



Project Manual

WSU Golf Team Clubhouse Upgrade Exterior & Addition

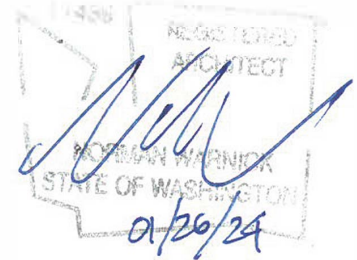
**Washington State University
Pullman, WA**

Project No. 1873-2023
Issued 2/6/2024
Washington State University
Facility Services, Capital

The Architect or Engineer Stamp on this page applies to all portions of the Specifications below.

ARCHITECTS:

Design West Architects P.A.
254 East Main Street
Pullman, WA 99163
(509) 332-3113



DIVISION 02 – EXISTING CONDITIONS
DIVISION 03 – CONCRETE
DIVISION 04 – MASONRY
DIVISION 05 – METALS
DIVISION 06 – WOOD, PLASTICS & COMPOSITES
DIVISION 07 – THERMAL & MOISTURE PROTECTION
DIVISION 08 – OPENINGS
DIVISION 09 – FINISHES
DIVISION 10 – SPECIALTIES

STRUCTURAL ENGINEERS:

LSB Consulting Engineers
523 E. Third Avenue
Spokane, WA 99202
(509) 323-9292



MECHANICAL ENGINEERS:

MSI Engineers
108 N Washington, Suite 505
Spokane, WA 99201
(509) 624-1050



DIVISION 22 – PLUMBING
DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING

ELECTRICAL ENGINEERS:

MSI Engineers
108 N Washington, Suite 505
Spokane, WA 99201
(509) 624-1050



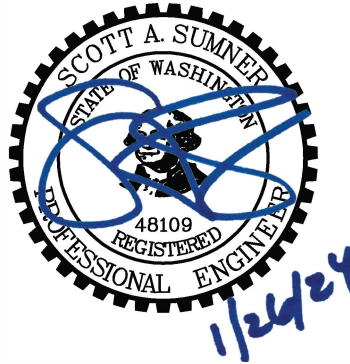
DIVISION 26 – ELECTRICAL
DIVISION 27 – COMMUNICATIONS

The Architect or Engineer Stamp on this page applies to all portions of the Specifications below.

CIVIL ENGINEERS:

Syntier Engineering
405 Brelsford Dr Ste C
Pullman, WA 99163
(509) 339-6187

DIVISION 31 – EARTHWORK
DIVISION 32 – EXTERIOR
IMPROVEMENTS
DIVISION 33 – UTILITIES



END OF ARCHITECTURAL / ENGINEERING STAMPS

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Washington State University
WSU Golf Team Clubhouse Upgrade Exterior & Addition
Pullman, WA

Sealed bids are being requested by the Board of Regents of Washington State University, for the above referenced project.

Project Scope:

Expand existing indoor golf practice facility with a 375 sq ft addition to face of building. Addition to include storage area, vestibule, and restroom. Refer to the attached project drawings and specifications. Contract Time shall be 180 days from Notice to Proceed. Proposals MUST BE based on this contract time.

Project Physical address: 1100 NE Fairway Rd, Pullman, WA 99164

Bid Estimate: \$320,000-\$340,000

Bid Deadline: March 5, 2024, prior to 2:00 p.m., virtual bid opening at 2:30 p.m.

Pre-bid Meeting: February 20, 2024, 1:00pm, by zoom.

Visit <https://facilities.wsu.edu/facilities-services-capital/contractors/> for bid docs and meeting details.

Email contracts@wsu.edu to be added to the Planholder's List.

Owner reserves the right to reject any and all bids and to waive any informalities or irregularities in the bids received.

Maja S. Huff
509-335-9082
Contracts@wsu.edu
Facilities Services
Washington State University

Additional Project Information available on the Website:

Bids will be received either by email to contracts@wsu.edu or in hard copy at McCluskey Services Building, 2425 East Grimes Way., Pullman, WA. Proposals will then be publicly opened and read aloud at **2:30 p.m.** by <https://wsu.zoom.us/j/96559626204?pwd=THh5S0tVTFF4NIhnQ08vVzVuQkVrdz09> **passcode: 060015** or Phone 253-215-8782 and entering Meeting ID 965 5962 6204. Attendance in person is not allowed.

A non-mandatory pre-bid conference for general contractors will be held at **1:00pm** on **February 20, 2024**. Attendees may attend by Zoom <https://wsu.zoom.us/j/92606951163?pwd=WHRZZkNpN3JNRkFQWDBSNjRPWHc5Zz09> **passcode: 568817** or Phone 253-215-8782 and entering Meeting ID 926 0695 1163. Attendance in person is not allowed.

