's recommendations.
   2. Polyvinyl Chloride Jackets and Fitting Covers (PVC):
      a. Fitting Covers:
         1) Lap PVC fitting covers over adjacent vapor barrier facing with end of overlap pointed downward.
         2) On indoor installations secure PVC fitting covers with fitting cover manufacturer's pressure sensitive tape and secure ends of tapes using outward-clenching staples.
         3) On outdoor installations seal fitting covers with cover manufacturer's solvent welding adhesive.
      b. Piping Jackets:
         1) Lap PVC jackets over fitting covers with longitudinal seams of jackets on lower third of piping, and end of overlap pointed downward.
         2) On indoor installations secure PVC fitting covers with fitting cover manufacturer's pressure sensitive tape and secure ends of tapes using outward-clenching staples.
         3) On outdoor installations seal fitting jacket seams and seal jackets to fitting covers using cover manufacturer's solvent welding adhesive.

3.08 APPLICATION TO PIPING SYSTEMS

A. Domestic Cold Water (CW), Industrial Cold Water (ICW):
   1. Above Ground:
      a. Type: FG. Or, at Contractor's option provide type PF.
      b. Thickness: One inch. At Contractor's option, 1/2 inch thickness for branch lines up to 12 feet long for concealed piping serving individual fixtures.

B. Domestic Hot Water (HW, HWR), Industrial Hot Water (IHW, IHWR):
   1. Above Ground (except specific locations noted herein):
      a. Type: FG. Or, at Contractor's option provide type PF.
      b. Thickness:
         1) For pipe sizes 3/4" through 2": One inch. At Contractor's option, 1/2 inch thickness for branch lines up to 12 feet long for concealed piping serving individual fixture.

C. Heating Water (HS, HR):
   1. Exposed Piping (except specific locations noted herein):
      a. Type: FG with PVC jacket.
      b. Thickness: 1-1/2", except 1" thickness for branch lines less than 1-1/2" size up to 12 feet long for concealed piping serving individual terminal devices and 2" thick for piping sizes larger than 1-1/2".

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

1.02 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
   1. Shop Drawings (submittal data)
   2. Product Data (submittal data)
   3. Manufacturer's Operation Manuals
   4. Manufacturer's Service and Lubrication Requirements
   5. Service Contracts and Field Start-up Reports
   6. Cleaning, Certification, and Test Reports
   7. System Information
   8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Emergency Fixtures		X		X				X
Faucets		X		X				X

PART 2 PRODUCTS

2.01 FAUCETS

A. ICW-1:
   1. Application: Water connection for Millipore pure water unit.
   2. Description: PVC, wall mount, needle control valve with Teflon seal, serrated nozzle, 3/8 inch NPT inlet, FDA approved, no elastomers, metals, or lubricants.
   3. Manufacturer: Marquest or approved. Similar to Marquest Series LB.

B. ICW-2:
   1. Application: Industrial cold water faucet for S-1 lab sinks.
   2. Description: PVC, deck mount, needle control valve with Teflon seal, gooseneck spout with serrated nozzle, 3/8 inch NPT inlet, FDA approved, no elastomers, metals, or lubricants.
   3. Manufacturer: Marquest or approved. Similar to Marquest Series LG.

2.02 EMERGENCY FIXTURES

A. ES-1:
   1. Description: Wall-mounted, 20 gpm flow control stay-open valve, universal emergency sign.
   2. Material: 1 inch galvanized steel pipe, ABS plastic shower head, stainless steel pull rod.
   3. Supply: 1 inch IPS.
   4. Custom Epoxy Coating: All exposed metallic surfaces shall be epoxy coated, including galvanized steel pipe, pull rod, actuating arm, and valve.

5. Manufacturer: Water Saver, Haws, Bradley, Encon, Guardian, Speakman or approved. Similar to Water Saver ES643.

B. EW-1:
1. Description: Wall-mounted, hinged dust cover, instant stay-open valve, flow control, universal emergency sign, in-line mesh strainer.
2. Non Metallic: Constructed entirely of ABS, PVC, and PVC coated brass.
3. Materials: PVC wall bracket, plastic spray heads and dust covers, orange ABS bowl, PVC coated brass ball valve and push flag.
4. Supply/Waste: 1/2 inch IPS supply, 1-1/2 inch IPS waste.
5. Manufacturer: Water Saver, Haws, Bradley, Encon, Guardian, Speakman or approved. Similar to Water Saver FE782.

PART 3 EXECUTION

3.01 GENERAL

A. Install in accordance with manufacturer's instructions.

B. Install fixture traps easily removable for servicing and cleaning.

END OF SECTION

SECTION 22 41 00

PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

C. Section 22 4000 - Plumbing Fixtures

1.02 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
   1. Shop Drawings (submittal data)
   2. Product Data (submittal data), including documentation of ORS 453.005 (7) (e) compliance.
   3. Manufacturer's Operation Manuals
   4. Manufacturer’s Service and Lubrication Requirements
   5. Service Contracts and Field Start-up Reports
   6. Cleaning, Certification, and Test Reports
   7. System Information
   8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Fixture Traps		X						
Stops and Supplies		X						

PART 2 PRODUCTS

2.01 FIXTURE TRAPS

A. P-Traps at Lab Sinks and Eyewash:
   1. Materials: Flame retardant polypropylene.
   2. Joints: Mechanical with machined groove in mating pipe. No metallic clamps or exposed metal components allowed inside the clean room.
   3. Manufacturer: IPEX Lab Line.

2.02 WATER SUPPLIES

A. Water Supplies at Lab Sinks and Eyewash:
   1. Description: Schedule 80 PVC with threaded joints. No exposed metal allowed inside the clean room.

PART 3 EXECUTION

3.01 GENERAL

A. Install products in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 22 51 00

HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

1.02 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
   1. Shop Drawings (submittal data)
   2. Product Data (submittal data), including documentation of ORS 453.005 (7) (e) compliance.
   3. Manufacturer's Operation Manuals
   4. Manufacturer's Service and Lubrication Requirements
   5. Service Contracts and Field Start-up Reports
   6. Cleaning, Certification, and Test Reports
   7. System Information
   8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Testing and Balancing Devices		X	X	X	X			
		X		X				

PART 2 PRODUCTS

2.01 AIR CONTROL DEVICES

A. Manual Air Vents:
   1. Description: Full line size tee with 6 inch high nipple, up to a 1/4 inch standard port ball valve, with 1/4 inch soft copper tube down to accessible location, terminating with 1/4 inch threaded bronze plug.

2.02 TESTING AND BALANCING DEVICES

A. Pressure / Temperature Test Plugs:
   1. Type: Automatic-sealing port to receive a 1/8 inch o.d. pressure or temperature probe.
   2. Body and Cap: Brass.
   3. Size: 1/2 inch N.P.T.
   4. Core: Dual seal, elastomeric, rated for 275 deg. F maximum operating temperatures.
   5. Extension: For up to 2 inch insulation thickness.
   6. Manufacturer: Sisco, Peterson Equipment Co., Hydro Temp, Flow Design Inc., or approved. Similar to Sisco P/T Plug Model BNO-500.

B. Flow Control Valves,1-1/2 inch and smaller:
   1. Type: Automatic, pressure compensating, flow limiting valves.
   2. Sizing: Line size body with cartridge sized to provide flow rates indicated on Drawings.
   3. Control Range: 2-32 psig differential pressure.

4. Cartridge: Removable, spring-loaded stainless steel cup.
5. Body: Brass, with threaded connections to unions.
6. Pipe Connections: Threaded or sweat connections to unions.
7. Unions: Two, O-ring or bronze seat, to permit removal of body without disassembly of inlet or outlet piping.
8. Accuracy: Plus or minus 5 percent, at differential pressure within control range.
9. Pressure Test Valves: Two 1/4 inch extended pressure / temperature test plugs, as specified in this Section.
10. Tag: Metal body tag plus hanging metal or plastic tag and chain indicating model, gpm flow rate, psid control range, and associated unit or zone.
11. Manufacturer's Warranty: 5 years.
12. Manufacturer: Griswold, Flow Design Inc., Bell and Gossett, Nexus, or approved.

PART 3 EXECUTION

3.01 GENERAL

A. Install products in accordance with manufacturer's recommendations.

B. Manual Air Vents:
   1. Provide at system high points and where shown on Drawings.

3.02 TESTING AND BALANCING DEVICES

A. Inspect flow control valves to determine if they have temporary start-up strainers. Remove start-up strainers after piping has been flushed.

END OF SECTION

SECTION 23 07 00

DUCTWORK INSULATION

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

1.02 QUALITY ASSURANCE

A. Products shall have flame spread and smoke developed ratings based on test procedures in accordance with NFPA-255 and UL-723. Ratings shall be indicated on the product or on the shipping cartons.

B. Unless otherwise specified herein, products shall have flame spread ratings not to exceed 25 and smoke developed ratings not to exceed 50.

C. Products shall comply with the requirements of Oregon Revised Statute (ORS) 453.005 (7) (e), effective January 1, 2011. The referenced statute limits the use of three types of brominated fire retardant chemicals, which are defined as hazardous substances.

1.03 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

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   4. Manufacturer’s Service and Lubrication Requirements
   5. Service Contracts and Field Start-up Reports
   6. Cleaning, Certification, and Test Reports
   7. System Information
   8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Duct Insulation		X				X		
Accessories		X						

PART 2 PRODUCTS

2.01 DUCT INSULATION

A. Fiberglass Blanket with Vapor Barrier:
   1. Type: Flexible blanket with factory applied vapor barrier facing.
   2. Conductivity ("k"): Not to exceed 0.31 at 100 degrees F mean temperature.
   3. Facing: Laminated aluminum foil, glass scrim, and kraft paper vapor barrier; with 2 inch sealing flap.
   4. Facing Permeability: Not to exceed 0.04 perms.
   5. Fiberglass density: 1.5 lb./cu.ft.

6. Approved Manufacturers:
   a. Certain Teed "Standard Duct Wrap, FSK"
   b. Knauf "Duct Wrap, FSK"
   c. Manville "Microlite, FSK"
   d. Owens Corning "All Service Duct Wrap"

B. Fiber Free Duct Liner (Elastomeric Foam):
1. Type: Fiber Free, mold resistant, noise reducing, flexible, closed cell, elastomeric sheet.
2. Conductivity ("k"): Not to exceed 0.27 at 75 degrees F mean temperature.
3. Flame Spread Index: Not to exceed 25.
4. Smoke Developed Index: Not to exceed 50.
5. Mold Growth: UL 181.
6. Fungi Resistance: ASTM G21/C1338.
7. Bacterial Resistance: ASTM G22.
8. Sound Transmission Class: 25 for 1” nominal thickness.
9. Approved Manufacturer: Armaflex CoilFlex Duct liner, K-FLEX USA Duct Liner, or approved.

2.02 ACCESSORIES

A. Mastic, Coatings, Tapes, and Adhesives: Comply with manufacturer's installation instructions for each type of insulation.

PART 3 EXECUTION

3.01 GENERAL

A. Prior to installation of insulation, verify that:
1. Ductwork has been tested and approved.
2. Duct seams have been sealed.
3. Duct surfaces are clean and dry.

B. Do not insulate the following:
1. Pre-insulated underground ducts.
2. Ducts constructed of fiberglass duct board, unless otherwise noted.
3. Duct access doors. Tape insulation to duct around duct access door

C. Install products in accordance with manufacturer’s recommendations.

D. Install products in accordance with MICA (Midwest Insulation Contractors Association) - National Commercial & Industrial Insulation Standards.

E. Definitions:
1. Outside Air Ducts: Ducts conveying untempered outside air.
2. Tempered Air Ducts: Ducts conveying air within 15 degrees F of conditioned space setpoint temperature.
3. Vented Spaces: Includes unconditioned spaces (attics, crawl spaces, vented mechanical rooms) outside the building envelope.
4. Unconditioned spaces & plenums: Includes unconditioned, unvented spaces such as unvented mechanical rooms, shafts, or plenums (with or without return air) within the building envelope.

3.02 FIBERGLASS BLANKET INSULATION WITH VAPOR BARRIER

A. Fully wrap duct, with facing to the outside.

B. Overlap vapor barrier facing 2 inches minimum at seams and joints.

C. Seal all seams, joints, and penetrations with foil-faced pressure sensitive tape of same material as insulation facing, to provide a continuous vapor barrier.

D. On ducts 24 inches or more in width, secure insulation on underside of ducts with stick pins 18 inches maximum on center, 6 inches minimum from edges of duct. Cut pins off flush with washer and seal with vapor barrier tape.

3.03 APPLICATION TO DUCT SYSTEMS

A. Supply Air Ducts Above Ceilings, Not Shown With Internal Liner:
   1. Insulation Type: Fiberglass Blanket with Vapor Barrier.
   2. Insulation Thickness: 1.5 inches.

B. Supply Air Ducts Exposed In Conditioned Spaces:
   1. No external Insulation required.

END OF SECTION

SECTION 23 09 00

CONTROLS - BUILDING AUTOMATION SYSTEM

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

C. Section 20 6000 - Mechanical Identification

D. Section 20 9100 - Testing, Adjusting, and Balancing

E. Section 23 1000 - Controls Sequences of Operations

F. Section 23 3600 - Air Terminal Units

1.02 WORK INCLUDED

A. Building Automation System (BAS) Contractor shall provide and install: A fully integrated Building System (BAS), incorporating direct digital control (DDC) for energy management, equipment monitoring and control, and subsystems with open communications capabilities as herein specified.

B. Provide engineering, installation, calibration, software, software programming, and checkout for complete and fully operational BAS. The following shall be included:
   1. Workstation operator graphics and user interface access to BAS equipment in project shall be added to an existing campus workstation/s as directed by University Facilities.
   2. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.
   3. Implement the detailed design for analog and binary objects, system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.
   4. Design, provide, and install equipment cabinets, panels, data communication network cables needed, and associated hardware.
   5. Electronic controls for items indicated on Drawings and described hereinafter including sensors, switches, relays, transformers, thermostats, temperature sensors, control panels and central processing hardware and software.
   6. Graphics programming for systems and functions indicated and required. Include integration of new system and updating building floor plans with Owner’s existing system and graphics standards.
   7. Install interconnecting cables between supplied cabinets, application controllers, and input/output devices.
   8. Provide complete manufacturer’s specifications for items that are supplied. Include vendor name of every item supplied.
   9. Provide supervisory specialists and technicians at the job site to assist in system installation, startup, and commissioning.
   10. A comprehensive operator and technician training program as described herein.
   11. As-built documentation, diagrams, and other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.
   12. New sensors, , valves, and install only new electronic actuators.
   13. Adjustment and validation of control system. System testing. System demonstration to Mechanical Engineer and Owner's Representative.
   14. No gateways shall be used for communication to controllers installed under this section. Gateways may be used for communication to existing systems or to systems installed under other sections.

15. Provide network cable from the second floor BAS controller/s to the existing MBC panel installed in the basement mechanical room. Conduit from the project area floor panel to basement mechanical room MBC will be provided by Division 26.
16. Provide control power UPS for new controllers, control transformers and wiring for control devices specified in this Section.

1.03 WORK BY OTHERS

A. Installation of wells and valves furnished by BAS manufacturer.

1.04 SYSTEM DESCRIPTION

A. The installation of the control system shall be performed under the direct supervision of the controls manufacturer with the shop drawings, flow diagrams, bill of materials, component designation, or identification number and sequence of operation all bearing the name of the manufacturer. The installing manufacturer shall certify in writing, that the shop drawings have been prepared by the equipment manufacturer and that the equipment manufacturer has supervised their installation. In addition, the equipment manufacturer shall certify, in writing, that the shop drawings were prepared by their company and that all temperature control equipment was installed under their direct supervision.

B. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed specifically for this project.

C. The system shall be scalable in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, DDC Controllers, and operator devices.

D. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC Controller shall operate independently by performing its own specified control, alarm management, operator I/O, and data collection. The failure of any single component or network connection shall not interrupt the execution of any control strategy, reporting, alarming and trending function, or any function at any operator interface device.

E. DDC Controllers shall be able to access any data from, or send control commands and alarm reports directly to, any other DDC Controller or combination of controllers on the network without dependence upon a central or intermediate processing device. DDC Controllers shall also be able to send alarm reports to multiple operator workstations without dependence upon a central or intermediate processing device.

F. DDC Controllers shall be able to assign password access and control priorities to each point individually. The logon password (at any PC workstation or portable operator terminal) shall enable the operator to monitor, adjust or control only the points that the operator is authorized for. All other points shall not be displayed at the PC workstation or portable terminal. (e.g. all base building and all tenant points shall be accessible to any base building operators, but only certain base building and tenant points shall be accessible to tenant building operators). Passwords and priority levels for every point shall be fully programmable and adjustable.

1.05 APPROVED CONTROL SYSTEMS AND VENDORS

A. Direct Digital Control system components and shall be as manufactured, designed, and installed by local or regional branch office of Siemens Building Technologies Division, and shall utilize the APOGEE Product line.

B. Inclusion herein does not guarantee acceptance of products or installation. Control systems shall comply with the terms of this specification.
   1. The Contractor shall use only operator workstation software, controller software, custom application programming language, and controllers from the corresponding manufacturer and product line unless Owner approves use of multiple manufacturers.

2. Other products specified herein (such as sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

1.06 QUALITY ASSURANCE

A. The BAS system shall be designed and installed, commissioned and serviced by manufacturer factory trained personnel employed manufacturer or manufacturer representative. Manufacturer shall have an in-place support facility within 2 hours response time of the site with technical staff, spare parts inventory and necessary test and diagnostic equipment. Distributors or licensed installing contractors are not acceptable.

B. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be manufacturer's latest standard design that complies with the specification requirements.

C. BAS peer-to-peer network controllers, central system controllers and local user displays shall be UL Listed under Standard UL 916, category PAZX.

D. BAS shall comply with UL 864 UUKL and 864 UDTZ, and other subsystem listings as applicable, and herein specified, where required for operation of fire& life safety systems.

E. Electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

1.07 REFERENCE STANDARDS

A. The latest edition of the following standards and codes in effect and amended as of supplier's proposal date, and any applicable subsections thereof , shall govern design and selection of equipment and material supplied:
   1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
   2. ANSI/ASHRAE Standard 135-2004, BACnet.
   3. Uniform Building Code (UBC), including local amendments.
   4. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.
   5. National Electrical Code (NEC).
   6. FCC Part 15, Subpart J, Class A
   7. EMC Directive 89/336/EEC (European CE Mark)
   8. UL-864 UUKL listing for Smoke Controls for any equipment used in smoke control sequences
   9. Owner’s Standards: University of Oregon Campus Construction Standards in effect at the time of bid. Refer to http://facilities.uoregon.edu/?q=node/608.

B. City, county, state, and federal regulations and codes in effect as of contract date.

C. Except as otherwise indicated the system supplier shall secure and pay for permits, inspections, and certifications required for his work and arrange for necessary approvals by the governing authorities.

1.08 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Drawings:
   1. The system supplier shall submit engineered drawings, control sequence, and bill of materials for approval, as indicated in Product Table included herein.
   2. Drawings shall be submitted in the following standard sizes: 8.5”x11” and 11” x 17”.
   3. Drawings shall be made available on DVD or CD-ROM.

C. Project Management:
   1. The vendor shall provide a detailed project design and installation schedule with time markings and details for hardware items and software development phases. Schedule shall show all the target dates for transmission of project information and documents and shall indicate timing and dates for system installation, debugging, and commissioning.

D. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
   1. Shop Drawings (submittal data)
   2. Product Data (submittal data)
   3. Manufacturer's Operation Manuals
   4. Manufacturer's Service and Lubrication Requirements
   5. Service Contracts and Field Start-up Reports
   6. Cleaning, Certification, and Test Reports
   7. System Information
   8. Warranties

PRODUCT TABLE	Operation & Maintenance Information							
	1	2	3	4	5	6	7	8
Index sheet, listing contents in alphabetical order							X	
Valve schedules		X	X					
Damper Schedules		X	X					
Equipment data cut sheets for equipment to be furnished as part of this project		X	X	X				
Point List	X							
System Schematics, including: Sequence of operations, point names and addresses, Wiring diagrams, Panel layouts, and System riser diagrams	X						X	
Logic flow diagrams for digital control sequences	X							
Acceptance test procedure list					X		X	
Manufacturer's equipment parts list of functional components of system, and data sheets for equipment furnished.							X	
AutoCAD disk and hard copy of system schematics, including wiring diagrams.							X	
Description of sequence of operations							X	
Auto-CAD compatible as-installed drawings.							X	
As-installed logic flow diagrams for digital control sequences.							X	
As-installed interconnection wiring diagrams							X	
Operator's Manual							X	
Trunk cable schematic showing remote electronic panel locations, and trunk data.							X	
List of connected data points, including panels to which they are connected and input device (detector, thermostat, etc.)							X	
Software programming literature.							X	
Conduit routing diagrams							X	

1.09 TRAINING

A. Contractor shall provide training in operation, maintenance, and programming of DDC system for Owner Designated Personnel. Training shall be presented by factory trained instructor, provided through installing control system manufacturer, to give full instruction to designated personnel in operation of system installed. Instructors shall be thoroughly familiar with subject matter they are to teach. Training shall conform to, and include, the following:
   1. Provide 6 hours of training for Owner's designated operating personnel.
   2. Students shall be provided with binder containing product and system specific training modules for system installed. Minimum of one copy per student plus one extra copy.
   3. Training shall be held during normal working hours of 8:00 am to 4:30 PM weekdays, on dates and times as selected by Owner.
   4. Explanation of drawings, operations and maintenance manuals.
   5. Walk-through of job to locate control components.
   6. Operator workstation and peripherals.
   7. DDC controller and ASC operation/function.
   8. Operator control functions including graphic generation and field panel programming.
   9. Explanation of adjustment, calibration and replacement procedures.

B. Provide application engineer to instruct owner in operation of systems and equipment.

1.10 WARRANTY

A. Warranty shall cover costs for parts, labor, associated travel, and expenses for a period of one year from completion of system acceptance.

B. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours Monday through Friday, 48 hours on Saturday and Sunday. Factory authorized warranty service shall be available on site within 30 minutes of a call for service.

C. This warranty shall apply equally to both hardware and software.

D. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Failures on control systems that include all computer equipment, transmission equipment and all sensors and control devices during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner.

E. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.

F. Provide updates to operator workstation software, project-specific software, graphic software, database software, and firmware that resolve Contractor identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with the above-mentioned items. Do not install updates or upgrades without Owner's authorization.

PART 2 PRODUCTS

2.01 GENERAL

A. Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract.

2.02 UPS FOR DDC

A. Provide UPS (Uninterruptible Power Supply) for new BAS controllers.

B. Control transformers serving BAS control equipment shall be grouped at BAS panel and powered by UPS.

2.03 NETWORKING COMMUNICATIONS

A. The design of the BAS shall support networking of operator workstations and Building Controllers. The network architecture shall consist of two levels, an Ethernet based primary network for all operator workstations, servers, and primary DDC controllers along with secondary Floor Level Networks (FLN) for terminal equipment application specific controllers.

B. Access to system data shall not be restricted by the hardware configuration of the building management system. The hardware configuration of the BAS network shall be totally transparent to the user when accessing data or developing control programs.

C. Operator Workstation Communication:
   1. All color graphic operator workstations shall reside on the Ethernet network and the consoles shall be set up in a client/server configuration.
   2. The servers will act as the central database for system graphics and databases to provide consistency throughout all system workstations.
   3. The network shall allow concurrent use of multiple BAS software site licenses.

D. Workstation Graphics:
   1. BAS Contractor shall create color graphic floor plan display and system schematics for each piece of mechanical and control equipment including terminal units, dampers and differential pressure transmitters.

2.04 OPERATOR'S INTERFACE

A. Reuse existing workstation/s on campus approved by the owner's representative.

B. Software:
   1. At the conclusion of project, contractor shall leave with owner CD ROM(s) or DVD(s) that include the complete software operation system and project graphics, setpoints, system parameters, etc. This backup shall allow the owner to completely restore the system in the case of a computer malfunction.

2.05 APPLICATION SPECIFIC CONTROLLERS (ASC)

A. General:
   1. Provide for control of each piece of equipment , including, but not limited to the following:
      a. Variable Air Volume (TU) boxes
      b. Constant Air Volume (CAV) boxes
      c. Reheat Coils (RH)
      d. Each Building Controller shall be able to communicate with application specific controllers (ASCs) over the Secondary Network to control terminal equipment only.
   2. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.
   3. Each ASC shall include all point inputs and outputs necessary to perform the specified control sequences. The ASC shall accept input and provide output signals that comply with industry standards. Controllers utilizing proprietary control signals shall not be acceptable. Outputs utilized either for two-state, modulating floating, or proportional control, allowing for additional system flexibility.

4. Communication. Each controller shall perform its primary control function independent of other Secondary Network communication, or if Secondary Network communication is interrupted. Reversion to a fail-safe mode of operation during Secondary Network interruption is not acceptable.
5. Control Algorithms. The controller shall receive its real-time data from the Building Controller time clock to insure Secondary Network continuity. Each controller shall include algorithms incorporating proportional, integral and derivative (PID) gains for all applications. All PID gains and biases shall be field-adjustable by the user via room sensor LCD or the portable operator's terminal as specified herein. Controllers that incorporate proportional and integral (PI) control algorithms only shall not be acceptable.
6. Control Applications. Operating programs shall be field-selectable for specific applications. In addition, specific applications may be modified to meet the user's exact control strategy requirements, allowing for additional system flexibility. Controllers that require factory changes of all applications are not acceptable.
7. Calibration. Each controller shall include provisions for manual and automatic calibration of the differential pressure transducer in order to maintain stable control and insuring against drift over time.
    a. Manual calibration may be accomplished by either commanding the actuator to 0% via the POT or by depressing the room sensor override switch. Calibration of the transducer at the controller location shall not be necessary
    b. Calibration shall be accomplished by stroking the terminal unit damper actuator to a 0% position so that a 0 CFM air volume reading is sensed. The controller shall automatically accomplish this whenever the system mode switches from occupied to unoccupied or vice versa.
    c. Calibration shall be accomplished by zeroing out the pressure sensor and holding damper at last known position until calibration is complete. The controller shall automatically accomplish this whenever the system mode switches from occupied to unoccupied or vice versa.
8. Memory:
    a. Provide each ASC with sufficient memory to accommodate point databases, operating programs, local alarming and local trending. All databases and programs shall be stored in non-volatile EEPROM, EPROM and PROM, or minimum of 72-hour battery backup shall be provided. The controllers shall be able to return to full normal operation without user intervention after a power failure of unlimited duration.
    b. Upon replacement, new ASCs shall recover control function and site specific defaults automatically and resume normal operation.
9. Power Supply. The ASCs shall be powered from a 24 VAC source and shall function normally under an operating range of 18 to 28 VAC, allowing for power source fluctuations and voltage drops. Power supply for the ASC must be rated at a minimum of 125% of ASC power consumption and shall be of the fused or current limiting type. The BAS contractor shall provide 24 VAC power to the terminal units by utilizing:
    a. The existing line voltage power trunk and installing separate isolation transformers for each controller
    b. Dedicated line voltage power source and isolation transformers at a central location and installing 24VAC power trunk to supply multiple ASCs in the area.
10. Environment. The controllers shall function normally under ambient conditions of 32 to 122 F (0 to 50 C) and 10% to 95%RH (non-condensing). Provide each controller with a suitable cover or enclosure to protect the circuit board assembly.
11. Immunity to noise. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
12. Manufacturer Installed Controls:
    a. BAS manufacturer shall furnish ASC and actuator for factory mounting to equipment manufacturer.
    b. Cost of factory mounting shall be borne by equipment manufacturer.

c. For VAV terminals, equipment manufacturer shall provide and install flow-cross sensor, 24 Vac transformer, controls enclosure, fan relay, SCR and factory install, wire and tube ASC controller and actuator.
d. Fan powered VAV terminals shall be equipped with a fan speed controller and relay to change summer and winter speed set point.

2.06 INPUT/OUTPUT INTERFACE

A. Hardwired inputs and outputs may tie into the system through building or application specific controllers.

B. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no damage to the controller.

C. Binary inputs shall allow the monitoring of On/Off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against the effects of contact bounce and noise. Binary inputs shall sense “dry contact” closure without external power (other than that provided by the controller) being applied.

D. Pulse accumulation input objects. This type of object shall conform to all the requirements of binary input objects and also accept up to 10 pulses per second for pulse accumulation.

E. Analog inputs shall allow the monitoring of low-voltage (0 to 10 VDC), current (4 to 20 mA), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with—and field configurable to— commonly available sensing devices.

F. Binary outputs shall provide for On/Off operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on building and custom application controllers shall have three-position (On/Off/Auto) override switches and status lights. Outputs shall be selectable for either normally open or normally closed operation.

G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10 VDC, 4 to 20 mA or 0-20 PSI signal as required to provide proper control of the output device. Analog outputs on building or custom application controllers shall have status lights and a two-position (AUTO/MANUAL) switch and manually adjustable potentiometer for manual override. Analog outputs shall not exhibit a drift of greater than 0.4% of range per year.

H. Tri-State Outputs. Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point floating devices shall be limited to zone control and terminal unit control applications (VAV terminal units, duct-mounted heating coils, zone dampers, radiation, etc.). Control algorithms shall run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

I. System Object Capacity. The system size shall be expandable to at least twice the number of input/ output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

2.07 TERMINAL UNIT ROOM CONTROLLERS – GENERAL EXHAUST (TUGE-2-1)

A. Terminal Units: See Section 23 36 00 Air Terminal Units.

B. Furnish and install TEC with fast acting actuator.

2.08 PRIMARY CONTROL DEVICES

A. General:
   1. Major components shall conform to following requirements. Provide additional components as required for complete system.

2.09 DAMPER ACTUATORS

A. Damper operators shall be electronic type and shall be fully proportioning unless otherwise specified. Operators shall have ample power to overcome friction of damper linkage and air pressure acting on damper blades plus 50% safety factor. Damper operator mounting arrangement shall be outside airstream wherever possible. Operators shall have external adjustable stops to limit stroke. Operator linkage arrangement shall be such as to permit normally open or normally closed positions of damper as indicated.

B. Automatic damper actuators shall be mechanical spring return. Capacitors or other non-mechanical forms of fail-safe are not acceptable. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the damper as required.

C. Electric damper actuators (including Terminal Unit actuators) shall be direct shaft mounted and use a V-bolt and toothed V-clamp causing a cold weld effect for positive gripping. Single bolt or setscrew type fasteners are not acceptable.

D. Terminal unit damper actuation shall be floating type or analog (2-10vdc, 4-20ma).

E. Normal Position:
   1. Bypass Air Damper - Normally closed.
   2. Supply Terminal Unit - Normally open

F. Supply Air Bypass Damper Actuator:
   1. Actuator shall be a 24 VAC/DC, 2-Position with less than 30-second Runtime, 15-second Spring Return Time, similar to Siemens OpenAir™ Rotary Electronic Control Damper Actuator, or approved.

2.10 CONTROL VALVES AND ACTUATORS

A. General:
   1. The BAS contractor shall furnish all specified motorized control valves and actuators, and shall furnish control wiring to actuators.
   2. Automatic control valves shall be fully proportioning with modulating plugs for equal percentage flow characteristics.
   3. Valves shall be sized by Control Manufacturer and be provided with actuators of sufficient power for duty intended.
   4. Valve body and actuator selections shall be sufficient to handle system pressure and ambient temperature and shall close against differential pressures encountered.
   5. Terminal unit actuators shall be furnished to terminal unit manufacturer for factory installation onto terminal units.
   6. Valve Selection Criteria:
      a. Sizing:
         1) Two position: Line size.
         2) Modulating Heating Water: Six psig drop maximum.
      b. Normal Position:
         1) Heating Water: Normally open.
      c. Fail Position:
         1) Heating Water (at terminal heating devices): Last position.
      d. Capacity: As shown on Drawings.

B. Quality Assurance for Actuators and Valves:
   1. UL Listed Standard 873 and C.S.A. Class 4813 02 certified.

2. NEMA 2 rated enclosures for inside mounting, provide with weather shield for outside mounting.
3. Five-year manufacturer's warranty. Two-year unconditional and three-year product defect from date of installation.

C. Valve Actuators:
1. Control Valve Actuators (3 inch and smaller):
a. Actuators shall have a gear release button on non-spring return models to allow manual setting. The actuator shall have either an insulating air gap between it and the linkage or a non-conducting thermoplastic linkage. Care shall be taken to maintain the actuator's operating temperatures and humidity within its specifications. Pipes shall be fully insulated and heat shields shall be installed if necessary. Condensation may not form on actuators and shall be prevented by a combination of insulation, air gap, or other thermal break.
b. The control circuit shall be fully modulating using 2 - 10 volt or 4 - 20 mA signals. Accuracy and repeatability shall be within 1/21 of control signal.
c. Valve body and actuators shall be shipped fully assembled and tested at the valve factory prior to shipment.

D. Acceptable Manufacturers: Belimo, Siemens, or approved.

2.11 SENSORS

A. Room Temperature Sensors: Room sensors not allowed due to metal free environment in clean lab spaces. Room temperature monitored via duct sensor mounted in general exhaust duct.

B. Duct and Liquid Temperature Sensors:
1. 100 ohm Platinum RTD.
2. Duct - Averaging: 20-1200 deg F, ± 0.7 degrees F over range.
3. Liquid Immersion: 30-250 deg F, ± 0.7 degrees F over range.
4. Immersion sensors shall be provided with separable stainless steel well.
5. Averaging elements with sufficient length to span duct.
6. Model: Siemens 533-380, 535-49X series and 536-767.

C. Duct Sensors downstream of Reheat Coil:
1. 100k Ohm Thermistor.

D. Exhaust Duct Static Pressure Transmitter/Indicator :
1. Gauge shall be mounted in accessory wall panel with sensor tubing routed to sensor location shown on HVAC plans.
2. Type: Filter differential pressure gauge with manually adjustable signal flag and indicating output signal for BAS monitoring.
3. Range: 0.0 to 1.0 inches, w.g. control signal output, 4-20 mA.
4. Manufacturer: Dwyer, Cleveland Draft Gauge, Farr, or approved. Similar to Dwyer series 605 Magnehelic Differential Pressure Indicating Transmitter.

2.12 CLEAN ROOM SPACE PRESSURE MONITOR AND ALARM SENSOR

A. Provide a space monitor and alarm system (SPM) capable of measuring the differential pressure between two spaces and alarming if any of the required control conditions are not maintained.

B. The SPM shall measure the differential pressure between two spaces using industrial grade differential pressure transducers meeting the following performance criteria. Systems using air velocity measurement between two spaces which imply a specific space pressure exists are not acceptable.
1. Accuracy: ±0.35% F.S. including linearity, hysteresis, deadband and repeatability
2. Temperature Effects: 0.025% F.S./deg F
3. Stability – Maximum Change F.S./Yr: ±0.5%
4. Over-pressure: 15 psid proof/25 psid burst

C. Each SPM shall have local high intensity LED indicating lights identifying either normal or alarm status of the space being monitored, a local audible alarm, an alarm acknowledge button, and local indication of the measured space pressure down to one ten-thousandth of an inch of water (0.025 Pa).

D. Each space shall have a dedicated SPM that shall be capable of both standalone operation as well as full integration into the building management system (BMS). The SPM shall also be capable of local communication and configuration via a handheld device having an integral and compatible IR communication port. SPM monitoring and configuration shall be performed through [LonWorks®] [BACnet®-MS/TP communication networks] and/or through local IR communication between the SPM and compatible portable device. The operational mode shall be selectable via the use of a remote mounted key switch.

E. The SPM shall provide a field selectable 4-20 mA or 0-10 VDC analog output signal linear to the measured space differential pressure as well as a form C SPDT binary alarm relay for remote monitoring and alarming capability.

F. Selections and adjustments that may be made at the jobsite shall include Positive and/or Negative pressurization mode selection, alarm setpoint values, and alarm delay value.

G. All of the SPM system components shall meet International Protection Rating Standard IP64B for wash-down and intrusion compliance to allow for good housekeeping practices.

H. Each SPM shall include a pressure monitoring module with mounting box and two space pressure sensors. All components of the space pressure monitoring system shall be designed for both flush mounting and surface mounting, and shall be furnished to comply with the specified project requirements.

I. Manufacturer: Paragon Micro Guardian model SPM-300, Siemens Room Pressure Monitor (RPM), or approved.

PART 3 EXECUTION

3.01 CONTROL SYSTEM INSTALLATION (GENERAL)

A. Installation shall be by Control System Manufacturer. Installation by Wholesalers, Franchised Dealers, or any firm whose principal business is not that of manufacturing and installing automatic temperature control systems shall not be acceptable.

B. Install products in accordance with manufacturer's instructions.

C. Provide miscellaneous devices, hardware, software, interconnections installation and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

D. Contractor shall collaborate with Owner directly to determine Owner’s preference for naming conventions, etc. before entering data in system.

E. Prepare and start logic control system under provisions of this section.

F. Provide Owner's Representative with spare parts list. Identify equipment critical to maintaining the integrity of the operating system.

3.02 EXAMINATION

A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the architect/engineer for resolution before rough-in work is started.

B. The contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.

C. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

D. The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor's work and the plans and the work of others—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor's work with the work of others.

E. Do not begin work until unsatisfactory conditions are resolved.

3.03 LOCATION AND INSTALLATION OF COMPONENTS

A. Locate and install components for easy accessibility; in general, mount 48 inches above floor with minimum 3'-0" clear access space in front of units. Obtain approval on locations from owner's representative prior to installation.

B. Instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture and high or low temperatures.

C. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections — sized to suit pipe diameter without restricting flow.

3.04 ELECTRICAL AND WIRING

A. Provide interlock and control wiring. Wiring shall be installed neatly and professionally, in accordance with Specification Division 26 and national, state and local electrical codes.

B. Provide wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions. Provide shielded low capacitance wire for communications trunks.

C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of control equipment with the owner's representative prior to rough-in.

D. NEC Class 1 (line voltage) wiring shall be UL Listed in approved conduit according to NEC and Division 26 requirements.

E. Low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub fused when required to meet Class 2 current limit.)

F. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in conduit may be used provided that cables are UL Listed for the intended application. For example, cables used in ceiling plenums shall be UL Listed specifically for that purpose.

G. Provide power and transformers for control components from electrical service provided by Division 26 at the system control panel where indicated on the electrical drawings or from local electrical panel. Coordinate with electrical contractor.

H. Control wiring exposed in Lab spaces, mechanical, electrical and telephone rooms to be installed in raceways. Other wiring to be installed neatly and inconspicuously per local code requirements. If local code allows, control wiring above accessible ceiling spaces may be run with plenum rated cable (without conduit).

3.05 IDENTIFICATION

A. Provide nameplates for switches, starters, and control devices in accordance with Section 20 6000.

B. Nameplate wording shall be consistent with device names used on shop drawings and in Contract Documents.

C. Point name and address shall be indicated at each end of control wire connections to DDC equipment.

D. Identifiers shall match record documents.

3.06 PROTECTION

A. The contractor shall protect work and material from damage by its employees and/or subcontractors and shall be liable for damage thus caused.

B. The contractor shall be responsible for its work and equipment until finally inspected, tested, and accepted.

3.07 COORDINATION

A. Coordination with controls specified in other sections or divisions:
   1. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:
      a. All communication media and equipment shall be provided as specified in Part 2, “Communication” of this specification.
      b. Each supplier of controls product is responsible for the configuration, programming, startup, and testing of that product to meet the sequences of operation described in this section.
      c. The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this section and those provided under other sections or divisions of this specification.

3.08 GENERAL WORKMANSHIP

A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the National Electrical Code (NEC).

D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.09 EXISTING EQUIPMENT

A. Unless otherwise directed, the contractor is not responsible for the repairs or replacement of existing energy equipment and systems, valves, dampers, or actuators. Should the contractor find existing equipment that requires maintenance, the architect is to be notified immediately.

3.10 INSTALLATION OF SENSORS

A. General:
   1. Install sensors in accordance with the manufacturer’s recommendations.
   2. Mount sensors rigidly and adequately for the environment within which the sensor operates.
   3. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.

4. All pipe-mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.

B. Differential air static pressure:
   1. Room Pressure and Reference Pressure: Pipe the high-pressure port to a location behind a thermostat cover. Pipe the low-pressure port of the pressure sensor to reference the adjacent Lab pressure with the entrance to clean lab.
   2. The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.
   3. Mount transducers in a location accessible for service without use of ladders or special equipment.

3.11 ACTUATORS

A. Mount and link control damper actuators according to manufacturer's instructions.
   1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.
   2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
   3. Provide all mounting hardware and linkages for actuator installation.
   4. Dampers: Actuators shall be direct-mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° available for tightening the damper seals. Actuators shall be mounted following manufacturer's recommendations.
   5. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

B. Actuator Mounting for Damper and Valve arrangements shall comply to the following:
   a. Damper Actuators: Shall not be installed in the air stream
   b. A weather shield shall be used if actuators are located outside. For Damper Actuators use clear plastic enclosure.
   c. Damper or valve actuator ambient temperature shall not exceed 122 degrees F through any combination of medium temperature or surrounding air. Appropriate air gaps, thermal isolation washers or spacers, standoff legs, or insulation shall be provided as necessary
   d. Actuator cords or conduit shall incorporate a drip leg if condensation is possible. Water shall not be allowed to contact actuator or internal parts. Location of conduits in temperatures dropping below dew point shall be avoided to prevent water from condensing in conduit and running into actuator.