Printing Disclaimer: The bidding documents are available for all interested bidders and plancenters. The University does not provide printing services; it is the bidder's responsibility to print the drawings to the appropriate scale indicated. We encourage the use of professional printing shops.

END OF SECTION 00 11 13

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

- A. Refer to the Advertisement for Bids for Project identification, availability of bidding documents, Prebid Conference, and Contract completion date. Refer to Summary of Work, Section 01 11 00, for a brief description of the Work.

1.02 BIDDER QUALIFICATIONS

- A. Contractor Registration:
 - 1. Bidders subject to the Contractor's Registration Act (RCW Chapter 18.27) must show their State of Washington Contractor's license number on the Form of Proposal. In addition, bidders are cautioned to verify that all subcontractors submitting bids are also registered and licensed in accordance with the laws of the State of Washington. Owner is prohibited by virtue of RCW 39.06.010 from executing any Contract for public works with any contractor who is not registered or licensed in accordance with the laws of this state. Prior to submitting a bid, bidder must obtain an appropriate clearance and license to do business in the State of Washington as follows:
 - a. Contractor's License: Make license application to the Department of Labor and Industries, Contractor's Registration, P.O. Box 7689, Olympia, Washington 98504.
 - b. Registration Number: Out-of-State Contractors must obtain a registration number and permission to do business in the State of Washington from the Secretary of State, Olympia, Washington 98501.
 - c. Other Registrations: Register with the State Department of Revenue as a contractor engaging in business in this state and register with the State Department of Labor and Industries and the Employment Security Department.
 - 2. Payment and Performance Bonds:
 - a. Bidders must be able to furnish satisfactory separate Payment and Performance Bonds for full amount of the initial Contract Sum, plus sales tax.

1.03 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

- A. Before submitting a bid or proposal, bidders shall carefully examine the Contract Documents, visit the Project site, and fully inform themselves as to all existing conditions and limitations, and shall include in their bid or proposal a sum to cover the cost of all items included in the Work, and shall rely on their own examination in making their bid or proposal. No change in the Work, the

Contract Sum, or the Contract Time will be allowed for issues that would have been reasonably apparent by the foregoing examination.

- B. Bidder acknowledges that it has satisfied itself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the Project site, including all exploratory work done by Owner, as well as from the Drawings and Specifications made a part of the Contract Documents.
- C. Bidder acknowledges that adjoining areas will be in normal course during the Work. Bidder should anticipate pedestrian and traffic congestion, limited parking, and the need to coordinate all Work with ongoing operations.
- D. Owner assumes no responsibility for any conclusions or interpretations made by bidder based on the information made available by Owner. Should a bidder find discrepancies or omissions in the Drawings or Specifications, or should bidder be in doubt as to their meaning, bidder shall at once notify Owner. If appropriate, Owner will send written instructions to all bidders by addenda. Questions received less than 7 Days before the time of bid opening may not be answered. All issued addenda shall be incorporated into these Contract Documents.

1.04 PREBID CONFERENCE

- A. All bidders are encouraged to attend a pre-bid conference. The pre-bid conference will be held virtually by zoom. Bidders shall refer to the Advertisement for bids for the link to the meeting.
- B. The University is requiring that Zoom be downloaded and installed via a computer client rather than connecting through a web browser plugin. The computer client can be found here: <https://support.zoom.us/hc/en-us/articles/207373866-Zoom-Installers>

1.05 CLARIFICATIONS

- A. Should bidders find discrepancies in, omissions from, or unclear information within the Contract Documents, they should notify Owner at once. Owner shall issue a written instruction in the form of an addendum to all bidders. Neither the Owner nor Architect/Engineer will be responsible for any oral instructions. Questions received less than 7 Days before bid opening may not be answered. All addenda issued prior to the opening of bids will be incorporated into the Contract.

1.06 SPECIFIED PRODUCTS

- A. Bids must be based upon items identified in the Specifications or approved substitutions. In certain cases, specific items have been named because of operational or maintenance considerations; approval of substitutions should not be assumed.

- B. Requests for approval of substitutions must be made in writing and received by Owner at least 7 Days prior to the date of bid opening. Said request must include complete descriptions, technical data, and performance records. Any approval of the proposed substitution will be made by addendum issued to all bidders.
- C. To submit substitution requests prior to Bid opening:
 - 1. Only one substitution request per bidder will be considered for each product.
 - 2. Requests for substitutions shall provide sufficient data to allow Owner to evaluate the suitability of the proposed product. Bidder must clearly identify product and model number of proposed substitution.
- D. By requesting a substitution, bidder represents and warrants that (1) it has personally investigated the proposed material or product and determined that it is equal or better in all respects to that specified, (2) the same or better warranty will be provided for the substitution, (3) it has coordinated with affected subcontractors, (4) the substitution will not impact other parts of the Work, (5) the aggregate costs associated with the substitution actually reduces its bid amount, (6) all costs associated with the substitution are included in its bid, and (7) it waives any known or unknown future claim for an increase in the Contract Sum or Contract Time associated with the substitution.
- E. Owner retains full discretion over whether to approve a substitution, and Owner's approval does not relieve bidder of the above requirements.