3.12 DDC OBJECT TYPE SUMMARY

A. Provide database generation.

B. Displays:
   1. System displays shall show analog and binary object types within the system. They shall be logically laid out for easy use by the owner.

C. Trendlog:
   1. Binary and analog object types (including zones) shall have the capability to be automatically trended.
   2. Trend Logs to be provided in Microsoft Excel format complete with descriptive headings of data columns and graphs appropriately scaled to demonstrate their operation. Trend logs to include the following data points:
      a. Room control temperature and setpoint.
      b. Room monitored temperature.
      c. Terminal Unit discharge air temperature and setpoint.

d. Room and duct static pressures.
e. Building T.U. supply air CFM and setpoint.
f. Control valves % output.

3. Additional trend log submittals may be necessary following any changes or modifications made to verify control system performance.

D. Alarm:
1. Analog inputs (High/Low Limits) and selected binary input alarm points shall be prioritized and routed (locally or remotely) with alarm message per owner's requirements.

E. Database Save:
1. Provide back-up database for stand-alone application controllers on disk.

3.13 START-UP AND COMMISSIONING

A. Perform commissioning in accordance with Division 1 requirements.

B. Pre-functional Checks, System Start-up, and Verification: When system installation and pre-functional checks are complete, calibrate equipment and verify transmission media operation before system is placed on-line. Testing, calibrating, adjusting and final field tests shall be completed by system installer. Verify that systems are operable from local controls in specified failure mode upon panel failure or loss of power. Upon completion of calibration, Contractor shall startup system, perform necessary testing and run diagnostic tests to ensure proper operation. Contractor shall be responsible for generating software and entering database information necessary to perform sequence of control and specified software routines.

C. Qualified technician, Factory trained by control system Manufacturer, shall test control equipment under normal operating conditions. Upon completion of testing and adjustments, submit written certification to Engineer, Commissioning Agent, and Architect that controls have been calibrated, adjusted, are operating satisfactorily, and are ready for functional testing.

D. Perform functional testing and provide trend data in accordance with Division 1 requirements.

E. After completion and approval of functional testing, allow technician’s time to monitor, trend and adjust control system during warranty period to fine tune programmed items and ensure system is operating properly. Time normally required to address warranty issues is excluded. Submit trend logs of controlled equipment, as requested by Engineer periodically, to verify control system performance.

3.14 DEMONSTRATION

A. Demonstration: Control equipment shall be tested under operating conditions by a qualified technician in the employ of the Controls Manufacturer, in the presence of owner's representative or engineer. Upon completion of testing and adjustments, submit written certification to architect that controls have been calibrated, adjusted, tested and are operating satisfactorily.

B. Demonstration:
1. Prior to final acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, start up and performed his/her own tests.
2. The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary part of the installation, start-up, and debugging process. The engineer and/or owner's representative will be present to observe and review these tests. The engineer and owner shall be notified at least 5 days in advance of the start of the testing procedures.
3. As each control input and output is checked, a log shall be completed showing the date, technician’s initials, and any corrective action taken or needed.
4. Demonstrate the following:
a. Compliance with sequences of operation through all modes of operation.

END OF SECTION

SECTION 23 10 00

CONTROLS SEQUENCE OF OPERATIONS

PART 1 GENERAL

1.01 GENERAL

A. Provide a complete building automation system based on the following points and sequence of operation. The determined point list is the minimum amount of points to be provided. If additional points are required to meet the sequence of operation, they shall be provided.

B. Point Definitions and Abbreviations:
   1. The following points as defined for each piece of equipment are designated as follows:
      a. Digital Input (DI) – Sensor provides two-state input to controller, such as an open/closed position, alarm, or on/off status.
      b. Digital Output (DO) – Controller provides two-state output to controlled equipment, such as open/close, start/stop, or enable/disable.
      c. Analog Input (AI) – Sensor provides variable input to controller, such as temperature, pressure, or position (for example, percent open).
      d. Analog Output (AO) – Controller provides variable output. 0–20mA, 4–20mA and 0-10VDC are the only acceptable analog outputs. The driver for analog outputs must come from both hardware and software resident in the controllers. Transducers will not be acceptable under any circumstance.
      e. Floating Point Control Output (FO): Controller provides on/reverse output to slow-acting operator at controlled item when the input signal is above or below the setpoint. Use of floating point control may utilize two (2) DO outputs or single AO.
      f. N.O. - Normally Open.
      g. N.C. - Normally Closed.

C. Control setpoints noted herein are estimated setpoints for initial start-up. During testing and monitoring, Control Contractor shall be responsible for setpoint adjustment to obtain optimum system performance. Record final settings in Operation and Maintenance Manual.

D. System setpoints:
   1. Setpoints (i.e., temperatures, static pressure etc.) shall be adjustable.
   2. Setpoints shall be directly adjustable through system graphics at the workstation without requiring any modification of BAS computer code. This may require assigning virtual points to adjustable setpoints. Frequently adjusted points including temperature and pressure setpoints shall be adjustable from the equipment graphic or floor plan graphic.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GEOCHEMIST LABORATORY CONTROLS

A. HVAC System Operation:
   1. Constant volume building supply fans provide conditioned airflow with approximately 55 to 60 deg F temperature range to ceiling mounted HEPA Fan Units (HFUs). Duct mounted heating water reheat coil provides temperature control in the clean rooms using general exhaust temperature sensors and TUS supply air temperature control. Constant volume building exhaust fans with run-around heat recovery coils provide exhaust for the new fume hoods and the general exhaust ceiling mounted grilles. A general exhaust terminal unit (TUGE) serving both the Chemistry and Dish Rooms regulates room pressure.

B. HEPA Fan Units (HFU) Operation:
   1. Operation: Continuous 24 hrs.
   2. Monitoring and Speed Adjustment: Individual and global fan motor speed adjustment and fault sensor monitoring of RPM drop on EC type motors for each HFU will be monitored by a wall mounted remote console unit furnished by the HFU manufacturer capable of monitoring all the units. This section will be responsible for installation, power to console via the CAT 5 cable or external source, local Modbus-RTU interface wiring between the console and HFU Universal Control Card furnished with each HFU and configuring units through a menu driven display. Network programming is not required. See manufacturer's installation manual.
   3. Provide label under console: "HEPA Fan Units".

C. Supply air Automatic Bypass Damper :
   1. BAS monitors building supply fan operation serving the HFUs via a CT. Automatic bypass damper with fast acting actuator installed in the building supply duct ahead of the filter module opens when the building supply fan is shut down for scheduled maintenance or unscheduled shutdown, temporarily utilizing room air for source of supply air. HFUs continue to operate at reduced capacity with the building supply duct static pressure at zero pressure. Automatic bypass damper closes when building supply fan starts.

D. Room Temperature Control:
   1. Supply air temperature sensor mounted in the supply duct downstream of reheat coil modulates heating water control valve to maintain a 67 to 72 deg F (adjustable) supply air setpoint. Duct mounted temperature sensors mounted in the general exhaust ducts serving the Chemistry Lab and Dish Lab monitor the representative room temperature and reset the supply air temperature to maintain a 72 +/- 2 deg F minimum setpoint (adjustable) in either lab. Utilize either a high signal selection and/or average room temperature sequence to ensure both rooms stay within the above temperature range.

E. Room Pressure Control:
   1. A space pressure monitor and alarm system monitors room pressure in the Chemistry Lab. Room pressure and alarm status is displayed on the wall mounted monitoring module. BAS monitors room pressure via an output signal linear to room pressure from the system monitoring panel. Space sensing tube to be housed in a non-metallic electrical single gang box and cover with holes, or similar arrangement, to avoid contamination of the metal free environment.
   2. BAS modulates a general exhaust terminal unit serving both the Chemistry Lab and Dish Lab over the scheduled maximum/minimum CFM range to maintain +0.05" w.g. (adjustable) in the Chemistry Lab.
   3. Coordinate final supply and exhaust airflows to be balanced for the labs with the Testing and Balancing contractor to ensure the following room pressure gradient is maintained: Chemistry Lab pressure > Dish Lab pressure > Ante Room pressure.
   4. BAS alarms network if room pressure falls below 0.01" w.g. (adjustable).
   5. Provide label under control panel: "Chemistry Room Pressure".

F. Pre-Filter Monitoring:
   1. BAS monitors filter pressure drop via filter module magnehelic gauge output signal and alarms network if filter pressure exceeds 0.5" w.g. (adjustable).

G. Building Exhaust Pressure Monitoring:
   1. BAS monitors static pressure in the main branch exhaust duct serving the clean rooms, at a location shown on the HVAC plans, via a wall mounted magnehelic transmitter indicator gauge. Transmitter outputs signal to the BAS and alarms network if the duct pressure falls 0.15" (adjustable) below the final "as-balanced" duct static pressure indicating a loss of pressure in the exhaust system due to heat recovery coil requiring cleaning or building exhaust fan belts requiring replacement.
   2. Provide label under Transmitter Gauge: "Exhaust Duct Pressure".

H. Control Network:
   1. Provide network cable from the second floor BAS controller/s to the existing MBC panel installed in the basement mechanical room. Conduit from the project area floor panel to basement mechanical room MBC will be provided by Division 26.

I. Points Summary:
   1. Inputs:
      a. Room pressure from DP transmitter (AI)
      b. General exhaust (room) air temperature (2) (AI).
      c. General exhaust terminal unit damper % open.
      d. Reheat coil supply air temperature sensor (AI).
      e. Reheat coil valve % open.
      f. Pre-filter differential pressure (AI).
      g. Air handling unit supply fan run status (CT).
      h. Exhaust duct static pressure (AI).
   2. Outputs:
      a. Reheat coil valve (AO).
      b. General exhaust terminal unit damper (AO).
      c. Bypass damper (DO).
   3. Alarms:
      a. Low or high room pressure in Chemistry Clean Lab
      b. General exhaust (room) temperature outside setpoint limits
      c. High pre-filter pressure drop
      d. Low exhaust duct pressure

END OF SECTION

SECTION 23 31 00

DUCTWORK

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

C. Section 23 0700 - Ductwork Insulation

D. Section 23 3300 - Ductwork Accessories

1.02 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Corrosion Resistant Ductwork:
   1. Shop Drawings:
      a. Fully dimensioned and to-scale layout drawings of coated duct system and fittings including but not limited to duct sizes, locations, elevations, and slopes of horizontal runs, walls and floor penetrations, and connections.
      b. Show the location of each flanged duct connection and structural support member including:
         1) Coordinated flanged connections in horizontal runs with clearance from horizontal structural supports and other services above the ceiling.
         2) Showing interface between coated ducts and existing non-coated ducts or fume hood duct collars.
      c. Details of structural attachment points required to be welded prior to coating duct.
      d. Contractor shall assist duct manufacturer in developing the shop drawings.

C. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
   1. Shop Drawings (submittal data)
   2. Product Data (submittal data)
   3. Manufacturer's Operation Manuals
   4. Manufacturer’s Service and Lubrication Requirements
   5. Service Contracts and Field Start-up Reports
   6. Cleaning, Certification, and Test Reports
   7. System Information
   8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Round and Rectangular Ductwork	X	X				X		
Corrosion Resistant Ductwork	X	X				X		
Flexible Duct		X						
Duct Sealants		X						

PART 2 PRODUCTS

2.01 DUCTWORK

A. Fabrication and Site Delivery:
   1. Factory / Shop sealed by blanking or capping duct ends, bagging of small fittings, surface wrapping or shrink wrapping.

B. Duct support channels:
   1. General: Field fabricate of manufactured channel components.
   2. Channels: Pre-Galvanized, Hot-Dip Galvanized, or Stainless Steel channel strut components as specified in Section 05 4300.
   3. Trapeze Size: As published by manufacturer for span and total weight supported. Provide sizing criteria with product data submittal.
   4. Manufacturer: Refer to Section 05 4300. Coordinate with Section 05 4300 for single manufacturer.

C. Rectangular, Single Wall Ducts (Low Pressure):
   1. Ducts Included:
      a. Supply ducts.
      b. General exhaust ducts. Not included are exhaust ducts with "CR" designation adjacent to the duct size shown on the drawings.
   2. Fabricate and support in accordance with:
      a. Oregon Mechanical Specialty Code (IMC), current edition.
      b. SMACNA HVAC Duct Construction Standards, 1995 edition.
   3. SMACNA Pressure Classification:
      a. Supply Ducts: +2 inches w.g.
      b. Exhaust Ducts: -2 inches w.g.
   4. Transverse Joints, Indoors: In accordance with details in SMACNA HVAC Duct Construction Standards or one of the following proprietary joint systems:
      a. Ductmate "25" with butyl gasket tape.
      b. Ductmate "35" with butyl gasket tape.
      c. Lockformer "TDC" with butyl gasket tape.
      d. Ward Duct Connectors Inc. "WDCI Lite" with butyl gasket tape.
      e. Ward Duct Connectors Inc. "WDCI Heavy" with butyl gasket tape.
   5. Crossbreaking:
      a. Duct panels 16 inches wide and larger shall be beaded or crossbroken, regardless of whether or not duct is lined or insulated.
      b. Beads shall be 1/8 inch deep, shall be parallel to transverse joints, and shall be spaced 12 inches on center.
   6. Material Thickness:
      a. Where duct gauges are not identified on the drawings: Determined gauge using tables in SMACNA HVAC Duct Construction Standards, based on duct size, material, pressure class, joint type, and reinforcement spacing.
         1) "Addendums to SMACNA" and other publications by proprietary joint manufacturers shall not be used for determining material thickness.
         2) For determining duct gauges using SMACNA tables, proprietary joint systems shall be considered equivalent to the following SMACNA rigidity classes:
         3) Lockformer "TDC," 24 gauge: Class "D."
         4) Lockformer "TDC," 22 gauge: Class "E."
         5) Lockformer "TDC," 20 gauge: Class "F."
         6) Lockformer "TDC," 18 gauge, with tie rod(s) on each side of joint: Class "K."
         7) Ductmate "25": Class "F."
         8) Ductmate "35": Class "J."
         9) Ward "WDCI Lite": Class "F."
         10) Ward "WDCI Heavy": Class "J."
      b. Ducts with proprietary joints shall be 24 gauge minimum.

7. Sealing Requirements: Seal transverse joints and longitudinal seams with tape-and-adhesive or liquid duct sealer, specified herein. Not required for gasketed, flanged joints.
8. Fittings: See duct construction detail shown on drawings.

D. Round Single Wall (Medium Pressure):
1. Ducts Included:
   a. Supply and general exhaust ducts and associated fittings shown without internal insulation.
   b. Supply ducts upstream and downstream of terminal units.
   c. General ducts upstream and downstream of terminal units. Not included are exhaust ducts with "CR" designation adjacent to the duct size shown on the drawings.
2. Material: Galvanized steel.
3. Fabricate and support in accordance with latest editions of:
   a. Uniform Mechanical Code
   b. SMACNA HVAC Duct Construction Standards
4. SMACNA Pressure Classification: 10 inch w.g. minimum.
5. Seam Type: Spiral lockseam.
6. Material Thickness: In accordance with tables in SMACNA HVAC Duct Construction Standards, based on duct diameter, duct material, and pressure class.
7. Sealing Requirements:
   a. Medium Pressure: Seal transverse joints with tape-and-adhesive or liquid duct sealer, specified herein.
8. Fittings:
   a. Factory-fabricated by duct manufacturer.
   b. Elbows shall be of die-stamped, pleated, standing seam, or gored (segmented) construction.
   c. 90° gored elbows shall be 5 piece.
   d. 45° gored elbows shall be 3 piece.
   e. Gored elbows shall have continuously welded seams.
   f. Joints of standing seam fittings shall be fully sealed with liquid sealant.
   g. See duct construction detail shown on drawings.
9. Manufacturer: Metco, Dee's fSheet Metal, Semco, Arrow, Arjae Sheet Metal, or approved.

E. Corrosion Resistant Ductwork (Exhaust Ducts Serving Fume Hoods):
1. Option #1 (Lined Stainless Steel):
   a. General Requirements:
      1) Fluoropolymer barrier coating lined 300 series stainless steel duct for corrosive fume and smoke exhaust shall bear the Factory Mutual #0003044796 signifying approval by Factory Mutual to their FM 4922 standard for non-sprinkled exhaust duct. The duct shall be approved for use without height (vertical riser) restrictions.
      2) The duct must have been tested using ASTM E-84 test methods in a certified test laboratory resulting in a Flame Spread less than 25 and a Smoke Development of less than 50 on both the inside and outside of the duct.
      3) The fluoropolymer liner shall be approved for use at up to 0.016” thickness, although maximum corrosion resistance is achieved at 0.010” plus or minus 0.002”.
   b. Materials:
      1) Liner: The internal liner shall be seamless fluoropolymer barrier coating applied at a thickness of 0.010” (0.3mm) plus or minus 0.002” by electrostatic deposition followed by high temperature cure.
      2) Stainless Steel Substrate: A 300 series stainless steel shall be used to fabricate all duct, fittings and accessories.
      3) Flange Back Up Rings: Standard flange back up rings shall be manufactured using A-36 steel (BI) rings.

4) Quick Clamps as an Option to standard BI rings: Standard quick disconnect clamps (QC Clamps) shall be manufactured from 300 series stainless steel for connecting ducts smaller than 20" diameter.
5) Gasket Materials: Gaskets shall be form in place fully expanded PTFE material and a minimum of ⅛" thick. See table shown below. Gaskets shall be supplied by the duct manufacturer with the ducts.

Joint Diameter	Width	Thickness:
< 12 inch	0.18 inch	0.12 inch
< 24 inch	0.25 inch	0.12 inch
< 42 inch	0.25 inch	0.18 inch
≥ 42 inch	0.25 inch	0.25 inch

6) Bolts, nuts, and washers shall be (ASTM A449) grade 5 plated steel unless otherwise specified.

c. Construction:
1) Stainless Steel Structure: The duct shall be designed and manufactured in accordance with the latest S.M.A.C.N.A. Industrial Duct Construction Standards requirements for Class 5 (corrosive vapors) thickness and reinforcement, for –6.0/+50 inches water column. Duct and fittings shall be formed of continuously welded stainless steel, with internal welds ground smooth to allow for internal lining.
2) Inner Liner: The Inner Liner shall be fluoropolymer barrier coating using the same formulation on file with Factory Mutual. The liner will be applied by electrostatic deposition with elevated temperature cure to achieve final liner thickness. Liner thickness shall be 0.016" (0.4mm) maximum average.
3) Liner Integrity – All duct and fittings shall be visually inspected for defects and dielectric spark tested to check against pinholes.

d. Duct Sizes and Tolerances:
1) Size: The standard duct size shall be the outside diameter in inches. Standard sizes shall begin at 2" and generally available in any size up through 132" diameter.
2) Length: Standard lengths on duct sections shall be 4 ft, 5 ft nominal and 8 ft nominal. On diameters 14" and under, duct shall be supplied in maximum 4 or 5 ft lengths. Custom lengths shorter than nominal standards shall be available.
3) Actual lengths will vary slightly from nominal as follows: On diameters up to and including 48" diameter with rolled flanged ends, actual duct will be 0.75" less than nominal lengths (i.e., 5 ft nominal = 59.25" actual and 8 ft nominal = 95.25" actual). On duct over 48" diameter with fixed welded flanges duct will be 0.25" longer than the nominal length. Manufacturer shall provide fittings style sheets for additional clarification.
4) Wall Thickness: The minimum wall thickness, stiffeners and support spacing shall be in accordance with S.M.A.C.N.A. for the appropriate pressure/ vacuum class. Standard product is designed for –6/+50 inches water column based upon the SMACNA Round Industrial Duct Construction Standard.
5) Rectangular Ducts: The nominal size of rectangular duct shall be determined by the inside dimensions.
6) Fittings: All fittings such as elbows, laterals, tees, and reducers shall be equal or superior in strength to the adjacent pipe section and shall have the same diameter as the adjacent pipe. The dimensions of fittings shall be as shown in fitting detail sheets provided by the manufacturer.
7) Elbows: Standard elbows shall have a centerline radius of one and one half times the diameter of the fitting. Standard elbows shall be mitered construction. Elbows above 45 deg through 90 deg shall have a minimum of three gores.
8) Reducers: Reducers of either concentric or eccentric style will have a length as determined by the difference of the diameters of the reducer (either 2.5 or 5X the

difference is standard). Alternate reducer lengths will be acceptable in order to accommodate layout requirements.

9) Flanges: Standard flange design is a floating Van Stone style ring flange up to a maximum of 30-inch diameter, with fixed, welded flanges on larger sizes.
10) Standard flanges on duct larger than 48" diameter shall be rolled stainless steel rings welded to duct without flaring the duct. All welds shall be continuous and ground smooth for coating, and the flange face is coated the in the same manner as the duct.

e. Manufacturer: Composites USA, Pure Guard II, or approved.
f.

2. Option #2 (Fiberglass Duct):
   a. General Requirements:
      1) Fiberglass duct for corrosive fume and smoke exhaust shall bear the Factory Mutual 4922 test approval #4B1A5.AM as a non-sprinkled smoke removal duct and Factory Mutual 4910 #3003307 test approval as a Clean Room Approved material without requirement for emergency air exhaust blowers. These test
      2) results shall not be achieved by the use of any collapsing device that will shut off the airflow in case of an exhaust fire.
      3) In addition, the duct shall be Listed by Underwriters Laboratories per U.L. 181 as a Class 1 Air Duct material report demonstrating compliance with the Uniform Building Code and the B.O.C.A. Code.
      4) The duct must have been tested using ASTM E-84 test methods in a certified test laboratory resulting in a Flame Spread of 5 or less and a Smoke Development of 10 or less on both the inside and outside of the duct. The use of any coating to achieve these results will not be permitted. To maximize corrosion resistance, the duct shall incorporate a synthetic Halar surfacing veil on the inside corrosion liner.
   b. Materials:
      1) Resin: The resin used shall be a premium grade corrosion resistant copolymer resin. The resin shall be approved by Factory Mutual for non-sprinkled smoke removal duct fabrication under the 4922 test procedure without the use of collapsing dampers which would restrict air flow through the system.
      2) Reinforcing Material: The reinforcing material shall be a commercial grade of glass fiber having a coupling agent which will provide a suitable bond between the glass reinforcement and the resin.
      3) Surfacing Materials: Halar fluoropolymer synthetic surfacing veil. A full chemical resistant corrosion liner incorporating a synthetic surfacing veil shall be used, resulting in a corrosion liner that meets the requirements of PS-15-69, ASTM C-581 and ASTM C-582.
      4) Gasket Materials: Gaskets shall be form in place fully expanded PTFE material and a minimum of ⅛" thick. See table shown below. Gaskets shall be supplied by the duct manufacturer with the ducts.
   c. Construction:
      1) Laminate: The laminate shall consist of an inner surface, an interior layer, a structural layer and an exterior layer of bidirectional fiberglass cloth. The compositions specified for the inner surface and interior layer shall be intended to achieve optimum chemical resistance. Halar materials and liner thicknesses shall meet the requirements of the NBS PS-15-69 and ASTM C-581.
      2) Inner Surface: The inner surface shall be free of cracks and crazing with a smooth finish. Some waviness is permissible as long as the surface is smooth and free of pits. Between 0.020 and 0.030 inches of reinforced resin-rich surface shall be provided. This surface will be reinforced with Halar surfacing veil.
      3) Interior Layer: A layer next to the inner surface shall be reinforced with not less than 20 percent nor more than 30 percent by weight of non-continuous glass strands (having fiber lengths from 0.5 to 2.0 inches).

4) Structural Layer: The structural layer or body of the laminate shall be filament wound or contact molded of chemically resistant construction suitable for the service and providing the additional strength necessary to meet the tensile and flexural requirements. The structural layer will be built up to meet the wall thickness required for the duct size shown in table 3.
5) Exterior Layer: The exterior layer shall be fiberglass bi-directional cloth to provide additional strength, corrosion resistance and a surface optimized for secondary bonding. The exterior surface shall be relatively smooth with no exposed fibers or sharp projections.
6) Cut Edges: All cut edges shall be coated with resin so that no glass fibers are exposed and all voids filled. Structural elements having edges exposed to the chemical environment shall be made with chopped-strand glass reinforcement only. Design of the duct system is to facilitate water drainage.
7) Joints: Finished joints shall be built up in successive layers and be as strong as the pieces being joined and as crevice free as is commercially practicable. The width of the first layer shall be 2 inches minimum. Successive layers shall increase uniformly to provide the specified minimum total width of overlay which shall be centered on the joint. Crevices between jointed pieces shall be filled with resin or thixotropic resin paste, leaving a smooth inner surface.
8) Wall Thickness: The minimum wall thickness shall be as specified in Table 3. Isolated small spots may be as thin as 80 percent of the minimum wall thickness, but in no case more that 1/8 inch below the specified wall thickness.
9) Surface hardness: The laminate shall have a Barcol hardness of at least 90 percent of the resin manufacturer's minimum specified hardness for the cured resin. This applies to both interior and exterior surfaces.
10) Appearance: The finished laminate shall be as free as commercially practicable from visual defects such as foreign inclusions, dry spots, air bubbles, pinholes, pimples, and delamination.

d. Duct Sizes and Tolerances:
1) Size: The standard duct size shall be the inside diameter in inches.
2) Continuous sweep elbows shall be available through 48” diameter. The tolerance including out-of-roundness shall be +1/16 inch for duct up to and including 6-inch inside diameter, and +1/8 inch or +1 percent, whichever is greater, for duct exceeding 6 inches inside diameter.
3) Length: Standard lengths shall be nominal 20 ft on sizes above 1.5" diameter. When specified cut to length, the length of each fabricated piece of duct shall not vary more than +1/8 inch from the ordered length unless arrangements are made allow for trim in the field.
4) Wall Thickness: The minimum wall thickness shall be 0.13"
5) Rectangular Duct: The nominal size of rectangular duct shall be determined by the inside dimensions.
6) Squareness of Ends: All plain end duct shall be cut square with the axis of the duct within 1/8 inch up to and including 24 inch diameter and to within 3/16 inch for all larger diameter duct.
7) Fittings: All fittings such as elbows, laterals, tees, and reducers shall be equal or superior in strength to the adjacent pipe section and shall have the same diameter as the adjacent pipe.
8) Elbows: Standard elbows shall have a centerline radius of one and one half times the diameter of the fitting. Standard elbows, up to and including 48 inches shall be molded sweeps of one piece construction.
9) Butt Joints: This type of joint shall be considered the standard means of joining pipe sections and pipe to fittings.

10) The procedure used in making the butt joint is as follows: The finished joints shall be built up in successive layers and be as strong as the pieces being joined and as crevice free as is commercially practicable. The width of the first layer shall be 1.5 inches minimum, centered over the joint. Successive layers shall increase uniformly to provide the specified minimum total width of the overlay. Crevices between jointed pieces shall be filled with resin or thixotropic resin putty leaving a smooth inner surface.
11) Flanges: The use of flanges shall normally be kept to a minimum with the butt joint being used as the standard means of joining duct sections. The construction of flanges shall be the same as that for laminates, using all mat construction, i.e. no woven roving, for the flange faces.
12) Flange Attachment: The thickness of the flange hub reinforcement measured at the top of the fillet radius shall be at least one-half the flange thickness and shall be tapered uniformly the length of the hub reinforcement. The fillet radius, where the back of the flange meets the hub, shall be 3/8 inch minimum.
13) Flange Face: The flange face shall be perpendicular to the axis of the pipe within 1/2 deg. A camber of 1/8" with respect to the centerline, measured at the flange outside diameter shall be allowable.

e. Manufacturer: Composites USA, Dual Guard 2000, or approved.

F. Flexible Duct:
1. Pressure Rating: 6 inch w.g. positive, 1/2 inch w.g. negative.
2. Core: Steel or aluminum helix bonded to continuous liner.
3. Insulation: Fiberglass blanket between core and outer jacket.
4. Thermal Conductance: 0.24 btuh/sq ft/deg. F max.
5. Vapor Barrier Outer Jacket: Seamless polymer.
6. Connect and support in accordance with latest editions of:
   a. Oregon Mechanical Specialty Code
   b. SMACNA HVAC Duct Construction Standards
7. UL Listing: UL 181 Class 1 Air Duct.
8. Manufacturer:
   a. Flexmaster Type 3
   b. ATCO UPC #070
   c. Thermaflex G-KM

G. Liquid Duct Sealer, Indoors:
1. Sealer for fume hood exhaust ducts: PTFE sealer. See Corrosion Resistant Ductwork.
2. Sealer for environmental air ducts:
   a. UL Classification: Flame spread rating not to exceed 25; smoke developed rating not to exceed 50; when applied in a 2 inch wide strip at a thickness of 0.0032 inch.
   b. Low-Emitting Material: Volatile organic compound (VOC) content less than 30 grams per liter for metal-to-metal bonding per SCAQMD Rule #1168.
   c. Application Temperature Limits: 40 to 110 deg. F.
   d. Manufacturer: United McGill Corp., Accumetric, Vulkem, Carlisle Hardcast, Alcoa, Design Polymerics, Miracle Adhesives, Ductmate, or approved. Similar to Accumetric Boss 350.

H. Tape-and-Adhesive Duct Sealer, Indoors:
1. UL Classification: Flame spread rating not to exceed 25; smoke developed rating not to exceed 50; when applied in a 2 inch wide strip at a thickness of 0.0032 inch.
2. Application Temperature Limits: 30 to 110 deg. F.
3. Manufacturer:
   a. Hardcast Inc. DT tape with FTA-20 adhesive
   b. United McGill MDT6-300 tape with MTA-20 adhesive

PART 3 EXECUTION

3.01 GENERAL

A. Install products in accordance with manufacturer's recommendations.

B. Provide duct fittings and offsets not shown on Drawings, if required for coordination with the work of other sections.

C. Install products in accordance with Manufacturer's recommendations and standards referenced herein.

D. Duct sizes on Drawings are net inside dimensions, measured to inside face of internal duct face for double-wall ducts.

E. Fabricate and install ductwork to minimize gaps. Gaps in sheet metal shall be no larger than allowed for sealant per sealant manufacturer’s installation instructions.

F. Corrosion Resistant Ductwork(Lined Stainless Steel and Fiberglass): Install in accordance with manufacturer's recommended installation practice including:
   1. Duct Hangers and Spacing
   2. Gaskets

3.02 DUCT SUPPORTS

A. Notwithstanding other finish requirements herein, provide Pre-Galvanized, Hot-Dip Galvanized, or Stainless Steel support components as scheduled for support of the work of other Divisions in Part 3 of Section 05 4300, with fasteners as follows:
   1. Hot-dip galvanized supports: Provide stainless steel fasteners and fittings.
   2. Pre-galvanized supports: Provide zinc-plated fasteners and fittings.

3.03 DUCT AND FITTING HANDLING

A. Delivery to Site:
   1. At site, sealed ends shall be visually examined and resealed as required.

B. Storage:
   1. Store away from high dust generating processes.
   2. Provide pallets or blocking to keep above floor.
   3. Provide temporary cover to protect stored material.

C. Installation:
   1. Protective coverings shall be removed immediately before installation and inspected to determine if wipe down is necessary.
   2. During construction, provide temporary sealing of openings into duct systems, to prevent accumulation of dust in ducts.
   3. Open ends of completed duct and overnight work-in-progress shall be sealed.

3.04 DUCT SEALING

A. Joints, Seams and at all wall penetrations.

B. Clean duct surfaces prior to applying sealant.

C. Prior to application, verify that ducts are dry and within specified temperature limits.

D. Inspect after first application of sealant to identify areas where shrinkage has occurred. Fill voids with a second application.

3.05 FLEXIBLE DUCT

A. Installation to conform to SMACNA HVAC Duct Construction Standards.

B. Maximum Length: 6 feet, unless noted otherwise on Drawings.

C. Limitations to Use: Flexible duct shall not be substituted for round or rectangular duct indicated on Drawings. Flexible duct is acceptable only where shown on Drawings.

D. Connections to Collars: Secure core with stainless steel or nylon drawband under the insulation. Secure vapor barrier with an additional stainless steel or nylon drawband outside of insulation.

END OF SECTION

SECTION 23 33 00

DUCTWORK ACCESSORIES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

C. Section 23 3100 - Ductwork

1.02 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
1. Shop Drawings (submittal data)
2. Product Data (submittal data), including documentation of ORS 453.005 (7) (e) compliance.
3. Manufacturer's Operation Manuals
4. Manufacturer's Service and Lubrication Requirements
5. Service Contracts and Field Start-up Reports
6. Cleaning, Certification, and Test Reports
7. System Information
8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Volume Dampers		X						
Corrosive Ductwork Volume Dampers		X						
Turn Vanes		X						
Automatic Damper		X	X					
Duct Access Doors		X						

PART 2 PRODUCTS

2.01 VOLUME DAMPERS

A. Volume Dampers, up to 10 inch width:
1. Blade: Minimum 22 ga. galvanized steel.
2. Regulator: Quadrant type, 1/4 inch diameter shaft, wingnut, indicator dial marked "open" and "shut".
3. Bearings: 1/4 inch diameter shaft, spring-lock on tail bearing.
4. Regulator/Bearing Set Manufacturer: Duro-dyne KS-145; Duro-dyne SRST for externally insulated ducts, or approved.

B. Volume Dampers, 11 inch to 20 inch width:
1. Blade: Minimum 18 ga. galvanized steel. Use multiple blades for height over 12 inches.
2. Regulator: Quadrant type, 3/8 inch diameter shaft, wingnut, indicator dial marked "open" and "shut".
3. Bearings: 3/8 inch diameter shafts, spring-lock on tail bearing.

4. Regulator/Bearing Set Manufacturer: Duro-dyne KSR-195; Duro-dyne SRST for externally insulated ducts, or approved.

C. Volume Dampers, 21 inch to 30 inch width:
   1. Blade: Minimum 16 ga. galvanized steel. Use multiple blades for height over 12 inches.
   2. Regulator: Quadrant type, 1/2 inch diameter shaft, wingnut, indicator dial marked "open" and "shut".
   3. Bearings: 1/2 inch diameter shafts.
   4. Regulator/Bearing Set Manufacturer: Duro-dyne KS-12; Duro-dyne SRST for externally insulated ducts, or approved.

D. Volume Dampers, over 30 inch width:
   1. Blade: Minimum 16 ga. galvanized steel with stiffeners as required. Use multiple blades for height over 12 inches.
   2. Regulator:
      a. Description: Quadrant type, 1/2 inch diameter shaft size, wingnut, indicator dial marked "open" and "shut".
      b. Manufacturer: Duro-dyne K-5; or approved.
   3. Shaft: 1/2 inch diameter, continuous across damper width.
   4. End Bearing:
      a. Description: Cast alloy, inside duct type, 1/2 inch diameter shaft size.
      b. Manufacturer: Duro-dyne SB-112 or approved.
   5. Regulator/Bearing Set Manufacturer: Duro-dyne KS-12; Duro-dyne SRST for externally insulated ducts, or approved.

E. Volume Dampers in Corrosion Resistant Ductwork:
   1. Stainless Steel Lined Ductwork and Fiberglass Ductwork. See Section 233100 Ductwork.
      a. Butterfly style dampers with same materials of construction and quality assurance parameters as the duct system. Each damper shall be shipped complete with all the components listed below:
         1) Stainless Steel Lined Ductwork:
            a) Lined Stainless Steel Damper Body
            b) Lined Stainless Disc or Blade Assembly
            c) Lined Stainless Shaft with Viton® O-ring seals with PTFE (Teflon®) Gland Seals
            d) SS Locking Quadrant Hand Mechanism
            e) Van Stone Style Flanges or Quick Clamps to Match Mating Pure Guard SS Duct
         2) Fiberglass Ductwork.
            a) FRP Damper Body
            b) FRP Disc or Blade Assembly
            c) FRP Shaft with thermoplastic bushings
            d) FRP or SS Locking Quadrant Hand Mechanism
            e) Flanges - Optional
      b. Certified dimensional drawings shall be provided for approval showing all damper assembly component weights, flange drilling patterns and critical dimensions.
      c. Butterfly Damper Design:
         1) Damper Body: Flange thickness and bolt hole layout shall be the same as for the duct dimensions. Face to face dimensions shall be specified at the time of the system layout and should generally be designed to minimize the number of system flange joints.
         2) Damper Blade: Shall be manufactured from the same material as the duct. The blade should be designed to withstand the design conditions without failure with a safety factor of 5:1 or deflect in excess of 1.0% of the diameter.
         3) Shaft Seals: Viton® O-ring with PTFE (Teflon®) Gland seals.
         4) Bushings: Thermoplastic shoulder bushings.

5) Deformation or Creep: The equipment shall be suitable for all operating conditions. Deformation or creep shall not interfere with the damper operation under the most severe combined operating conditions.

d. Manufacturer: Composites USA, Pure Guard II and Dual Guard 2000 duct systems.

F. Opposed Blade Volume Dampers:
1. Damper Assembly:
a. Type: V-crimped galvanized steel.
b. Blade Action: Opposed blade as noted on Drawings.
c. Blades: 6 inches wide, v-crimped, 16 ga. galvanized steel.
d. Frames: 16 ga. galvanized steel or extruded aluminum.
e. Blade-to-blade Linkage: Concealed within frame.
f. Blade Axles: 1/2 inch diameter hexagonal or square zinc-plated steel; or 7/8 inch diameter hexagonal extruded aluminum.
g. Bearings: Oil-impregnated sintered bronze or molded synthetic.
h. Control Shaft: 1/2 inch diameter, extends 6 inches beyond frame.
i. Performance Ratings: Certified in accordance with AMCA Standard 500.
j. Manufacturer: Ruskin, Greenheck, Cesco, or approved. Similar to Ruskin CD35.
2. Regulator:
a. Quadrant type, 1/2 inch diameter shaft size, wingnut, indicator dial marked "open" and "shut". Duro-dyne K-5 or approved.

2.02 TURN VANES

A. Turn Vanes, 20 inch and less duct width:
1. Arrangement: Stationary vanes fixed to side rails installed in 90 degree square elbows.
2. Vane and Rail Material: Galvanized steel.
3. Vanes: Double wall, minimum 26 gauge, 90 degree, 2-inch throat radius.
4. Rails: Minimum 24 gauge, 1-1/2 inch on center vane spacing.
5. Manufacturer: Durodyne, Ductmate, Hardcast, Ward Industries, Cain, or approved. Similar to Durodyne Junior Vane Rail JVR2.

B. Turn Vanes, greater than 20 inch duct width:
1. Arrangement: Stationary vanes fixed to side rails installed in 90 degree square elbows.
2. Vane and Rail Material: Galvanized steel.
3. Vanes: Double wall, minimum 24 gauge, 90 degree, 4-1/2 inch throat radius.
4. Rails: Minimum 24 gauge, 3-1/4 inch on center vane spacing.
5. Manufacturer: Durodyne, Ductmate, Hardcast, Ward Industries, Cain, or approved. Similar to Durodyne Vane Rail VR2.

2.03 AUTOMATIC DAMPERS

A. Automatic Dampers (A):
1. Description: Extruded aluminum, airfoil blade, low leakage, multiple blade type as required.
2. Blade Action: Parallel blade for two-position isolation damper operation.
3. Blades: Extruded aluminum, airfoil shape. Damper blades shall not exceed 6 inches in width, and 48 inches in length. Provide multiple sections for dampers over 48”.
4. Frames: 13 ga. galvanized steel or extruded aluminum, flanges for mounting.
5. Blade-to-blade Linkage: Damper drive shaft to be directly bolted to damper blade, with no slip-on or keyed connection and no jackshaft. Drive shaft to extend through damper frame, into damper blade.
6. Blade Axles: 1/2” diameter hexagonal or square zinc plated steel; or 7/8” diameter hexagonal extruded aluminum.
7. Bearings: Oil-impregnated sintered bronze or bearing grade molded synthetic.
8. Control Shaft: 1/2” diameter, extends 6” beyond frame.
9. Blade Edge Seals: Extruded vinyl or rubber.
10. Jamb Seals: Flexible stainless steel.
11. Leakage Rate: Maximum of 4 cfm per sq ft at 1 inch w.g.

12. Performance Ratings: Certified in accordance with AMCA Standard 500.
13. Actuator: Provided by Section 23 09 00 Controls - Building Automation System.
14. Manufacturer and Model: Ruskin CD 50 or T.A. Morrison Company (TAMCO) Series 1500. No exceptions to meet owner's standards.

2.04 DUCT ACCESS DOORS

A. Duct Access Doors, Rectangular Ducts:
   1. Frame: Minimum 24 ga. galv. steel, with gasket and knock-over tabs.
   2. Door: Galv. steel of thickness equal or greater than that of the duct, double panel with 1 inch insulation, continuous steel hinge, cam lock, and gasket.
   3. Size: As required for maintenance access to equipment inside ducts.
   4. Products shall comply with the requirements of Oregon Revised Statute (ORS) 453.005 (7) (e), effective January 1, 2011. The referenced statute limits the use of three types of brominated fire retardant chemicals, which are defined as hazardous substances
   5. Manufacturer: Ruskin, Air Balance, Safe Air, Cesco, Duro Dyne, or approved. Similar to Air Balance model FSA100.

PART 3 EXECUTION

3.01 GENERAL

A. Install products in accordance with manufacturer's recommendations.

3.02 AUTOMATIC DAMPERS

A. Install per manufacturer’s recommendations. Coordinate with controls work in Sections 23 0900 and 23 1000 for damper actuator installation.