1.07 TAXES

- A. State of Washington Sales Tax shall not be included in the bid price, except that the retail sales tax upon sales and rentals to prime contractors and subcontractors of tools, cranes, air compressors, bulldozers, lubricating oil, sandpaper, form lumber, and similar items of material and equipment which are primarily for use by the bidder rather than for resale as a component part of the finished work, shall be included in the bid price. (See WAC 458-20-170 (State Department of Revenue Rule 170))
- B. Sales tax applicable to the Contract Sum will be added to the Contract Sum by Owner at the time the Contract (Section 00 50 00) is written and shall be paid to Contractor. Contractor shall then remit payment for the sales tax to the State Department of Revenue in conformance with the law.

1.08 FILING FEES

- A. Applicable state laws concerning prevailing wages, hours, workers' compensation, and other conditions of employment are called to the attention of bidders for their compliance. Bidders shall include in their bid any and all fees, including filing fees, required to comply with applicable labor laws.

1.09 PAYMENT AND PERFORMANCE BONDS

- A. Upon award of the Contract, the successful bidder will be required to provide Owner with satisfactory separate payment and performance bonds. Cost of bond premiums must be included in the bidder's proposal.

1.10 FORM OF PROPOSAL

- A. Proposals must be formatted in accordance with the following:
1. Bidder must utilize the Form of Proposal, examples of which are included in the Contract Documents; all numbers must be clearly and legibly stated both in writing and in figures; and signatures must be in longhand.
 2. Bids must not contain any recapitulation of the Work to be done.
 3. Bidders must include prices for all Alternate Bid items if they are included in the Form of Proposal.
 - a. Bidders shall bid upon all Alternates indicated in the Form of Proposal. When bidding on alternates for which there is no charge, bidder shall write the words "No Charge" or some similar designation in the space provided on the Form of Proposal. If a bidder fails to bid an alternate, or notes "no bid," it will be construed as meaning that there will be no change in the Contract Sum and that the alternate is included in the Contract Sum.
 4. Bids shall be received either electronically or in hard copy:
 - a. Electronic Bids: Bidders may submit their bid via email to contracts@wsu.edu prior to the bid submission deadline. The emailed bid must include all documents that would have normally been submitted in the sealed envelope, including but not limited to the Form of Proposal and bid bond, in either PDF or Image format.
 - 1) The official clock for receipt of electronic bids will be the time and date stamp by WSU email services, not bidders email services.
 - b. Hard Copy Bids: Each part of the Form of Proposal must be sealed in its own opaque envelope and marked "Proposal, **WSU Golf Team Clubhouse Upgrade Exterior & Addition**". Bidders name shall appear on the outside of this sealed envelope. All bids are to be delivered or mailed to Facilities Services, P.O. Box 641150, McCluskey Services Building, Washington State University, Pullman, WA 99164-1150. If mailed, the Bid envelope shall be enclosed in another envelope for mailing.
 - 1) An official clock, at the office location designated for receipt of bids, will be designated by Owner for determining the timely receipt of each bid.

- c. Bidders are solely responsible for delivery of their proposals at the specified location and before the specified time set for receipt of bids.
- 5. Bids will be received on the dates and at the times indicated in the Advertisement for Bids.
- 6. Proposals received and determined untimely by Owner, may be considered as non-responsive and hard copy bids will be returned to bidder unopened, or notification will be made by email for electronic bids.
- 7. Bids will be received until the respective times indicated in the Advertisement for Bids. They must be received prior to the respective times stated; i.e., where bids for Part A are required until 2:00 p.m., all bids received by 1:59:59 p.m. are timely; all bids received on or after 2:00:00 p.m. are untimely.
- 8. Proposals shall consist of the following components:
 - a. Proposal: Completed Part A proposal indicating the following:
 - 1) Base Bid and Alternate Bid (if any) amounts;
 - 2) Acknowledgment of Addenda received;
 - 3) Signature, Corporate Identification, and Contractor License number; and
 - 4) Bid Security to be attached to Part A proposal form.
- 9. All proposals will remain sealed/unshared until the bid opening.