END OF SECTION

SECTION 23 36 00

AIR TERMINAL UNITS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

C. Section 23 0900 - Controls - Building Automation System

1.02 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
   1. Shop Drawings (submittal data)
   2. Product Data (submittal data), including documentation of ORS 453.005 (7) (e) compliance.
   3. Manufacturer's Operation Manuals
   4. Manufacturer's Service and Lubrication Requirements
   5. Service Contracts and Field Start-up Reports
   6. Cleaning, Certification, and Test Reports
   7. System Information
   8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Air Terminal Units	X	X	X	X				X

1.03 QUALITY ASSURANCE

A. Products shall comply with the requirements of Oregon Revised Statute (ORS) 453.005 (7) (e), effective January 1, 2011. The referenced statute limits the use of three types of brominated fire retardant chemicals, which are defined as hazardous substances.

PART 2 PRODUCTS

2.01 AIR TERMINAL UNITS

A. Terminal Units, General Exhaust (TUGE-2-1):
   1. Type: Single duct, pressure independent, variable volume.
   2. Casing: Minimum 22 gauge galvanized steel, low leakage.
   3. Damper:
      a. Fast acting damper actuator and controller provided by Section 23 0900 Controls - Building Automation System.
      b. Maximum leakage rate of 1% at 3 inch w.g. inlet static pressure.
      c. Shaft: Steel.
   4. Air Flow Sensor: Multiple point, averaging differential pressure sensor, compatible with control system.
   5. Flow Measuring Taps: External taps and calibration chart for field measurement of airflow.

6. Controls:
   a. Refer to Section 23 0900 for DDC terminal unit controller and damper actuator.
   b. Provide factory installation of DDC controller and damper actuator furnished under Section 23 0900.
   c. Provide factory connection of airflow sensor to DDC controller. Provide factory installed metal panel enclosure with hinged door for DDC controller.
   d. Factory test assembled units before shipment.
7. Duct Outlet Connection: Slip and drive.
8. Performance Data: Rated in accordance with ARI standard 880-94.
9. Capacity: Refer to schedule on Drawings.
10. Manufacturer: Carnes, Titus, Krueger, E.H. Price, Siemens, or approved. Similar to Siemens or Price Model SDV with Low Leakage option.

PART 3 EXECUTION

3.01 GENERAL

A. Install products in accordance with manufacturer's recommendations.

B. Coordinate installation with other trades to ensure maintenance access to Terminal Units per University of Oregon Construction Standards including 36” access space on sides and bottom.

END OF SECTION

SECTION 23 37 00

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

C. Section 20 9100 - Testing, Adjusting, and Balancing

1.02 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
   1. Shop Drawings (submittal data)
   2. Product Data (submittal data), including documentation of ORS 453.005 (7) (e) compliance.
   3. Manufacturer's Operation Manuals
   4. Manufacturer's Service and Lubrication Requirements
   5. Service Contracts and Field Start-up Reports
   6. Cleaning, Certification, and Test Reports
   7. System Information
   8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Grilles	X	X						
Registers	X	X						

1.03 QUALITY ASSURANCE

A. Products shall comply with the requirements of Oregon Revised Statute (ORS) 453.005 (7) (e), effective January 1, 2011. The referenced statute limits the use of three types of brominated fire retardant chemicals, which are defined as hazardous substances.

PART 2 PRODUCTS

2.01 GRILLES AND REGISTERS

A. General:
   1. Refer to Drawings for types, neck sizes, and blow patterns.

B. Supply Register Wall (SRW-1):
   1. Type: Double deflection, individually adjustable blades.
   2. Material: Steel or aluminum.
   3. Border: 1-1/4 inch wide, countersunk screw holes, gasket.
   4. Front Blades: Maximum 3/4 inch on center, parallel to long dimension.
   5. Rear Blades: Maximum 3/4 inch on center, parallel to short dimension.
   6. Finish: White.
   7. Opposed Blade Damper adjustable through the grille.

8. Manufacturer: Titus, Krueger, Carnes, Tuttle & Bailey, Anemostat, E.H. Price, or approved. Similar to Titus 300RL.

C. Exhaust Grille Ceiling (EGC-1):
   1. Type: Perforated face, lay-in.
   2. Material: Steel or aluminum.
   3. Face: 24x24, removable, perforated, with 3/16 inch diameter holes on staggered 1/4 inch centers.
   4. Frame Type: Lay-In.
   5. Neck: Square or round neck as indicated on the drawings.
   6. Finish: White.
   7. Manufacturer: Titus, Krueger, Carnes, Tuttle & Bailey, Anemostat, E.H. Price, or approved. Similar to Titus PAR.

PART 3 EXECUTION

3.01 GENERAL

A. Install products in accordance with manufacturer's recommendations.

B. Secure grilles and registers with flat head, countersunk screws, flush with borders, painted to match borders. Hex head and/or bright finish screws are not acceptable.

C. Install outlets and inlets tight to mounting surfaces.

D. Center outlets and inlets between lights and in ceiling tiles, as shown on Architectural reflected ceiling plans.

E. Install outlets and inlets plumb and square with walls and ceilings.

END OF SECTION

SECTION 23 40 00

AIR CLEANING DEVICES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 20 1000 - General Mechanical Provisions

B. Section 20 2000 - Mechanical Operation and Maintenance Manuals

1.02 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Submittals required for the products listed in the Product Table, in accordance with Section 20 1000. Operation & Maintenance Information required as indicated in the Product Table in accordance with Section 20 2000.

B. Operation & Maintenance Information requirements indicated by number designation as follows. Refer to Section 20 2000 for a description of each type of information.
   1. Shop Drawings (submittal data)
   2. Product Data (submittal data)
   3. Manufacturer's Operation Manuals
   4. Manufacturer's Service and Lubrication Requirements
   5. Service Contracts and Field Start-up Reports
   6. Cleaning, Certification, and Test Reports
   7. System Information
   8. Warranties

	Operation & Maintenance Information							
PRODUCT TABLE	1	2	3	4	5	6	7	8
Filter Media	X	X						
Filter Module and Filter Gauge	X	X						
HEPA Fan Units	X	X	X	X			X	X

PART 2 PRODUCTS

2.01 FILTER MEDIA

A. Medium Efficiency Filters (25-30%, MERV 7):
   1. Location:
      a. Duct mounted filter module (F-1).
   2. Filter Bank Details: Refer to schedule on Drawings.
   3. Type: Pleated media, disposable.
   4. Material: Reinforced non-woven cotton and synthetic fabric.
   5. Listing: UL 900 Class 1.
   6. Minimum Efficiency: 25%-30% average efficiency based on ASHRAE 52.1-1992 and MERV 7 minimum when tested in accordance with ASHRAE 52.2-1999.
   7. Media Thickness: 4 inches.
   8. Maximum Pressure Drop:
      a. 4 inch Thickness: 0.07 inch w.g. at 250 fpm face velocity when clean.
   9. Quantity: Provide three sets of filters as follows; one set furnished with rack assembly, one set to be installed before final air balance, and one set delivered to the owner.
   10. Manufacturer: Farr, Cambridge, Fram, Flanders, Filtration Group, or approved. Similar to Farr Type 30/30.

2.02 FILTER MODULE FOR DUCT MOUNTED FILTER (F-1)

A. Description:
   1. Low leakage, High Pressure, duct-mounted, side loading, slide rack filter system consisting of gasketed convertible track filter rack assembly, gasketed doors, seals and filter media.
   2. Filter housing shall be a multi- stage, short depth, filter system with In-line housing depth not exceeding 12”.

B. Construction:
   1. Pressure Rating: Standard pressure construction rating to +/- 6.0” w.g.
   2. Wall Construction: Double-wall construction with insulation between walls.
   3. The housing shall be constructed of 16-gauge galvanized steel with pre-drilled standing flanges to facilitate attachment to ductwork or other system components.
   4. Corner posts of Z-channel construction shall ensure dimensional adherence.
   5. A frame support track of aluminum construction shall be an integral component of housing construction.
   6. Dual access doors, swing-open type, shall include high-memory sponge neoprene gasket to facilitate a door-to-filter seal. Each door shall be equipped with adjustable and replaceable positive sealing UV-resistant star-style knobs and replaceable door hinges.
   7. A universal holding frame constructed of multi-track adaptable extruded aluminum filter mounting tack, three static pressure taps and polyurethane filter sealing gasket.

C. Finish: Primed.

D. Performance:
   1. Less than 1/2 of 1% air bypass/leakage on filter track seal.
   2. Leakage at rated airflow, upstream to downstream of filter holding frame shall be less than 1% at 3.0” w.g. Leakage into or out of the housing shall be less than one half of 1% at 3.0” w.g.

E. Filters Media: Medium Efficiency Filters (25-30%, MERV 7).

F. Filter Media Sizes: Filter media size as shown on Drawing Filter Schedule, 4" media depth.

G. Maximum Housing Length: 13 ins.

H. Filter Housing Manufacturer: Camfil Farr MultiTrack 13, or approved.

2.03 FILTER GAUGE FOR PRE- FILTER MODULE

A. Filter Gauge:
   1. Filter gauge shall be field mounted on the filter access side piped with copper tubing around filter bank.
   2. Type: Filter differential pressure gauge with manually adjustable signal flag and indicating output signal for BAS monitoring.
   3. Range: 0 to 1 inches, w.g. Control signal output 4-20 mA.
   4. Manufacturer: Dwyer, Cleveland Draft Gauge, Farr, or approved. Similar to Dwyer series 605 Magnehelic Differential Pressure Indicating Transmitter.

2.04 HEPA FAN UNITS (HFU-1 THROUGH HFU-7)

A. General Features:
   1. EC brushless DC motor with internal microprocessor. Dynamically adjusts motor speed to maintain set airflow to compensate for changes in static pressure in duct system and filter loading.
   2. Housing Style: Filter, baffle and motor removable from room side.
   3. Electrical enclosure with on/off switch, fan speed adjustment and LED speed indicator.
   4. Constant airflow over a wide range of external static pressures.
   5. Low power consumption at 235 watts.
   6. Low sound level at 48 dBA.

7. High Efficiency Particulate Air (HEPA) UL 900 Filter: 99.99% @ 0.3 micron, removable from room side.
8. Forward-curved centrifugal-type fan, with motor removable from room side.
9. Walk-able plenum (excluding pre-filter), rated to 250 lbs.
10. Pre-filter: Not required with external duct connection.
11. Tested to IEST recommended RPC standards.
12. UL listed with standard UL 900 filter.
13. Size: 48" x 24" to be installed in ceiling T-bar with gasket type seal.
14. Finish: White powder coated paint on housing and screen. No metal exposure to room is allowed due to a requirement for a metal-free environment.

B. Controls:
   1. Universal Control Card: DIP switch selectable incorporating the following control options:
      a. Manual speed control.
      b. 0-10 volt input speed control from a building automation system.
      c. Modbus RTU network over RS485 (serial).
   2. Remote Control Console: Wall mounted menu driven control console allowing user to monitor motor status and adjust speed of up to 10 units wired in a standalone Modbus-RTU network without the need for programming.

C. Options:
   1. 10" diameter duct collar.
   2. Red filter load indicator light, On = Time to change filter. Provide on one (1) HFU of the units installed in a room, required for a total of three (3) units.
   3. 1/8" FNPT roomside challenge port and 1/8" FNPT static/concentration port.

D. Warranty: 18 months.

E. Performance Requirements: See Schedule on Drawings.

F. Manufacturer: Envirco MAC10 IQ RSRE with Envirco Small System Console ACC1-10, or approved.

PART 3 EXECUTION

3.01 GENERAL

A. Install products in accordance with manufacturer's recommendations.

B. Install filter gauge piped around the Pre-Filter Module.

C. Do not operate systems without filters in place.

END OF SECTION

SECTION 26 01 00

GENERAL ELECTRICAL PROVISIONS

PART 1 GENERAL

1.01 CONTRACT CONDITIONS

A. Work of this Section is bound by General Conditions, Supplementary Conditions, and Division 1 bound herewith in addition to this Specification and accompanying Drawings.

B. The Drawings and Specifications are complimentary and what is called for by one shall be as binding as if called for by both.

C. The Contractor shall inspect the job site prior to bidding and become familiarized with existing conditions which will affect the work.

D. Prior to start of work, obtain "As built," "Record," or other Drawings showing existing conditions or underground utilities.

1.02 SECTION INCLUDES

A. General requirements specifically applicable to Division 26 and 28 sections, which apply in addition to Division 1 - General Requirements.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Comply with requirements herein where other Divisions call for Work under this Division of Specifications. Electrical Work required by other Divisions not shown on Electrical Drawings or specified in this Division of Specification shall be provided by trade or sub-trade requiring Electrical Work.

1.04 DESCRIPTION OF SYSTEM

A. Electrical Drawings are diagrammatic and do not necessarily show all raceways, wiring, number and types of fittings required.

B. Provide all related Electrical Work specified herein and diagramed or scheduled on Electrical Drawings. All work shall conform to applicable national, state, and local codes. Contractor is responsible for installation of complete and operating electrical systems.

C. Where any device or part of equipment is referred to in these specifications in the singular number (such as "the switch"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.05 QUALITY ASSURANCE

A. Qualifications of Installers:
   1. For actual fabrication, installation and testing of Work of this Section, use only thoroughly trained and experienced personnel familiar with requirements for this Work and with installation recommendations of Manufacturers of specified items.

B. Design Criteria:
   1. Conform Work with conditions shown and specified.
   2. Where adjustments or modifications of Work are necessary for fabrication and installation of items, or for resolution of conflicts between items, make such adjustments at no added expense to Owner.
   3. Submit adjustments or modifications of Work affecting functional or aesthetic design of Work to Architect for review.
   4. Pay for equipment relocations or modifications necessitated by failure to advise Architect of conflicts or coordinate work.

C. Select equipment to meet design conditions stated. Contractor is responsible for meeting technical data and performance requirements of system.

D. Satisfy requirements of regulatory agencies or codes having jurisdiction over project. Provide UL labels for all equipment falling under testing capabilities of UL.

E. Procure licenses and permits, and pay fees, deposits, assessments and tax charges required for Electrical Work.

F. Arrange for and pay for inspections and tests required by codes and ordinances during construction.

1.06 REFERENCE STANDARDS

A. The following specifications and standards, except as hereinafter modified, are incorporated herein by reference and from a part of this specification to the extent indicated by the references thereto. Except where a specific date is given, the issue in effect (including amendments, addenda, revisions, supplements, and errata) on the date of Invitation for Bids shall be applicable. In text such specifications and standards are referred to by basic designation only.
   1. Underwriters Laboratories (UL).
   2. National Fire Protection Association (NFPA), Specifically:
      a. NFPA 70 - National Electric Code.
      b. NFPA 72 - National Fire Alarm Code.
      c. NFPA 72E - Electrical Safety in Workplace.
      d. NFPA 101 - Life Safety Code.
      e. NFPA 110 - Emergency and Standby Power Systems.
      f. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
   3. State of Oregon Electrical Specialty Code.
   4. International Mechanical Code (IMC) with State of Oregon Amendments.
   5. International Building Code (IBC) with State of Oregon Amendments.
   6. International Fire Code (IFC) with State of Oregon Amendments.
   7. National Electrical Manufacturer's Association (NEMA).
   8. American National Standards Institute (ANSI).
   9. National Electrical Testing Associations (NETA).
   10. Occupational Safety and Health Administration (OSHA).
   11. City, County, and State Codes and Ordinances.
   12. Telecommunications Industries Association (TIA).
   13. Electronics Industries Alliance (EIA).
   14. Federal Communications Commission (FCC).
   15. Institute of Electrical and Electronics Engineers (IEEE).
   16. Building Industry Consulting Service International (BICSI).

1.07 SUBMITTALS

A. Provide shop drawings and product data for the Work of Divisions 26, 27 and 28 in accordance with Division 1.

B. Submittal material sent by facsimile machine will not be accepted.

C. Post Contract Award:
   1. Prepare and submit as follows:
      a. Provide complete drawings, diagrams, illustrations, performance charts, brochures, and/or other data which adequately describes product to enable thorough evaluation.
      b. Number of copies, method of distribution, format and schedule for submission; per Supplementary Conditions or Division 1.
      c. Submit all at one time.
      d. Use 3-ring loose leaf binders for submittals with index referenced to Specification section and page. Tab individual sections.

e. Review and correct submittal information with stamped approval prior to forwarding to Architect.
f. Do not order or manufacture equipment until full review received from Architect and/or Engineer.
g. Submit, where applicable, certificates denoting conformance to standards adopted by recognized organizations such as NEMA, UL, OSHA, etc.
h. Schedule of values.

D. Review statements and submittals prepared by the Contractor will be evaluated by the Engineer, and one of the following statements will be affixed to the submittal material.
1. "No Exception Taken" The meaning and intent of this statement is that the Engineer finds no objection (except those noted thereon or in correspondence) to inclusion of items or Work indicated in construction provided that it:
a. Complies with Contract Drawings and Specifications as to quantities, space requirements, and dimensions.
b. Does not interfere with other trades.
c. Is not the cause of union tradesmen disputes.
d. Does not infringe on patent rights.
e. Is not the cause of injury or damage to persons or property.
f. Complies with OSHA regulations.
2. "Rejected" The meaning and intent of this statement is that the submitted material does not conform to plans and specifications. Resubmittal of a different product or shop drawing is required.
3. "Revise and Resubmit" This statement is used when the general product line is acceptable, but the submitted material varies in dimension, accessories, etc. from what is required. Resubmittal is required.
4. "Make Corrections Noted" This statement is used as an alternative to "Revise and Resubmit" when resubmittal is not required.
5. Said review does not relieve Contractor of any Contractual responsibilities.

E. Provide product data for materials and equipment as required by individual sections.

F. Provide Shop Drawings for materials and equipment as required by individual sections.

1.08 SUBSTITUTIONS

A. Substitution requests will not be considered unless they are submitted in writing, in accordance with Instructions to Bidders, Supplementary Instructions to Bidders, and Division 1.

B. Products specified herein are so specified to establish a minimum level of product quality. Except where indicated that no substitutions are allowable, equivalent quality products may be submitted to the Architect for approval.

C. Substitution requests will not be considered unless they include the following:
1. Model numbers of proposed substitutions.
2. Options which are required to make the proposed substitution comply with Specifications.
3. Summary of modifications of the Work which are required to accommodate the proposed substitution.

1.09 OPERATION AND MAINTENANCE MANUALS, INSTRUCTION AND TRAINING

A. Manual:
1. Provide in accordance with Division 1. Scope: Following installation of electrical equipment, and prior to acceptance of Electrical Work, prepare manuals describing operations, servicing, and maintenance requirements of electrical equipment and systems installed.
2. Equipment described in manual:
a. Equipment listed under "Submittals."
b. Other auxiliary miscellaneous systems.

3. Information contained in manual:
   a. Catalog data on each item including complete parts lists, catalog numbers, maintenance information and wiring diagrams.
   b. Service organizations for equipment.
   c. Manufacturer's recommended servicing instructions.
   d. Diagrams complete for each system installed.
4. Presentation:
   a. Provide information on neat, clean 8-1/2 inch x 11 inch sheets.
   b. Provide drawings, accordion folded to letter size.
   c. Divide manual into chapters which follow section sequence of Specifications of this Division.
5. Cover:
   a. Enclose each manual in hardboard post-type binder.
   b. Imprint front of binder with following:
      1) "Electrical Equipment."
      2) Name of Owner.
      3) Year completed.
      4) Names of Architect, Engineer and Contractor.
   c. Imprint outside end cover of binder with following:
      1) "Electrical Equipment."
      2) Name of building.
      3) Name of Owner.
      4) Year of completion of building.

B. Instruction and Training:
1. Contractor responsibilities:
   a. Train Owner personnel in operation and maintenance of all installed electrical equipment and systems.
   b. Submit proposed scope of training materials and instruction schedule to Architect for review and approval 30 days prior to scheduled completion of building.
   c. Arrange mutually agreeable dates for training with Owner.
   d. Include classroom and on-the-job instruction by qualified installation and maintenance personnel.

C. Seismic Restraint Test Report:
1. [Commissioning Report: Coordinate with requirements listed in Section 20 92 00.]

1.10 RECORD DRAWINGS

A. Provide in accordance with Division 1.

1.11 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Make inspection of equipment for possible damage at time of delivery to avoid future delays in construction due to replacement or repair.

B. Protect against damage, theft and deterioration.
1. Store in original factory containers.
2. Do not expose equipment to dust, powder, abrasive, wetness, excessive dampness or temperature extremes, unless equipment approved for that use.

C. In event of damage, immediately make all repairs and/or replacements necessary to approval of Architect, at no additional expense to Owner.

1.12 PROTECTION

A. Suitably protect any unfinished Work from potential physical damage.

B. Do not leave unfinished Work unattended, which would pose life safety hazard.

C. Protect other Work against damage and discoloration caused by Work of this Section.

1.13 COORDINATION

A. Provide coordination for the Work of this Division in accordance with Division 1.

B. Report any discrepancies discovered between existing job conditions and Work to be installed. Fully resolve such discrepancies prior to continuation of work.

C. Coordinate sequencing of equipment installation and energizing with other trades.

D. Consult Architect prior to installing equipment in area which obviously exceeds, or will exceed, ambient operating requirements such as for temperature and humidity.

1.14 ALTERNATIVES AND ALLOWANCES

A. Refer to Division 1 for possible effect upon Work of this Section.

1.15 WARRANTY

A. Warrant all Work included in this Specification for period of one year from date of substantial completion, under provisions of Division 1.

B. During warranty period, remedy without delay or expense to Owner any defects providing, in judgment of Engineer, that such defects are not result of misuse or abuse on part of Owner.

C. Warrant that all equipment and installations are in compliance with OSHA regulations.

1.16 SCHEDULE OF VALUES

A. After award of contract, submit to Engineer a cost breakdown of work. Divide costs into the following categories:
   1. Administration.
   2. Basic materials and methods.
   3. Panelboards and switchgear.
   4. Lighting fixtures.
   5. Fire alarm equipment.
   6. Other.

B. Submit in accordance with provisions of this Section.

PART 2 PRODUCTS

2.01 MATERIAL

A. Provide new material and equipment items that are standard products of Manufacturers regularly engaged in production of such materials and equipment. Architect reserves right to reject items not in accordance with Specifications.

B. For each type of equipment, use same manufacturer throughout.

C. Provide corrosion protection for ferrous metalwork exposed to weather by hot dip galvanizing, or factory painted finish suitable for outdoor installations.

D. Verify all materials are acceptable to Authority having jurisdiction, as suitable for the use intended.

PART 3 EXECUTION

3.01 COMPLETION

A. Complete each system as shown or specified herein and place in operation, except where only roughing-in or partial systems are called for.

B. Outlets or equipment shown on the plans, with no supply conduit or conductors indicated, shall be completed in the same methods and manner as similar or like outlets or equipment shown on the drawings.

3.02 SCHEDULING OF WORK

A. Schedule Work with all other Contractors to maintain job progress schedule, and avoid conflicts in installation of Work by various trades.

B. Coordinate with General Contractor to provide adequate access for installing large equipment.

3.03 EXCAVATION

A. Contact utilities before starting any excavation to locate underground services on site or in adjacent streets.

B. Locate and protect any existing underground services.

C. Repair any services damaged.

3.04 TRENCHING AND BACKFILLING

A. See Section 31 23 33.

B. Provide trenching and backfilling to depth required for underground conduit, per NEC and/or Utility requirements, 36 inches minimum.

C. Backfilling prior to inspection of installation by Architect and serving Utility not permitted.

D. Minimum backfill requirements:
   1. Raceway runs beneath building slabs, beneath areas to be paved and beneath streets and sidewalks.
      a. Use 1/4 inch to 1 inch diameter, crushed or clean round river rock.
   2. Underground raceway runs at all other locations.
      a. Backfill in compacted layers not exceeding 6 inches in depth.
      b. Use sand or "clean" earth free from rock larger than 1 inch diameter and debris.
   3. Provide one continuous #14 copper conductor as a tracing conductor for locating the conduits in the future. Install the tracing conductor at the center line of the upper-most conduit in the trench. Install one tracing conductor in each conduit trench for each 4-foot trench width and one for each additional trench width of less than 4 feet wide. (i.e., provide one for a trench up to 4-feet wide, two for 5-8 feet wide, three for 9-12 feet wide, etc.). Provide a 6 foot coil of tracing wire at each end of the trench clearly marked on an identification tag: “TRENCH TRACING CONDUCTOR”. Also include the tracing conductor destination and a description of the conduits/conductors in the trench. The identification tag shall be machine generated text, enclosed in a waterproof clear plastic seal, and attached to the coil by means of a tywrap.

E. Trenching and Backfilling for Services:
   1. Coordinate with all utilities for joint trench service Work.
   2. Uncover existing utilities by hand digging only.
   3. Size to accommodate all utility service conduits and accessories.

F. Power digging only in direction away from existing facilities.

G. Route trenching in manner to avoid weakening footings.

H. Restore, to Architect's satisfaction at no additional expense, any sidewalks, landscaping, or other existing structure damaged due to excavation.

3.05 SLEEVES AND OPENINGS

A. Provide through floors and walls for Electrical Work.

B. Coordinate with General Contractor and other trades involved.

C. Patch and seal around all openings, both sides of material penetrated where possible.

3.06 CUTTING AND PATCHING

A. See Division 1.

B. Inform General Contractor of all openings required in building construction for installation of Work.

C. Where access within or behind existing surfaces is required by the work of this Section, remove, cut, patch reinstall, and refinish surfaces and assemblies as required to restore them to their previous and/or scheduled finish condition.

3.07 PAINTING

A. See Division 9.

B. Painting of Electrical Work shall be performed by General Contractor.

C. Painting of Electrical Work not included in Electrical Work, unless otherwise noted on Drawings or specified herein.

D. Coordinate with General Contractor.

3.08 MANUFACTURER'S INSTALLATION DETAILS

A. Follow exactly, where available.

B. Provide special wiring or fittings as required.

3.09 ACCESSIBILITY OF EQUIPMENT

A. Install equipment accessible for operation, maintenance or repair as required by NEC.

B. Inaccessible Equipment:
   1. Where the Owner's Representative determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled as directed, at no additional cost to the Owner.
   2. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping and ductwork.

3.10 COORDINATION

A. Coordinate all light fixture and device locations with other trades to avoid possible conflicts with ducts, sprinkler piping, and other obstacles affecting installation.

B. Coordinate conduit, junction boxes, supporting equipment, etc. Affecting normal operating and maintenance activities related to mechanical equipment, piping, valves, accessories, etc.

3.11 TESTS

A. Fully test and adjust equipment installed under these specifications prior to Owner's personnel instruction. Each system shall be left in proper operation free of faults, shorts or unintentional grounds.

B. Do not test or operate for any other purpose, such as checking motor rotation, any item of equipment until fully checked in accordance with Manufacturer's instructions.

C. Demonstrate functions and location of each system and indicate its relationship to "Riser-Diagrams" on Drawings. Demonstrate by "Start-Stop operation" how to work controls, reset protective devices, replace fuses and procedures for emergency conditions.

D. Submit to Engineer certificate of completed demonstration countersigned by Architect.

3.12 CLEANING OF ELECTRICAL INSTALLATION

A. See Division 1.

B. Prior to acceptance of building, thoroughly clean all exposed portions of electrical installation.

C. Remove all nonessential labels and traces of foreign substances.

D. Use only cleaning solution approved by Manufacturer.

E. Avoid any damage to finished surfaces.

3.13 EXTRA STOCK

A. Provide extra stock, as described in individual sections, to Owner in accordance with Division 1.

3.14 EQUIPMENT CONNECTIONS

A. Provide a complete electrical connection for all items of equipment including incidental wiring, materials, devices and labor necessary for a complete operating system. The location and method for connecting to each item of equipment shall be verified prior to rough-in. The voltage and phase of each item of equipment shall be checked before connecting. Motor rotations shall be made in the proper direction. Pump motors are not to be test run until liquid is in the system and proper lubrication to all bearings in unit is checked.

B. Conduit, wire and circuit breaker sizes for mechanical and similar equipment are based on the equipment ratings of one manufacturer. The equipment actually furnished may have entirely different electrical characteristics. Conduit, wire and circuit breakers shall not be ordered or installed until exact electrical requirements are obtained. Responsibility for this coordination rests with the Contractor.

END OF SECTION

SECTION 26 01 55

ELECTRICAL SYSTEMS FIRE STOPPING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 26 01 00 - General Electrical Provisions

B. Section 26 05 30 - Conduit

C. Section 26 27 26 - Wiring Devices

1.02 SUMMARY

A. Section includes requirements for through-penetration fire stopping for items including wiring, conduit, and cable tray, provided under Divisions 26, 27 and 28.

B. Section also includes requirements for recessing fixtures, cabinets, or devices in fire rated walls, ceilings, and floors.

C. Products shall be of a single manufacturer for each type of fire stopping required, and where several types are integrated into a single assembly. Provide putty, sealants, wraps, boards, and accessories as necessary and required for the work of this project.

1.03 REFERENCES

A. Underwriters Laboratories:
   1. UL Fire Resistance Directory.
   2. UL Component Listing Test Criteria.
   3. Warnock Hersey.

B. American Society For Testing And Materials Standards:
   1. ASTM E 814 - 88: Standard Test Method For Fire Tests of Through-Penetration Firestops.

C. International Building Code, 2003, with Oregon Amendments (Oregon Structural Specialty Code, OSSC, 2004) – Chapter 7 Fire Resistance Rated Construction.

1.04 DEFINITIONS

A. Assembly: Particular arrangement of materials specific to a given type of construction.

B. Barriers: Time rated fire walls, ceiling/floor assemblies, and structural floors.

C. Fire Stopping: Assembly of materials applied at penetrations to limit spread of heat, fire, gases and smoke.

D. Penetration: Opening through or into a barrier such that full thickness of rated materials is not obtained.

E. System: Specific products and applications, classified and numbered by Underwriters Laboratories (UL), Inc. to close specific barrier penetrations.

F. F Rating: Time period that fire stop assembly can withstand fire and hose stream test as determined in UBC Standard 7-5.

G. T Rating: As required for F Rating and to limit temperature rise above the initial temperature to 325 degrees F on protected side as determined in UBC Standard 7-5.

1.05 SHOP DRAWINGS, PRODUCT DATA, OPERATION & MAINTENANCE DATA

A. Provide manufacturer's installation drawings and instructions for each proposed assembly. Identify intended product and applicable UL System number or UL classified devices.

B. Provide manufacturer recommendations and drawings relating to non-standard applications where necessary.

1.06 QUALITY ASSURANCE

A. Installer Qualification: Acceptable to, or certified by, Fire Stopping system manufacturer.

B. Regulatory Requirement: Contractor shall verify acceptance from Authority Having Jurisdiction for proposed assemblies conforming to, or not conforming to, specific UL Fire Stop System Numbers, or UL classified devices.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original, unopened packaging with legible manufacturer's identification. Store materials in accordance with manufacturer’s instructions. Store in clean, dry, ventilated location, protected from freezing.

1.08 WARRANTY

A. Submit copies of written warranty for Fire Stopping assemblies. Warranty period shall be one year minimum.

PART 2 PRODUCTS

2.01 GENERAL

A. Fire Stop products and accessories shall be asbestos-free, intumesce when exposed to temperatures of 250 degrees F, and maintain an effective barrier against flame, smoke and gases. Mortar systems must be Warnock Hersey approved.

B. Fire Stop Fire Rating: Not less than rating of barrier penetrated in which fire stopping will be installed.

2.02 FIRE STOPPING ASSEMBLIES

A. Assemblies of materials used to seal spaces around penetrations shall have a UL Fire Stop System Number appropriate for the construction type, penetration type, annular space requirements, and fire rating at each penetration.

B. Systems and devices must withstand the passage of cold smoke either as an inherent property of the system or by the use of a separate product included as a part of the UL system or device and designed to perform this function. Systems complying with the requirements for through-penetration firestopping in fire-rated construction are acceptable provided the system will provide a smoke seal.

C. Performance Requirements: Fire Stop assembly shall be able to withstand standard fire and hose stream test (F Rating) and limit temperature rise (T Rating) of penetrans on protected side as required by Authorities Having Jurisdiction. Conform to UBC Standard 7-5.

D. Manufacturers: 3M, Dow, Chase Technology Corp., Bio Fireshield Inc., ProSet, Johns Manville, Specified Technologies Inc, Metacaulk, GS Hevi-Duti/Nelson, or approved.

2.03 ACCESSORIES

A. Fill, void, or cavity materials: As classified under category XHHW in the UL Fire Resistance Directory.

B. Forming materials: As classified under category XHKU in the UL Fire Resistance Directory.

PART 3 EXECUTION

3.01 GENERAL

A. Provide Fire Stopping seal at cable tray, wiring, or conduit penetration, installed under Divisions 26, 27 and 28, through fire rated construction.

B. Provide fire rated assembly around electrical devices, panelboards, outlet boxes, back boxes, cabinets, and light fixtures recessed in fire rated walls and ceilings. See Architectural drawings for locations of fire rated walls and ceilings.

C. Verify barrier penetrations are properly sized and in suitable condition for application of materials.

D. Provide masking and drop cloths to prevent contamination of adjacent surfaces by Fire Stopping materials. Clean spills of liquid components. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

E. Clean surfaces to be in contact with penetration seal materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance. Cut and trim materials as required to neatly match edges of penetration.

F. Comply with manufacturer’s recommendations for temperature and humidity conditions before, during, and after installation of Fire Stopping.

END OF SECTION

SECTION 26 01 60

MINOR ELECTRICAL DEMOLITION FOR REMODELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and Equipment for Patching and Extending Work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings. Report discrepancies to Architect before proceeding with demolition work.

B. Verify that abandoned wiring and equipment serve only abandoned facilities. Report discrepancies to Architect before disturbing existing installation.

3.02 PREPARATION

A. Disconnect electrical installations in walls, floors, and ceilings scheduled for removal. Report discrepancies to Architect before disturbing existing installation.

B. Verify that abandoned wiring and equipment serve only abandoned facilities. Report discrepancies to Architect before disturbing existing installation.

C. Interrupt power only to make connections or switchovers.
   1. Obtain permission from Owner's Representative before scheduling partial or complete outages.
   2. Schedule each outage at least 24 hours in advance.
   3. Keep outages as short duration as possible and make temporary connections if required to maintain service to areas adjacent to work area.
   4. When work must be performed on energized equipment or circuits, use personnel’s experience in such operations.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations as required to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit.

D. Disconnect abandoned outlets and remove devices. Provide blank cover for abandoned outlets where conduit system is not removed.

E. Disconnect and remove abandoned panelboards and distribution equipment.
   1. Remove interior bussing of existing panel where panel enclosure is being reused as a junction box.

F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

G. Disconnect and remove abandoned luminaires.
   1. Remove brackets, stems, hangers, and other accessories.

H. Repair adjacent construction and finishes damaged during demolition and extension work.

I. Maintain access to existing electrical installations which remain active.
   1. Modify installation or provide access panel as appropriate.

J. Extend existing installations using materials and methods compatible with existing electrical installations.

K. Check branch circuit wiring disturbed in execution of this Work which is to remain for continuity, overloads and grounds. Repair any deficiencies.

L. Existing outlets indicated on drawings to be removed or to remain, are shown for general information only and do not indicate exact location or total number of outlets involved.

M. Relocate and reuse existing lighting fixtures as shown on drawings. Repair or replace missing or faulty parts such as reflectors, lens, and ballasts for first class operating condition. Provide new lamps.

N. All salvage materials shall remain property of Owner and shall be stored at location designated by Owner, unless otherwise noted by Architect.

O. Prior to acceptance of the building, thoroughly clean exposed portions of the electrical installation, removing labels and traces of foreign substance, using only a cleaning solution approved by the manufacturer and being careful to avoid damage to finished surfaces.

3.04 DISPOSAL OF PCB BALLASTS CONTAINING PCB'S

A. Ballasts in removed fixtures not labeled "No PCBs" shall be assumed to contain PCBs.

B. Remove PCB ballasts from fixtures and properly dispose of by incineration.
   1. Employ an abatement contractor with five years documented experience in ballast disposal.

C. Submit to Architect: Certification of Ownership transferal including Bills of Lading, Bills of Storage, and Bills of Incineration.

3.05 DISPOSAL OF FLUORESCENT LAMPS CONTAINING MERCURY

A. Lamps in removed fixtures shall be assumed to contain mercury.

B. Remove lamps from fixtures and properly dispose of by mercury reclamation process.
   1. Employ an abatement contractor with five years documented experience in lamp disposal.
   2. Submit to Architect: Certification of Ownership transferal including Bills of Lading, Bills of Storage, and Bills of Reclamation.

END OF SECTION

SECTION 26 05 19

WIRE AND CABLE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building wire.

B. Cable.

C. Wiring connections and terminations.

1.02 SUBMITTALS

A. Submit shop drawings and product data under the provisions of Section 26 01 00.

B. Submit manufacturer's instructions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - WIRE

A. American Insulated Wire Corp.

B. Essex/Paranite/Diamond.

C. General Cable/Guardian/Carol.

D. Southwire.

E. Cerrowire.

F. Substitutions: Under provisions of Section 26 01 00.

2.02 BUILDING WIRE

A. Feeders and Branch Circuits Larger than 2 AWG:
   1. Copper.
   2. Stranded conductor.
   3. 600 volt insulation.
   4. THHN, THWN, XHHW, except where adverse conditions require other insulation types.

B. Feeders and Branch Circuits 4 AWG and Smaller:
   1. Copper conductor.
   2. 600 volt insulation.
   3. THHN/THWN.
   4. Not less than 98% conductivity.
   5. Stranded conductor.

C. Control Circuits:
   1. Copper.
   2. Stranded conductor
   3. 600 volt insulation.
   4. THHN/THWN.

D. Color Coding: (Obtain state and local electrical inspector’s approval).
   1. 120/208 Volt System:
      a. A phase - black.
      b. B phase - red.
      c. C phase - blue.
      d. Neutral - white striped with black, red, or blue per phase
      e. Travelers - purple.

f. Switch leg - pink.
g. Ground - green.

2. 277/480 Volt System:
   a. A phase - brown.
   b. B phase - orange.
   c. C phase - yellow.
   d. Neutral - gray striped with brown, orange or yellow; white with stripes, but not green stripes.
   e. Travelers - purple.
   f. Switch leg - pink.
   g. Ground - green

2.03 REMOTE CONTROL AND SIGNAL CABLE

A. Control Cable for Class 1, 2, or 3 Remote Control and Signal Circuits:
   1. Copper conductor.
   2. 600 volt insulation.
   3. Rated 60° C.
   4. Individual conductors twisted together.
   5. Shielded or non-shielded as required by equipment manufacturer.
   6. Covered with a PVC jacket.
   7. Class 2 or 3 cables used in plenums shall be UL listed for such use.
   8. Shall conform to the recommendations of the communication and signal systems manufacturer.
   9. Provide wiring as required for the systems being furnished.

PART 3 EXECUTION

3.01 GENERAL WIRING METHODS

A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 16 AWG for control wiring.

B. Torque logs are required at each service and/or distribution location to ensure good connections.

C. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.

D. Place an equal number of conductors for each phase of a circuit in same raceway or cable.

E. No shared neutrals. Provide one neutral for each phase conductor in branch circuits.

F. Wire and cable shall be brought to the job in the original containers bearing the U.L. label.

G. Splice only in junction or outlet boxes.

H. Neatly train and lace wiring inside boxes, equipment, and panelboards using cable ties.
   1. Manufacturer: T&B Ty-Rap, or approved.

I. Wire pulling lubricant may not be Ideal 77 yellow.

3.02 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time.

B. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.

C. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

D. Equipment Grounding Conductors:
   1. Provide a separate, insulated equipment grounding conductor in feeder, lighting, and receptacle branch circuits.
   2. Terminate each end on a grounding lug, bus, or bushing.
   3. Provide individual ground wire in flexible conduit and non-metallic raceways.

3.03 CABLE INSTALLATION

A. Provide protection for exposed cables where subject to damage.

B. Support cables 12" minimum above accessible ceilings.

C. Use spring metal clips or plastic cable ties to support cables from structure or ceiling suspension system.

D. Include bridle rings or drive rings.

E. Use suitable cable fittings and connectors.

F. Install cables in conduits where installed in walls or other inaccessible spaces.

G. Wires shall be pulled in such a manner as to avoid kinking or abrasion to the insulation. Use only approved lubricants. Oil or grease shall not be used to lubricate wires.

H. UO - Make sure that couplings and conduit connectors have pre-insulated bushings in place before pulling wires.

I. Wire insulation color shall be the same from one end to another, inclusive.

3.04 WIRING CONNECTIONS AND TERMINATIONS

A. Splice only in accessible junction boxes.

B. #8 Copper Wire and Smaller:
   1. Use solderless spring connectors with insulating covers.
   2. Manufacturer: Buchanan, Ideal, Scotch, or approved.
   3. Connection by means of wire binding screws or studs and nuts having upturned lugs or equivalent shall be permitted for No. 10 solid or smaller conductors only.
   4. Molded connectors with metal thread-on core shall be used for splicing #14, #12 and #10 wire.
   5. Molded connector manufacturer: 3M or Buchanan.

C. #6 Copper Wire and Larger:
   1. Use pressure lug terminals and splicing connectors or compression lug terminals and connectors rated for the material of the terminals and conductor and properly installed.
   2. Manufacturer: Burndy, Ilsco, OZ/Gedney, or approved.
   3. Cover uninsulated conductors and connectors with an insulating device suitable for the purpose and 150 percent of the insulation value of conductors.