1.11 BID ALTERNATES, ALLOWANCES AND UNIT PRICES

- A. Bid Alternates, Allowances, and Unit Prices adjust the Project scope by adding, deleting, or modifying specific parts of the Work as stated hereinafter.
- B. An Alternate is an amount proposed by bidders and stated on the Bid Form for certain construction activities defined in the bidding documents that may be added to or deducted from the Base Bid amount and/or the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Each bidder shall submit, on the Form of Proposal, an amount for each Bid Alternate stating the difference in cost from the Base Bid amount for adding, deleting, or modifying specific materials and/or construction.
 - 2. The difference in cost shall include all deletions, additions, and adjustments to all trades as may be necessary by each modification.
 - 3. Only Alternates authorized by these specifications or pursuant to addenda will be considered.

- C. An Allowance is an amount established in the Contract Documents for inclusion in the Contract Sum to cover the cost of prescribed items not specified in detail sufficient to estimate at time of bid.
 - 1. Each bidder shall include in the Base Bid amount the amount for each Allowance as identified in the bidding documents.
- D. A Unit Price is an amount as a price per unit of measurement for materials or services added or deleted from the Base Bid amount.
 - 1. Each bidder shall submit on the Bid Proposal Form, an amount for each Unit Price stating the difference per unit or measurement for materials or services added or deleted from the Base Bid amount.
 - 2. The Unit Price stated shall be used as the amount for either adding or deleting the item per unit of measurement from the Work.
 - 3. The Unit Price amounts submitted on the Form of Proposal shall be used as the cost per unit of measurement for the entire duration of the Contract.

1.12 BID GUARANTEE

- A. Bidder shall furnish a bid guarantee in the form of a cashier's check or bid bond made payable to the Board of Regents of Washington State University for an amount equal to at least 5% of the total Base Bid amount, as evidence of good faith and as a guarantee that, if awarded the Contract, the bidder will execute the Contract and provide payment and performance bonds as required.
 - 1. Electronic submission of the Bid Guarantee shall constitute full submittal as if delivered in hard copy.
- B. Should the successful bidder fail to enter into a Contract and furnish satisfactory bonds within 10 Days after its proposal has been accepted, the bid security shall be forfeited as liquidated damages.
- C. Owner reserves the right to hold the bid guarantee of the 3 lowest bidders until the successful bidder has entered into a contract and furnished required bonds.

1.13 MWBE PARTICIPATION

- A. Washington State University is committed to the enhancement of opportunities for minority and women owned and controlled businesses in public contracting. The use or solicitation of minority and women's business enterprise firms is expressly encouraged.

1.14 CONTRACTOR AND SUBCONTRACTOR PARTICIPATION

- A. Contract price for purposes of RCW 39.30.060 shall mean the Base Bid amount if the estimated Contract price is not otherwise identified.

1.15 MODIFICATION OF PROPOSALS

- A. Modifications to proposals already submitted will be permitted only if requested in writing over the signature of the bidder and provided such requests are received prior to the time set for receipt of bids.
- B. The original Form of Proposal will remain unopened until bid opening. Modifications in the form of facsimile transmissions will not be accepted.
- C. Withdrawal of proposals will be permitted only if requested in writing over the signature of the bidder and provided such requests are received prior to the time set for receipt of bids.
- D. Withdrawal requests in the form of facsimile transmissions will not be accepted.
- E. After the scheduled closing time for the receipt of Form of Proposals, no bidder will be permitted to withdraw a proposal unless said award is delayed for a period exceeding 60 Days.

1.16 ALTERATIONS PROHIBITED

- A. Except as otherwise provided herein, Forms of Proposal which are incomplete, or which are conditioned in any way, or which contain items not called for in the Proposal Form, or which are not in conformity to the law, may be rejected.
- B. The Form of Proposal invites bids on specific Drawings and Specifications. Only the amounts and information asked for on the Form of Proposal furnished will be considered.

1.17 BID PROTEST PROCEDURES

- A. A bidder protesting for any reason the bidding documents, a bidding procedure, the University's objection to a bidder or a person or entity proposed by the bidder, including but not limited to, a finding of non-responsibility, the award of the Contract or any other aspect arising from, or relating in any way to, the bidding, shall file a written protest with the University within two (2) business days of the event giving rise to the protest. (Intermediate Saturdays, Sundays, and legal holidays are not counted as business days.) The written protest shall include the name of the protesting bidder, the title of the bid under which the protest is submitted, a detailed description of the specific factual and legal grounds for the protest, copies of all supporting documents, evidence that the apparent low bidder has been given notice of the protest, and the specific relief requested. The written protest shall be sent by email to contracts@wsu.edu.
- B. Upon receipt of the written protest, the University will consider the protest. The University may, within three (3) business days of the University's receipt of the protest, provide any other affected bidder(s) the opportunity to respond in writing to the protest. If the protest is not resolved by mutual agreement of the protesting bidder and the University, the Assistant Vice President for Facilities Services, Capital of the University, or her or his designee, will review the issues

and promptly furnish a final and binding written decision to the protesting bidder, and any other affected bidder(s), within six (6) business days of the University's receipt of the protest. (If more than one (1) protest is received, the University's decision will be provided within six (6) business days of the University's receipt of the last protest.) If no reply is received from the University during the six (6) business-day period, the protest will be deemed rejected.