D. Thoroughly clean wires before installing lugs and connectors.

E. Make splices, taps, and terminations to carry full ampacity of conductors without perceptible temperature rise.

F. Terminate spare conductors with electrical tape.

3.05 FIELD QUALITY CONTROL

A. Inspect wire and cable for physical damage and proper connection.

B. Torque test conductor connections and terminations to manufacturer's recommended values.

C. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

3.06 WIRE AND CABLE INSTALLATION SCHEDULE

A. Interior and Exterior Locations: Building wire in continuous metallic raceways, as shown on Drawings.

B. Cross marks for power and lighting branch circuits installed in raceways indicate quantity of number 12 copper branch circuit current carrying conductors unless otherwise noted. Where no cross marks appear on power or lighting circuits it shall be understood to provide two (2) number 12 carrying conductors for lighting and two number 12 current carrying conductors for receptacle circuits.

C. Unless otherwise noted on drawings provide one (1) number 12 conductor for each branch circuit for grounding.

D. Fire Alarm Wiring: 3/4"C.

E. Fire Alarm and BMS low-voltage can share voice/data j-hooks or cable trays if fully coordinated and Owner approved.

END OF SECTION

SECTION 26 05 29

SUPPORTING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit and equipment supports.

B. Fastening hardware.

1.02 RELATED SECTIONS

1.03 COORDINATION

A. Coordinate size, shape, and location of concrete pads with Division 3.

1.04 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 PRODUCTS

2.01 MATERIAL

A. Support Channel: Zinc plated.

B. Hardware: Corrosion resistant.

PART 3 EXECUTION

3.01 INSTALLATION

A. Equipment Support From Building Structure:
   1. Precast insert system.
   2. Expansion anchors.
   3. Preset inserts.
   4. Beam clamps.
   5. Spring steel clips.
   6. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
   7. Do not use powder-actuated anchors.
   8. Do not drill structural steel members.
   9. Drive anchors, nails, wires, and perforated tape are prohibited for supports.

B. Equipment Support Partitions:
   1. Toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls.
   2. Expansion anchors or preset inserts in solid masonry walls.
   3. Self-drilling anchors or expansion anchor on concrete surfaces.
   4. Sheet metal screws in sheet metal studs.
   5. Wood screws or sheet metal screws in wood construction.

3.02 SEISMIC REQUIREMENTS

A. Equipment anchorage and supports:
   1. All equipment shall be securely anchored to the building and properly supported to resist the forces of a Seismic event at the site.
   2. Anchorage for equipment subject to thermal expansion shall be in accordance with recommendations of the manufacturer.
   3. Anchors and fasteners shall be sized to resist shear and overturning moments caused by the anticipated seismic forces.

END OF SECTION

SECTION 26 05 30

CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rigid metal conduit and fittings.

B. Electrical metallic tubing and fittings.

C. Flexible metal conduit and fittings.

D. Liquidtight flexible metal conduit and fittings.

E. Non-metallic conduit and fittings.

1.02 RELATED SECTIONS

A. Section 26 01 55 - Electrical Systems Fire Stopping

B. Section 26 05 29 - Supporting Devices

C. Section 26 05 48 - Seismic Restraints

D. Section 26 05 53 - Electrical Identification

1.03 SUBMITTALS

A. Submit shop drawings and product data under the provisions of Section 26 01 00.

B. Submit manufacturer’s instructions.

PART 2 PRODUCTS

2.01 RIGID STEEL CONDUIT

A. Standard pipe with screwed joints for electrical raceway use.

B. Zinc coated by hot dip galvanizing or sherardizing.

C. Manufacturer: Allied Tube and Conduit, Triangle PWC Inc., Western Tube & Conduit, or approved.

2.02 ELECTRIC METALLIC TUBING (EMT)

A. Zinc coated by hot dip galvanizing or sherardizing.

B. Manufacturer: Allied Tube and Conduit, Triangle PWC Inc., or approved.

2.03 FLEXIBLE CONDUIT

A. Galvanized steel or aluminum, abrasion resistant.

B. Manufacturer: Anamet (Type DE-710), Triangle PWC, Inc. (Type 710), or approved.

2.04 FLEXIBLE CONDUIT, LIQUID TIGHT

A. Hot dipped galvanized steel core with thermoplastic overcoat.

B. Manufacturer: AFC Nortek, Alflex, Anamet (Type "UA"), Electriflex, Thomas & Betts, or approved.

2.05 PVC (RIGID PLASTIC) CONDUIT

A. Heavy wall, high impact plastic, Schedule 40 Polyvinyl Chloride.

B. Manufacturer: Carlon, PW Pipe, Triangle PWC, or approved.

2.06 CONNECTIONS AND FITTINGS

A. Especially for purpose used.

B. Same material and finish as raceway.

2.07 UNION JOINTS FOR RIGID STEEL CONDUIT

A. Split coupling.

B. Running threads not allowed.

C. Insulated throat.

D. Manufacturer: O.Z. Gedney type "SSP," or approved.

2.08 COUPLINGS AND CONNECTORS FOR ELECTRICAL METALLIC TUBING (EMT)

A. Exterior: Raintight compression type, employing split corrugated ring and tightening nut.

B. Interior: Raintight compression type only.
   1. Hex head set screw for 2-1/2" and larger.

C. Connectors larger than 1¼-inch shall be Thomas & Betts 200 Series insulating bushing.

D. Manufacturer: Appleton, Raco, Thomas & Betts, or approved.

E. Cast connectors and couplings are not allowed.

2.09 CONDUIT HANGERS AND SUPPORTS

A. One-hole or two-hole push-on straps or one-hole clamps.
   1. Manufacturer: Appleton, Raco, Thomas & Betts, or approved.

B. One- or two-hole pipe straps. Acceptable manufacturers: Kindorf, or approved.

C. One or two-hole push-on strap manufactures: Appleton, Raco, Thomas & Betts, or approved.

D. Lay-in pipe adjustable hangers. Acceptable manufacturers: Kindorf, Steel City, Pline, or approved.

E. Trapeze or wall surface supports shall be Kindorf “bolt-hole” base, galvanized steel channels with C105 and C106 single bolt pipe straps.

F. Galvanized steel channels and associated support rods shall be selected to accommodate weight of associated raceway and wire.

G. Fastener designed for the purpose may be used in wood or metal stud construction or for support channels, or beams.
   1. Manufacturer: Caddy, B-Line, or approved.

H. Conduits are not permitted to be supported from ductwork, pipes, ceilings, ceiling support wires or other systems foreign to electrical installation.

I. No drive-nail type anchors in concrete or masonry. Use plastic anchors with screws or para-bolts (sleeve anchor studs).

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Owner review and approval is required for any conduit buried in slab on grade applications.

B. Owner's FS Electrician(s) is to walk through the project to view pathways prior to encasement or enclosure.

C. MC cable not allowed unless otherwise noted.

3.02 CONDUIT SIZING AND ARRANGEMENT

A. Size conduit for Type THW conductors. Minimum conduit size for home runs and backbone conduit system is 3/4 inch. Individual branch circuits from backbone junction boxes to device or fixture locations may be run in 1/2 inch conduit.

B. Arrange conduit to maintain headroom and present a neat appearance.

C. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.

D. Maintain minimum 6 inch clearance between conduit and mechanical piping if practical. Coordinate installation with other trades. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

E. Maintain 12 inch clearance above removable ceiling tiles.

F. Provide conduit for building monitoring cables where called for on drawings.]

G. Individual station outlets will be served by at least a ¾" conduit run from the nearby cable tray to station location that will be equipped with 4" deep square box with single mud ring.

H. All branch circuits shall be run in metallic conduit or tubing.

I. In equipment rooms, run conduit on wall surfaces in a neat fashion as high on the wall as possible.

3.03 VOICE AND DATA CONDUIT PATHWAYS

A. Conduits from station locations shall stub to cable tray.

B. Large conduits from cable tray shall stub into serving Telecommunications Equipment Room (TER) or Telecommunication Room (TR).

3.04 CONDUIT SUPPORT

A. Arrange conduit supports to prevent distortion of alignment by wire pulling operations.

B. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.

C. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps.
   1. Provide space for 25 percent additional conduit on conduit racks.

D. Do not fasten conduit with wire or perforated pipe straps.

E. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

F. Exposed conduit and tubing attached directly to building surface, use one hole galvanized steel pipe clamps.

G. Conduit and tubing in metal stud walls shall be supported by fasteners approved for the purpose.

H. Conduits rising vertically between studs shall be supported by approved fasteners attached to supports horizontally secured between studs for multiple runs and shall be offset and attached to vertical stud, by an approved fastener, for single runs.

I. Wire suspension systems above suspended ceilings:
   1. Support conduits above suspended ceilings from structure.
   2. Provide a dedicated support wire system for conduits.
   3. Use fasteners and support hardware designed for the purpose.
   4. Do not support conduits from ceiling support wires.

J. Hanger Spacing:
   1. Do not exceed 8 foot 0 inches on center.
   2. Provide one hanger adjacent to each outlet box, and one hanger within 12 inches on each side of a change in direction.

K. Conduits not permitted to be supported from ducts, pipes or other systems foreign to electrical installation.

L. Support conduit as close to ceiling structure as practical. Coordinate conduit location with other trades.

M. Attachment of one-hole straps on horizontal runs shall be from above.

N. All surface run conduit to be secured with one- or two-hole straps.

3.05 CONDUIT INSTALLATION

A. Cut conduit square using a saw; de-burr cut ends.

B. Bring conduit to the shoulder of fittings and couplings and fasten securely.

C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.

D. Install no more than the equivalent of four 90 degree bends between boxes, for electrical wiring.

E. Use conduit bodies to make sharp changes in direction, as around beams, for electrical wiring.

F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 1-1/4 inch size.

G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

H. Avoid condensation between moist warm locations and cool locations by blocking air flow in conduit with "Duct Seal" or similar material.

I. Thoroughly clean interior of conduits.

J. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

K. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.

L. Install expansion joints where conduit crosses building expansion or seismic joints.

M. Communication Conduits shall NOT have more than 180 degrees of bend or 100 feet between pull points.

N. Pull points shall be appropriately sized junction boxes.

O. Use of metallic conduit is not sufficient for purposes of equipment safety grounding. All circuits regardless of the type of conduit shall be provided with a safety and equipment ground conductor.

P. Do not run conduit where it is not required for limited energy wiring.

Q. Minimum Inside Bend Radius for Communications Conduit Bends, Sweeps, Boxes, and Fittings:
   1. Underground or Underslab 4-inch (100 mm) Conduit: 60 inches (1.5 m)
   2. Other Conduit Runs:
      a. One-inch (25 mm) conduit, 11 inches (275 mm).
      b. Two-inch (50 mm) conduit, 21 inches (525 mm).
      c. Three-inch (75 mm) conduit, 31 inches (775 mm).
      d. Four-inch (100 mm) conduit, 40 inches (1000 mm).
      e. Other sizes, 10 times the inside diameter of the conduit.

R. Do not install boxes, bends, elbows, tees, conduit bodies, and other conduit fittings, which do not provide for the minimum inside cable bend radius specified in paragraph Q above.
   1. Conduit Bodies: in-line straight-through Type C condulet fittings can be used as pull boxes for conduit up to a maximum of 2 inches (50 mm) ID. Other conduit fittings, which include direction changes such as E, L, LB, LR, LL, LRT, TA, TB, and X, are not allowed.

S. Provide each conduit passing from a nonhazardous or noncorrosive area to a hazardous area and each conduit entering an enclosure within a hazardous area with a sealing fitting in accordance with NEC Article 500. The sealing fittings to be UL listed and to be filled with approved sealing compound of the same manufacture,

3.06 CONDUIT PENETRATIONS

A. Fire-Rated Walls and Floors: Seal conduit penetrations using one of the following methods:
   1. Provide mechanical fire-stop fittings with UL listed fire rating equal to wall or floor rating.
   2. Seal opening around conduit with UL listed foamed silicone elastomer compound.

B. Non Fire-Rated Walls: Silicone RTV foam membrane permitted.

C. Route conduit through roof openings for piping and ductwork where possible: otherwise, route through roof jack with pitch pocket.

D. For electrical vaults and utility tunnels, seal with non-shrinking, vinyl reinforced concrete sealant.

3.07 FLEXIBLE CONDUIT

A. Use limited to the following:
   1. Lighting fixture pigtails to remote junction box in accessible ceilings.
   2. Interior motor connections.
   3. At building expansion joints.
   4. Vibrating or movable equipment connections.
   5. Flexible conduit may not be installed in stud walls in new construction.
   6. In stud walls in lengths not exceeding 8'-0". Secured to prevent rattling.
   7. Flexible conduit may be fished in stud walls.

B. Provide separate ground conductor full length of flexible conduit or outside of conduit.

3.08 FLEXIBLE CONDUIT, LIQUID TIGHT

A. Exterior motor connections for movable or vibrating equipment.

B. Flexible connections in damp or wet locations.

C. Provide separate ground conductor full length of flexible conduit in addition to integral bonding tape.

3.09 RIGID PVC

A. Where conduits are exposed in rooms 214A, 214B & 214C.

B. Schedule 40.

C. Provide ground wire full length of circuit.

D. Use rigid steel factory elbows for bends in plastic conduit runs longer than 100 feet or in plastic conduit runs which have more than two bends regardless of length.

E. Use rigid steel factory elbows for conduits larger than 3/4".

F. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.

G. Rigid PVC conduit is not allowed in electrical vaults and utility tunnels.

3.10 ELECTRICAL METALLIC TUBING

A. Dry locations where not subject to damage.

B. Concealed in non-masonry/concrete walls or ceiling.

C. In poured concrete, masonry walls or above grade slabs.

D. May not be used in or under concrete slab or underground.

END OF SECTION

SECTION 26 05 32

OUTLET, PULL AND JUNCTION BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Pull and junction boxes.

1.02 RELATED SECTIONS

A. Section 26 27 26 - Wiring Devices: Service fittings and fire-rated poke-through fittings for floor boxes.

1.03 REFERENCES

A. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.

B. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

C. UL5 - Electrical cabinets and boxes.

D. UL508 - Standard for Industrial Control Equipment.

E. UL514 - Electrical outlet boxes and fittings.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 volts maximum).

1.04 PROJECT CONDITIONS

A. Verify field measurements are as shown on drawings.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 26 01 00.

B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - OUTLET BOXES

A. Appleton.

B. Bowers.

C. Crouse Hinds.

D. Killark.

E. O Z Gedney.

F. Raco/Bell.

G. Steel City.

H. Thepitt.

I. Substitutions: under provisions in Section 26 01 00.

2.02 OUTLET BOXES

A. Sheet Metal Outlet Boxes: Galvanized steel with 1/2 inch male fixture studs where required.

B. Cast Boxes: Aluminum or cast feralloy, deep type, gasketed cover, threaded hubs.

2.03 ACCEPTABLE MANUFACTURERS - PULL AND JUNCTION BOXES

A. Circle AW.

B. Hoffman.

C. Rittal.

D. Substitutions: under provisions of Section 26 01 00.

2.04 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: Galvanized steel.

B. Sheet Metal Boxes Larger Than 18 Inches in Any Dimension: Hinged enclosure.

2.05 TELECOMMUNICATIONS AND AV OUTLET BOXES

A. Sheet Metal Standard Outlet Boxes: Minimum 4-inch by 4-inch by 2-1/8 inch deep galvanized steel for use with single and double-gang plaster rings.

PART 3 EXECUTION

3.01 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.

C. Locate and install boxes to allow access. Where installation is inaccessible, coordinate locations and sizes of required access doors with applicable section.

D. Minor changes in the location of outlets from those shown on the plans shall be made without extra charge if so directed by the Project Manager before installation.

3.02 OUTLET BOX INSTALLATION

A. Do not install boxes back-to-back in walls. Provide minimum 6 inch separation, except provide minimum 24 inch separation in acoustic-rated walls.

B. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.

C. Provide knockout closures for unused openings.

D. Support boxes independently of conduit.

E. Support boxes above suspended ceilings from structure. Provide dedicated support wires for boxes as required by NEC 300.

F. Use multiple-gang boxes where more than one device is mounted together: Do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

G. Install boxes in walls without damaging wall insulation.

H. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes with architectural drawings.

I. Position outlets to locate luminaires as shown on reflected ceiling plans.

J. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.

K. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

L. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

M. Provide cast outlet boxes in exterior locations when exposed to the weather and wet locations.

N. In areas where outlets are subject to damage or abuse, provide backing behind box. Support both sides of boxes on backing.

O. Unused openings in outlet boxes must be left sealed or closed with plugs.

3.03 TELECOMMUNICATIONS OUTLET BOX INSTALLATION

A. Provide 4-inch by 2-1/8-inch deep outlet boxes for mounting telecommunications outlets with single or double-gang plaster rings as required, or as indicated on the Drawings.

3.04 PULL AND JUNCTION BOX INSTALLATION

A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

B. Support pull and junction boxes independent of conduit.

C. Boxes larger than 200 cubic inches or 18 inches in any dimension:
   1. Use hinged enclosure.

D. Boxes are to be cleaned inside and out upon completion and prior to acceptance of work

3.05 OUTLET BOXES IN ACOUSTICAL TREATED WALLS

A. In a single stud wall, there shall be a separation of 24" between centerlines of outlet boxes or receptacles set into opposite sides of the wall. When these boxes are of dimensions exceeding 4" wide, this dimension (24") shall be clear between the dise walls, providing a full 24" separation regardless of the box size. Conduit connecting such boxes shall be flexible and shall provide 6" slack per 24" of run.

B. In a double stud wall, boxes in opposite sides of the wall shall be located 24" on center, minimum. Effectively, this means that boxes on the same side of the wall will be 48" apart if there is a box between them on the other side of the wall. Conduit, in the case of a double wall, shall homerun to a point outside of the partition before connecting to cable and conduit connecting boxes on the other side. Conduit, which shall be flexible, may thread through the studs on its own side but shall under no circumstances interface with the stud on the other side of the wall.

C. The boxes shall be treated to reduce sound transmission. All unused knock-out holes shall be plugged with knock-out caps. The openings or cutouts in the walls to receive the boxes/receptacles shall be made no more than 1/4" oversize to allow a 1/8" gap all around. The flanges shall be perimeter sealed with acoustical caulking, prior to the boxes/receptacles being inserted.

D. An outlet box pad, which acts to increase mass and provide damping, shall be applied to the backs of boxes or where the box is installed in a partition rated at STC-49 to STC-56. In certain acoustically sensitive rooms (see drawings or acoustical performance schedule), where the box is installed in a partition rated at STC>56, the boxes/receptacles shall be boxed in from the rear on all five sides with two layers of gypsum board.

E. Electrical Outlet Box Pads shall be applied where called out on the drawings or specifications. Its function is to seal box openings, increase mass and provide damping to reduce air-transmitted sound through party walls. It shall consist of polybutene-butyl and inert fillers. Material shall provide good adhesion to metal and plastic. Pads shall be applied to the backs of installed electrical boxes, molded to box and folded around conduit cable entering the box. Pads shall not be used in areas subject to temperatures above 200° F.
   1. The following are acceptable, subject to the above:
      a. Lowry's Outlet Box Pads from Harry A. Lowry & Associates, Inc., Sun Valley, CA 800-225-8231.
      b. SpecSeal Firestop Putty Pads (fire-rated) from Specified Technologies, Incorporated, Somerville, NJ 800-992-1180
      c. Or approved equal.

END OF SECTION

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Wire and cable markers.

C. Pull box and junction box identification.

D. Device plate identification.

1.02 RELATED SECTIONS

A. Section 26 27 26 - Wiring Devices.

B. Section 26 28 13 - Disconnect Switches

C. Section 28 31 23 - Fire Alarm Systems - Existing

PART 2 PRODUCTS

2.01 MATERIALS

A. Nameplates:
   1. Engraved three-layer laminated plastic.
   2. White letters.
   3. Black background.

B. Wire and Cable Markers:
   1. Heat shrink thermo-labels. Brady or Panduit.

C. Labels:
   1. Adhesive Film Labels: Machine printed, in black on clear background, by thermal transfer or equivalent process.

PART 3 EXECUTION

3.01 GENERAL

A. During finish construction, labeling is to be reviewed and approved by the Owner.

B. Zoned systems must be clearly defined and labeled.

C. Label at all entries into new spaces and/or through walls.

D. Covering or painting of any sign/label requires replacement.

E. Mark and label new wiring and place in tray. Include installation date.

3.02 NAMEPLATE INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws or drive rivets.
   1. Secure nameplate to inside face of recessed panelboard doors in finished locations.
   2. Secure nameplate to inside face of panelboard doors in unfinished locations.

D. Where switches control remote lighting or power outlets, or where switches in the same outlet (two or more) serve different purposes such as lights, power, intercom, etc., or different areas such as corridor and outside, furnish either engraved nameplates or adhesive film labels with 1/8” black letters indicating function of each switch or outlet.

E. Use adhesive film labels for identification of individual wall switch and receptacle cover plates.

3.03 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboards, gutters, pull boxes, and at load connection.