- C. Failure to comply with these protest procedures will render a protest waived.
- D. Timely and proper compliance with, and exhaustion of, these protest procedures shall be a condition precedent to any otherwise permissible judicial consideration of a protest.

1.18 LOW RESPONSIBLE BIDDER

- A. It is the intent of Owner to award the Contract to the low responsible bidder. Before award, the bidder must meet the following bidder responsibility criteria to be considered a responsible bidder. The bidder may be required by Owner to submit documentation demonstrating compliance with the criteria. Bidder must:
 - 1. Have a current certificate of registration in compliance with chapter 18.27 RCW, which must have been in effect at the time of bid submittal;
 - 2. Have a current Washington Unified Business Identifier (UBI) number;
 - 3. If applicable:
 - a. Have Industrial Insurance (workers' compensation) coverage for the bidder's employees working in Washington, as required in Title 51 RCW;
 - b. Have a Washington Employment Security Department number, as required in Title 50 RCW;
 - c. Have a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
 - 4. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065(3).
 - 5. Not have been found out of compliance by the Washington State Apprenticeship and Training Council for working apprentices out of ratio, without appropriate supervision, or outside their approved work processes as outlined in their standards of apprenticeship under chapter 49.04 RCW for the one-year period immediately preceding the first date of advertising for this project.
 - 6. Not have been determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries, or through a civil judgment entered by a court of limited or general jurisdiction, to have willfully violated, any provision of chapter 49.46, 49.48, or 49.52 RCW, as defined in RCW 49.48.82.

- B. In addition to the bidder responsibility criteria above, bidder must also meet the following supplemental bidder responsibility criteria applicable to the Project:
1. The ability, capacity, and skill of bidder to perform the service required;
 2. The experience and efficiency of bidder;
 3. Whether bidder can perform the Contract within the time specified;
 4. The satisfactory completion of previous contracts or services;
 5. Such other information having a bearing on the decision to accept a bid proposal.
- C. Whenever Owner evaluates Contractor's responsibility, the foregoing may be taken into account. In addition to Contractor's experience, evaluation of bidder's responsibility will also be based on the documented experience of the Project Manager, Project Engineer, and the Superintendent proposed for the Project. **A minimum of three projects of comparable size and scope will be required for bidder.**
- D. Within 48 hours of receipt of request, apparent low bidder will provide such information about its team as Owner determines to be reasonably necessary to evaluate the responsibility of the bidder. Failure to reply with requested information will render a bidder non-responsible at Owner's option. At minimum, a bidder shall provide:
1. A financial statement;
 2. List of projects currently under construction, including current contract amount and status of each;
 3. Names and resumes of proposed Project Manager, Project Engineer, and Superintendent;
 4. Name of bonding company/agent; and
 5. References including project and owner name, a project contact, and project contact telephone number.
- E. As evidence that bidder meets the bidder responsibility criteria, the apparent low bidder must submit documentation as may be required above to the Owner within 48 hours of the bid submittal deadline. Owner reserves the right to request such documentation from other bidders also.
- F. Owner will review Contractor's past Contract Performance to assist in evaluating the contractor's qualifications and proven ability to successfully perform future contracts only when past performance has been previously documented via the Contract Performance Program.
- G. If Owner determines bidder does not meet the bidder responsibility criteria above and is therefore not a responsible bidder, Owner shall notify bidder in writing with the reasons for its determination. If bidder disagrees with this determination, it may appeal the determination within 24 hours of receipt of Owner's determination

by presenting additional information to Owner. Owner will consider the additional information before issuing its final determination. If the final determination affirms that bidder is not responsible, Owner will not execute a Contract with any other bidder until 2 business days after the bidder determined to be not responsible has received the final determination.

1.19 CONTRACT AWARD

- A. Owner intends but is not required to enter into a contract with the successful bidder, for all Work called for in the Contract Documents.
- B. The determination of the successful bidder will be made on the basis of the sum of the Base Bid together with Owner-selected Alternates.
- C. The responsibility of bidder and its subcontractors will be considered in making the award. Owner reserves the right to reject any or all bids and to waive informalities advantageous to Owner and/or the protection of the public interest.
- D. Reinstatement of Bid Alternate not initially selected shall be in accordance with provisions of the Bid Proposal Form of Proposal.

1.20 CONTRACT FORMS

- A. Owner's standard form Contract is included with the Contract Documents.

END OF SECTION 00 21 13

Washington State University
WSU Golf Team Clubhouse Upgrade Exterior & Addition
Pullman, WA

Refer to Instructions to Bidders for bid submittal procedures.

Bidder's Firm Name: _____ Date: _____

To: Facilities Services, Capital
McCluskey Services Building, P.O. Box 641150
Washington State University
Pullman, Washington 99164-1150

Pursuant to and in compliance with the Advertisement for Bids and the Instructions to Bidders, the Bidder, having carefully examined the Contract Documents entitled "WSU Golf Team Clubhouse Upgrade Exterior & Addition" and having visited the Project site and examined the conditions affecting the Work, hereby proposes and agrees to provide all labor, materials, equipment, services, and incidentals necessary to complete the Work for the following stipulated sums:

A. BASE BID

_____ DOLLARS (\$ _____),

B. UNIT PRICES - NOT USED

C. ALTERNATES – NOT USED

D. REINSTATEMENT OF BID ALTERNATES – NOT USED.

E. SALES TAX

The Bidder agrees that the amounts indicated in the proposal do not include Washington State and local sales taxes except as required by the Instructions to Bidders.

F. CONTRACT PROVISIONS

Should the Bidder be notified of the acceptance of this proposal within 60 Days from the date set for the opening thereof or at any time thereafter before this proposal is withdrawn, the bidder agrees to execute a Contract for the Work and to furnish the required bonds.

1. TIME OF COMPLETION
The bidder agrees, if awarded a Contract for the Work, to complete the Work within the Contract Time specified.
2. LIQUIDATED DAMAGES
The bidder agrees that time is of the essence of the Contract and acknowledges that the amount of damages specified is a measure of the damages which the Owner will sustain should the Bidder fail to complete the Work within the Contract Time.

G. BID GUARANTEE

The Bidder agrees that the bid guarantee accompanying the Part A Form of Proposal is left in escrow with Owner, that the amount of the guarantee is the measure of the damages that Owner will sustain by failure of the bidder to execute a Contract for the Work and furnish required bonds, and that if the bidder fails to deliver said documents within 10 Days after receipt of notice of award to the bidder, the bid guarantee shall become the property of Owner.

H. MINORITY AND WOMEN'S BUSINESS ENTERPRISE (MWBE) PARTICIPATION

Owner is committed to the enhancement of opportunities for minority and women owned and controlled firms in public contracting. While neither required, nor a part of bidder responsiveness, the use or solicitation of minority and women business enterprises is expressly encouraged.

I. CONTRACTOR AND SUBCONTRACTOR PARTICIPATION – NOT USED

J. ADDENDA

The bidder hereby acknowledges receipt of Addendum by number(s):

K. PREVAILING WAGE CERTIFICATION

The bidder has not been determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries, or through a civil judgment entered by a court of limited or general jurisdiction, to have willfully violated, any provision of chapter 49.46, 49.48, or 49.52 RCW, as defined in RCW 49.48.82.

L. DECLARATION

The bidder represents and warrants that he/she possess the authority to sign for and bind bidder.

The Bidder declares under penalty of perjury under the laws of the State of Washington, that all of the foregoing information as recited is true and correct to the best of his/her knowledge.

Bidder's Firm Name: _____

Signed By: _____ Official Title: _____

Print Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Telephone: _____ Fax: _____

State of Washington Contractor's License Number: _____

Federal Tax Identification Number: _____

Email Address: _____

The firm represented by the above signature is a:

Sole Proprietorship _____

Partnership _____

Corporation _____

Other _____

State of Incorporation _____

END OF SECTION 00 42 13

WSU Golf Team Clubhouse Upgrade Exterior & Addition

Agreement between Owner and Contractor

(Fixed Contract Sum)

This AGREEMENT is effective as of the date of the first signature on the Agreement so long as all other parties' authorized signatories have also executed the Agreement. This Agreement is made by and between the following parties in connection with the Project identified below.

OWNER: Washington State University
c/o Facilities Services, Capital
P.O. Box 641150
Pullman, WA 99164-1150

CONTRACTOR: [To be determined]

ARCHITECT (A/E): Design West Architects P.A
254 E Main St
Pullman, WA 99163

PROJECT: WSU Golf Team Clubhouse Upgrade Exterior & Addition
110 NE Fairway Rd
Pullman, WA 99164

In consideration of the mutual covenants and obligations contained herein, Owner and Contractor agree as set forth herein.