B. Identify with branch circuit or feeder number for power and lighting circuits.

C. Tag lighting feeds with circuit number and panel ID.

D. Identify control wire number as indicated on equipment manufacturer's shop drawings.

3.04 NAMEPLATE ENGRAVING SCHEDULE

A. Identify all electrical distribution and control equipment and disconnect switches at loads served.

B. ¼-inch nameplates are to be fastened with sheet metal screws.

C. Disconnect switches and control units shall include circuit number and panel ID.

D. Letter Height:
1. 1/8 inch for individual switches and loads served.
2. 1/4 inch for distribution and control equipment identification.
3. 1/8 inch identifying voltage rating and source.

3.05 PULL BOX AND JUNCTION BOX IDENTIFICATION

A. Provide permanent signage, interior and exterior, at all utility boxes, vaults, manholes, etc.

B. Install labels on inside of junction boxes and adhesive film label on the box cover.

C. Identify each junction box with complete system description. Examples:
1. Fire alarm.
2. Telephone.
3. 480 V system.
4. 208 V system.
5. Fan controls.

D. Optional Methods:
1. Neat hand lettering with permanent black marker.
2. Engraved nameplates.
3. Adhesive film labels.

E. UO - Fire alarm junction boxes:
1. Paint fire alarm junction boxes and covers red and label “FIRE ALARM “prior to installation.

F. Locations:
1. On outside of box cover where concealed.
2. In exposed box locations, locate on inside of box cover.
3. Identify main pull boxes by number and indicate numbers on record drawings.

3.06 DEVICE PLATE IDENTIFICATION:

A. 1/8 inch letter height.

B. Black letter color.

C. Location:
   1. Bottom center of device plate for single gang and bottom center of device for multiple gang outlets.
      a. Provide branch circuit identification (such as "C-37" to indicate Panel “C” Circuit #37) at bottom center of device plate.
   2. Where outlet use and branch circuit identification both are required, locate use such as "X-Ray" on top center and branch circuit identification at bottom center device plate.

D. OSU - Fire Alarm System:
   1. Identify fire alarm conduit with FA every 20 feet.
   2. Method:
      a. In unfinished areas: Neat hand lettering with permanent black marker.
      b. In finished areas: Use adhesive film labels

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Device plates and box covers.

1.02 RELATED SECTIONS

A. Section 26 05 32 - Outlet, Pull and Junction Boxes.

B. Section 26 05 53 - Electrical Identification.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 26 01 00.

B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

1.04 SUBSTITUTIONS

A. Products specified herein are so specified to establish a minimum level of product quality as determined by the engineer. Except where indicated no substitutions are allowable, equivalent quality products may be submitted to the Architect for approval, under provisions of Section 26 01 00.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - WALL SWITCHES AND RECEPTACLES

A. Hubbell.

B. Leviton.

C. Cooper Wiring Devices (Cooper)

D. Pass & Seymour (P&S).

2.02 WALL SWITCHES

A. Convenience Switch: AC general use quiet type switch with toggle handle.
   1. Heavy duty, industrial grade:
      a. 20 amp rating, 120-277 volts.
         1) Single Pole: Hubbell BS120, Cooper CSB120, Leviton CSB1-20, P&S CSB20AC1
         2) Double Pole: Hubbell 1222, Cooper CSB220, Leviton CSB2-20, P&S CSB20AC2
         3) Three Way: Hubbell BS320, Cooper CSB320, Leviton CSB3-20, P&S CSB20AC3
         4) Four Way: Hubbell BS420, Cooper CSB420, Leviton CSB4-20, P&S CSB20AC4
   2. Self-grounding type

2.03 RECEPTACLES

A. Convenience and straight blade receptacles.
   1. Industrial Specification Grade:
      a. 125 volt, 20 amp, self-grounding type.

b. Hubbell 5362 Series.
c. Quick type back wired pressure connectors not permitted.

B. Special Outlets not Specified herein:
1. As scheduled.
2. Comparable quality finish and duty to those specified above.
3. Of ample capacity to accommodate load.
4. Manufacturers: Same as for receptacles above.

2.04 DEVICE COLOR

A. White.

2.05 ACCEPTABLE MANUFACTURERS – WEATHERPROF SWITCH COVER PLATES

A. Hubbell: HBL1795.

2.06 ACCEPTABLE MANUFACTURERS – RECEPTACLE COVER PLATES

A. Hubbell.

B. Leviton.

C. Cooper Wiring Device (Cooper).

D. Pass & Seymour. (P&S).

E. Substitution: under provisions of Section 26 01 00.

2.07 ACCEPTABLE MANUFACTURERS – RECEPTACLE COVER PLATES

A. Decorative Cover Plate:
1. Color to match device, smooth, rigid impact resistant, nylon/thermo-plastic.

2.08 ACCEPTABLE MANUFACTURERS – TAMPER RESITANT RECEPTACLE COVER PLATES

A. Kid-E-Cover – ELICOLE
1. www.elicole.com

B. Substitutions: under provisions of Section 26 01 00.

PART 3 EXECUTION

3.01 INSTALLATION

A. Switches:
1. Wall switches 48 inches above floor to top of box.
2. OFF position down, unless otherwise noted.

B. Receptacles:
1. 18 inches above floor to top of box, unless otherwise noted.
2. 6 inches above counters, unless otherwise noted.
3. 3 inches above backsplash, unless otherwise noted.
4. Grounding pole on bottom, unless otherwise noted.
5. Verify exact height and orientation of outlets with Architectural Details prior to rough-in.
6. Install specific-use receptacles at heights shown on Contract Drawings.
7. Provide 20 amp rated receptacles where the device is served by a dedicated circuit or as part of a multi-outlet branch circuit.

C. Plates:
1. Decorative plates on switch, receptacle, and blank outlets in finished areas.
2. Jumbo size plates for outlets installed in masonry walls.
3. Galvanized steel plates on outlet boxes and junction boxes in unfinished area, above accessible ceilings, and on surface-mounted outlets.

4. Install device and wall plates flush and level.
5. Where outlets are adjacent to each other at same mounting heights, install under common device plate, except when outlets are of different voltages, such as telephone and duplex receptacle, unless otherwise noted.

END OF SECTION

SECTION 26 28 13

DISCONNECT SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disconnect switches.

B. Fuses.

C. Enclosures.

1.02 REFERENCES

A. ANSI/UL 198C - High-Intensity Capacity Fuses; Current Limiting Types.

B. ANSI/UL 198E - Class J Fuses.

C. FS W-F-870 - Fuseholders (For Plug and Enclosed Cartridge Fuses).

D. FS W-F-865 - Switch, Box, (Enclosed), Surface-Mounted.

E. NEMA KS 1 - Enclosed Switches.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 26 01 00.

B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES

A. Eaton/Cutler-Hammer.

B. General Electric.

C. Siemens/ITE.

D. Square D.

E. Substitutions: Under provisions of Section 26 01 00.

2.02 DISCONNECT SWITCHES

A. Nonfusible Switch Assemblies:
   1. Quick-make, quick-break, load interrupter enclosed knife switch.
   2. Externally operable handle.
   3. Interlocked to prevent opening front cover with switch in ON position.
   4. Handle lockable in OFF position.
   5. Provide early control pole normally open break/late make contact block accessory for motors sized larger than 10hp or any VFD controlled motor. Connect the control circuit through the control pole contacts to drop out the starter coil before the disconnect switch contacts open and allow re-energization of the starter after the disconnect contacts close.

B. Fusible Switch Assemblies:
   1. Include provisions for non-fusible switch assemblies as described above and fuse clips and fuses as described below.
   2. Fuse Clips:
      a. Single element fuses: Designed to accommodate Class J fuses for up to 600 amp ratings and Class L fuses for larger than 600 amp ratings.

b. Dual element time delay type fuses: Designed to accommodate Class RK-5 fuses.

C. Enclosures:
1. Indoor: NEMA Type 1 unless otherwise indicated on Drawings.

D. Single Phase Motors, 125 Volt, 1/8 Horsepower and Larger:
1. Where thermal overloads are provided: 125 volt, SPST toggle type switch.
2. Where thermal overloads not provided: 125 volt, SPST toggle type switch with thermal overload heaters.

2.03 ACCEPTABLE MANUFACTURERS - FUSES

A. Brush Fuses.

B. Bussman.

C. Cefco.

D. Littelfuse.

E. Ferraz-Shawmut / Mersen.

F. Substitutions: Under provisions of Section 26 01 00.

2.04 FUSES

A. Motor Protection:
1. UL Class RK-5, 250V and 600V.
2. Short circuit interrupting rating - 200,000 amps rms.
3. Current limiting, time delay.
4. Silver plated contacts, brass ferrules, non-hygroscopic bodies.
5. Size in accordance with equipment manufacturer's recommendations.

B. Non-Motor Loads: (No Time Delay)
1. 250V and 600V.
2. Short circuit interrupting rating - 200,000 amps rms.
3. Current limiting.
4. Silver plated contacts, brass ferrules, non-hygroscopic bodies.

C. Class H fuses not permitted.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install disconnect switches where indicated on Drawings.

B. Install fuses in fusible disconnect switches.

C. Provide fuses sized in accordance with NEC and equipment manufacturer's name plate ratings.

D. Locate as close to equipment controlled as possible, within sight of equipment, unless otherwise noted.

E. Maintain code clearances.

F. Label switch to indicate equipment served and to indicate power source.
1. Engrave label and install as described in Section 26 05 53 - ELECTRICAL IDENTIFICATION.

3.02 FUSIBLE DISCONNECTS REQUIRED

A. Where specifically noted on drawings.

B. Where fuses are recommended by equipment manufacturer.

C. Where multiple motors requiring separate disconnect switches are fed from a common branch circuit.

D. Furnish all code required disconnects under this work, whether specifically shown or not.

END OF SECTION

SECTION 26 50 00

LIGHTING FIXTURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide a typical lighting fixture, complete with lamps, at each lighting outlet shown.

1.02 SECTION INCLUDES

A. Interior luminaires and accessories.

B. Lamps.

C. Ballasts.

1.03 RELATED SECTIONS

A. Section 09 09 00 - Painting

B. Section 26 27 26 - Wiring Devices

1.04 SUBMITTALS

A. Submit product data under provisions of Section 26 01 00.

B. Include outline drawings, lamp and ballast data, support points, weights, and accessory information for each luminaire type.

C. Pole data and pole base details.

D. Submit manufacturer's installation instructions under provisions of Section 26 01 00.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 26 01 00.

B. Store and protect products under provisions of Section 26 01 00.

1.06 JOB CONDITIONS

A. Existing Conditions:
   1. Prior to ordering lighting fixtures, verify finish material in locations where lighting fixtures are mounted.
   2. Prior to ordering lighting fixtures, verify conditions for mounting lighting fixtures and select proper mounting hardware.
   3. Verify fire rating of new and existing ceilings.

PART 2 PRODUCTS

2.01 INTERIOR LUMINAIRES AND ACCESSORIES

A. See Luminaire Schedule.

B. Recessed Fluorescent Luminaires:
   1. Provide trim type and accessories required for installation in ceiling system installed.

C. Stems for Pendant Mounting:
   1. Rigid steel conduit, length as required for mounting height.
   2. 45 degree ball aligner and canopy.
   3. Finishes and Manufacturer: Same as for lighting fixture, unless otherwise noted.

D. Lighting Fixtures Recessed in Fire Rated Ceilings:
   1. Reference Division 9 and for fire rated ceiling materials included in project.

2. Provide fixture label indicating fixture is listed by UL for installation in the fire rated assembly.
3. Provide an approved fire rated enclosure around fixture to maintain a rated ceiling system.

E. Lighting Fixture Construction:
1. Light leaks not accepted. Fixture designed or gasketed to eliminate light leaks.
2. Surface mounted fixture with surface conduit: Constructed with knockouts or collars to allow fixture mounting tight to ceiling. Fixtures not allowed to mount on surface boxes, unless otherwise noted.
3. Unless otherwise noted, prismatic lenses shall be A19, 0.156 inches minimum thickness virgin acrylic. Hogged out prisms are not acceptable.
4. All fixture parts shall be painted after fabrication.

2.02 ACCEPTABLE MANUFACTURERS - LAMPS

A. General Electric.

B. Osram/Sylvania.

C. Philips.

D. Substitutions: Under provisions of Section 26 01 00.

2.03 LAMPS

A. Fluorescent T8 and T12 Lamps:
1. See Luminaire Schedule.
2. All by same manufacturer.
3. 5000K correlated color temperature, unless otherwise noted.
4. Minimum color rendering index of 80.
5. Minimum average rated lamp life - 40,000 hours.
6. Minimum intial lumens @ 25 degrees C - 1375 lumens.

2.04 BALLASTS (GENERAL)

A. HPF, unless otherwise noted.

B. Number of lamps controlled by ballast:
1. Fluorescent: As required by fixture or by switching requirements.

C. Date of manufacturer stamped on case.

D. Mounted as integral part of lighting fixture, unless otherwise noted.

E. Temperature ratings as follows:
1. Minimum indoor starting: +50° F.
2. Minimum outdoor starting: -20° F.
3. Maximum case temperature: +90° C.

F. Provide "in-line" fusing. Size per manufacturer's recommendation.

G. Voltage: As required by branch circuit voltage and "Luminaire Schedule."

H. Same manufacturer as LAMPS.

2.05 BALLASTS (FLUORESCENT NON-DIMMING TYPE)

A. Type - Solid state electronic.
1. Designed to operate T8.
2. Program start.
3. High frequency operation >40 MHZ.
4. Less than 10% THD.
5. Parallel lamp operation.

B. Acceptable manufacturers (rapid start, <10% THD):
   1. Advance.
   2. Osram Sylvania.
   3. General Electric.
   4. Philips.
   5. Substitutions - See Section 26 01 00.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install lamps in luminaires and lampholders.

B. Fixture Support:
   1. Light fixtures mounted in or on suspended ceilings shall be positively attached to the suspended ceiling system.
   2. Support surface-mounted and pendant-mounted luminaires directly from building structure and attach to main runners of ceiling grid T structure.
   3. If structure is inaccessible in existing plasterboard ceiling installations, use toggle bolts at each fixture end.
   4. Fasten to T grid system using bolts, screws, rivets, or approved ceiling framing member clips.
   5. Install Fluorescent luminaires larger than 2x4 foot size independent of ceiling framing.
   6. Support all pendant fixtures and all other incandescent, fluorescent, and HID fixtures in excess of 50 lbs independently of outlet box from roof, floor, or ceiling structure above. Use approved hanger, lag screws, lag bolts, toggle bolts, or cinch anchors to support fixture plus 100 lbs at each support.
   7. Provide two #12 gauge steel wire seismic supports connected to structure for light fixtures less than 50 lbs. Seismic supports may be installed slack.
   8. Coordinate with other trades for additional framing or support, if required to properly install recessed, surface, and pendant mounted fixture in various ceiling suspension systems.

C. Install recessed luminaires to permit removal from below.
   1. Use plaster frames in plaster ceiling.
   2. Install grid clips in grid type ceiling systems.

D. Recessed fluorescent fixtures in accessible ceilings:
   1. Install in suspended ceilings to exactly suit type of ceiling used without altering fixture or ceiling.
   2. Provide flexible conduit from fixture to remote junction box mounted to structure sufficiently long enough (4 to 6 feet) to provide flexibility of fixture arrangement and to remove each fixture from ceiling opening without disconnecting.

3.02 RELAMPING

A. Relamp luminaires which have failed lamps at completion of work.

3.03 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Touch up luminaire finish at completion of work.

3.04 PREPARATION

A. Field Measurements:
   1. See architectural reflected ceiling plans for exact location of ceiling mounted lighting fixtures.
   2. See architectural elevations for exact location of wall mounted lighting fixtures.

3. Coordinate lighting fixture location in mechanical spaces with mechanical equipment. Report adverse conditions to Architect.
4. Lighting fixtures are generally located for symmetrical pattern and to suit structural conditions. Location changes shall be approved by Architect.
5. Do not install any work until any discrepancies discovered have been resolved.

B. Preparation of Surfaces:
1. Clean field painted lighting fixtures, poles, etc., prior to application of paint. See Division 9.

C. Noisy Ballasts:
1. Architect shall determine which ballasts are excessively noisy and to be replaced at no cost to owner.
2. Check: Ballasts shall be tightly fastened to fixture and have no loose connections.

D. Aim adjustable fixtures in general as indicated on Drawings with final adjustments directed by Architect.

3.05 LUMINAIRE SCHEDULE

A. As scheduled on drawings.

3.06 PRODUCT WARRANTY

A. Manufacturers' Warranty:
1. Ballast manufacturer's warranty statements:
a. Include in O&M Manuals a manufacturer's warranty statement, that any failed ballast will be replaced in the fixture, for a period of five (5) years, at no cost to the owner, commencing at project completion. Replacement ballasts shall be on site within a 48 hour period.

END OF SECTION

SECTION 28 31 23

FIRE ALARM SYSTEMS - EXISTING

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall furnish and install fire alarm devices, as specified herein and indicated on the drawings.

B. The system shall include NAC panel for additional power for audible and visual alarm devices, a wiring system and all accessory devices required to provide a complete operating system.

C. All components shall be compatible with the existing Notifier system.

1.02 RELATED SECTIONS

A. Section 21 10 00 - Fire Protection.

B. Section 26 05 30 - Conduit.

C. Section 26 05 19 - Wire and Cable.

D. Section 26 05 32 - Outlet, Pull and Junction Boxes.

1.03 SUBMITTALS

A. Submit complete and descriptive shop drawings in accordance with Section 01 03 00.

B. Submit plans and specifications to the local fire marshal. Obtain his written acceptance of the system prior to beginning work and ordering equipment.

1.04 OPERATION AND MAINTENANCE DATA

A. Submit data under provisions of Section 26 01 00.

B. Install an additional manual inside the fire alarm control panel.

C. Include operating instructions, and maintenance and repair procedures, including trouble shooting procedures.

D. Include manufacturer representative's letter stating that system is operational.

1.05 REFERENCES

A. NFPA 72 - National Fire Alarm Code.

B. NFPA 101 - Life Safety Code.

C. UBC Chapter 11 - Accessibility.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Notifier.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install system in accordance with manufacturer's instructions.

B. Mounting Heights:
   1. Audible and visual signal devices 90 inches above floor.

C. Wire:
   1. Furnish and install all required wiring in accordance with Local and National Codes and Article 210 of the National Board of Fire Underwriter's Standard Number 72.
   2. 14 AWG minimum size conductors for fire alarm detection and signal circuit conductors or as per manufacturer's recommendations and as per NEC.
   3. All wiring shall be in conduit. Conduit shall be sized by the Contractor.

D. The Contractor shall test all conductors for ground before making final wiring connections. This shall be done with a megger insulation tester or equal.

E. All "J" boxes for fire alarm system shall be painted red and labeled in white letters, minimum 1/4" "fire alarm".

3.02 FIELD QUALITY CONTROL

A. Field testing will be performed under provisions of Section 26 01 00.

B. Test in accordance with NFPA 72H and local fire department requirements.

3.03 MANUFACTURER'S FIELD SERVICES

A. Provide manufacturer's field services under provisions of Section 26 01 00.

B. Include services of factory trained representative to supervise installation, adjustments, final connections, and system testing.

3.04 INSPECTION AND TESTS UPON COMPLETION OF SYSTEM

A. Check out and final connections to the fire alarm control panel shall be made by factory trained technicians in the employ of a factory authorized franchised dealer for the products installed. In addition, factory trained technicians shall demonstrate operation of the complete system and each major component to the Owner.

B. The system, upon completion of installation by the Electrical Contractor, shall be checked out and all connections to initiating and indicating devices shall be supervised by factory trained technicians in the employ of a factory franchised dealer for the product installed. Each individual device shall be checked out and tested for operation by a factory trained technician.

C. System field wiring diagrams shall be provided to the Electrical Contractor by the system manufacturer prior to installation.

D. Tests by the Electrical Contractor shall include tests for grounds and short circuits, continuity tests of exterior circuit. Performance of controls and all initiating and indicating devices shall be made by the factory trained technicians in the employ of a factory authorized franchised dealer for the product installed.

E. The report covering these tests and inspection will be submitted direct to the Architect in triplicate.

F. Documentation from the manufacturer shall be presented to the Architect and/or Engineer upon request indicating that the persons making the final connections and check out are factory trained technicians in the employ of a factory authorized franchised dealer for the products installed.

G. The system, upon completion of installation by the Electrical Contractor, shall be tested. All initiating devices and indicating devices and control functions shall be tested for operation.
   1. The completed Fire Alarm System shall be fully tested (100% point tested)in accordance with NFPA 72 by the Contractor in the presence of the Owner's Representative and the local Fire marshal.
   2. The test shall be supervised by factory trained technicians in the employ of a factory franchised dealer for the product installed.

3. Each individual device shall be checked out and tested for operation by a factory trained technician.
4. Upon completion of a successful test, the Contractor shall so certify in writing to the Owner and Architect.

3.05 WARRANTY

A. The Contractor shall warrant the completed Fire Alarm System wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use.

B. The equipment supplier shall make available to the Owner a maintenance contract proposal in compliance with NFPA 72 guidelines.

END OF SECTION