Article 1

The Work of the Contract

- 1.1 Contractor to fully execute the Work. Contractor shall fully execute the entire Work in strict accordance with the Contract Documents, and shall provide all material, equipment, tools, and labor necessary to timely complete the Work described in and reasonably inferable from the Contract Documents, except to the extent specifically indicated to be the responsibility of others.
- 1.2 Contractor to further Owner's interests. Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with Owner to cooperate and collaborate with Owner and others involved with the Project and to exercise Contractor's best skill and judgment; to furnish efficient, professional construction administration, management services and supervision with sufficient quantities of fully qualified, competent and experienced personnel; and to perform the Work in an expeditious and economical manner consistent with Owner's interests. The parties will endeavor to promote harmony, cooperation and mutual respect among the Project participants to the fullest extent possible in order to further the success of the Project and to effect prompt and successful completion of the Project within the requirements of the Contract Documents, the Contract Time and the Contract Sum.

Article 2 **Contract Documents**

- 2.1 The Contract Documents. The "Contract Documents" form the "Contract." The Contract Documents consist of this Agreement (Agreement between Owner and Contractor or the "Agreement"); any attached Exhibits and other documents listed in the Contract Documents; the General Conditions; other documents listed in Article 8 of this Agreement; and written modifications, amendments and Change Orders to the Contract issued after execution of this Agreement.
- 2.2. Contract is complete and integrated agreement. The Contract represents the entire, complete, and integrated agreement between the parties and supersedes prior negotiations, representations or agreements, either written or oral. No oral representations or other agreements have been made by the parties except as specifically established in the Contract.
- 2.3 Contract is between only Owner and Contractor. The Contract Documents shall not be construed to create a contractual relationship of any kind between any Persons other than Owner and Contractor.

Article 3 **Definitions**

- 3.1 Terms, words and phrases to have ordinary meanings. Terms, words and phrases used in the Contract Documents shall have the meanings given them in this Agreement and in the General Conditions or, if not defined, in a manner consistent with construction industry standards. In the event of any inconsistency in such definitions, the definitions in this Agreement shall control.
- 3.2 Construction Documents. The Construction Documents are identified in the General Conditions and other Contract Documents as Drawings and Specifications. The Construction Documents do not include shop drawings or other Submittals.
- 3.3 Contractor. "Contractor" is the Person identified as such in the Agreement and General Conditions. Contractor must be licensed, bonded, and insured as a contractor in the State of Washington, and must legally be permitted to do business. Contractor's authorized representative, including its Designated Representative, shall be authorized to act on Contractor's behalf with respect to the Project.
- 3.4 General Conditions modified. Section 4.03E of the General Conditions is hereby modified to clarify that Contractor and Owner may agree on the number of copies of Submittals to be provided to Owner. If no such agreement is reached, Contractor shall submit five copies.

Article 4 **Notice to Proceed and Substantial Completion**

- 4.1 Notice to Proceed. The date of Notice to Proceed will be specified in a written Notice issued by Owner. Owner may issue separate written authorizations to proceed for different portions of the Work.
- 4.2 Contract Time measured from date of commencement. The Contract Time shall be

measured from the Notice to Proceed date to the contractual date of Substantial Completion established in Section 4.3, subject to adjustments as provided in the Contract Documents. Time is of the essence in completion of the Work.

- 4.3 Substantial Completion and Final Completion. Contractor shall achieve Substantial Completion of the Work by 180 Days following Notice to Proceed, subject to adjustments as provided in the Contract Documents, and shall achieve Final Completion not later than 90 Days thereafter. Contractor represents to Owner that the Contract Time is adequate for full performance of the Work. Contractor shall also achieve any interim milestones and phasing requirements set forth in the Contract Documents.
- 4.4 Liquidated damages. Owner will assess, and Contractor will be responsible for, liquidated damages in the amount of two-hundred eighty-six dollars and fifty nine cents (\$286.59) per Day for each Day beyond the contractual date for Substantial Completion that Substantial Completion is not timely achieved, and subsequently two-hundred eight-three dollars and ninety seven cents (\$283.97) per Day for each Day beyond the time period established in Section 4.3 that Final Completion of the entire Work is not achieved. Contractor and Owner agree that the liquidated damages amounts are not penalties and are a reasonable estimation of actual damages to Owner, as of this date of Agreement, based on the inherent uncertainty and difficulty in calculating and quantifying damages caused by delays in the construction of university facilities.

Article 5 **Contract Sum**

- 5.1 Contract Sum. For Contractor's performance of the Contract, Owner shall pay to Contractor the Contract Sum of _____ dollars (\$_____), subject to additions and deductions for changes in the Work as provided in the Contract Documents. The Contract Sum includes by way of example and not limitation all costs of construction; general conditions; all taxes except Washington State sales tax due on the Contract Sum; Contractor's contingency; any approved Allowances; all insurance; overhead; and Contractor's fee.
- 5.2 Alternates. The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by Owner:

Alternate Number	Description	Price (\$0.00)
None		

- 5.3 Unit Prices. Any Unit Prices are as follows:

Description	Units	Price (\$0.00)
None		

Unit Prices as set forth in the Contract Documents are "all in." They include all material, equipment, labor, delivery, installation, and Subcontractor costs, any overhead and profit not included in the fee, and any other costs or expenses in connection with, or incidental to, the performance of that portion of the Work to which such Unit Prices apply.

- 5.4 Allowances. Allowances included in the Contract Sum are as follows:

Allowance	Amount	Included Items
None		

Allowances may be included in the Contract Sum due to uncertainty in scope, price and/or quantity at the time this Agreement is executed. Whenever actual costs are more or less than an allowance, the Contract Sum will be appropriately adjusted. Contractor must provide Owner with written notice of its intent to expend an allowance amount (providing Owner with the opportunity to approve or reject the cost) before expending an allowance amount.

- 5.5 Changes in the Work.

- 5.5.1 Owner may, without invalidating the Contract, order changes in the Work consisting of additions, deletions or other revisions. Owner shall issue such changes in writing.

- 5.5.2 Adjustments of the Contract Sum and/or Contract Time on account of changes in the Work may be determined by any of the methods listed in the General Conditions.

Article 6
Payments

- 6.1 Applications for Payment.

- 6.1.1 The Contract Documents detail the requirements for Applications for Payment. Based upon Applications for Payment that Contractor submits to Owner, Owner shall make progress payments to Contractor on account of the Contract Sum.

- 6.2 Progress Payments.

- 6.2.1 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows and in accordance with Section 01 29 00, Applications for Payment:

- .1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Contract Sum allocated to that portion in the Schedule of Values. Pending final determination of the cost to Owner of changes in the Work, amounts not in dispute may be included as provided in the General Conditions unless Owner requires that actual cost records be provided;
- .2 Add that portion of the Contract Sum 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 Owner, suitably stored and insured off the site at a location agreed upon in writing);
- .3 Subtract the aggregate sum of previous payments made by Owner;
- .4 Subtract amounts, if any, for which Owner has withheld payment; and
- .5 Subtract the statutory retainage of five percent (5%) of the above amount as a fund for the protection and payment of the claims of any Person arising out of the Work and the State of Washington with respect to taxes.

6.3 Subcontractor Payment Reporting.

6.3.1 All contract payments are subject to compliance tracking using the Washington State Office of Minority & Women's Business Enterprise's business diversity management system, Access Equity (B2Gnow). Contractor and all subcontractors (regardless of certification) will register and report all progress payments made utilizing the system. The Owner reserves the right to withhold payments from the Contractor for non-compliance with this requirement.

6.4 Final Payment.

6.4.1 Final payment, constituting the entire unpaid balance of the Contract Sum, less retainage, shall be made by Owner to Contractor no later than 30 Days after Contractor has fully performed the Contract and Final Completion has occurred (except for Contractor's responsibility to correct non-conforming Work discovered after final payment or to satisfy other requirements, if any, that extend beyond final payment), and Contractor has submitted a final Application for Payment.

6.4.2 Owner shall release retainage to Contractor in accordance with Chapter 60.28 RCW and the Contract Documents.

Article 7
Miscellaneous Provisions

7.1 Designated Representatives.

7.1.1 Owner's Designated Representative, designated below, shall be authorized to act on Owner's behalf with respect to the Project:

<u>Nolan Beal</u>	<u>Jeremy Griffin</u>
<u>Project Manager</u>	<u>Construction Manager</u>
<u>Facilities Services</u>	<u>Facilities Services</u>

7.1.2 Contractor's Designated Representative, identified below, shall be authorized to act on Contractor's behalf with respect to the Project:

7.1.3 Neither Owner's nor Contractor's Designated Representatives shall be changed without 10 Days' written notice to the other party.

7.2 Interest. Payments due and unpaid under the Contract Documents shall bear interest as specified by RCW 39.76, not to exceed the Bank of America prime plus two percent (2%) per annum.

7.3 Quality control and assurance and Owner's right to inspect the Work: Contractor shall develop and submit an overall Quality Control and Assurance Plan to ensure that the Work is inspected by qualified members of Contractor's staff or third parties. The Quality Control and Assurance Plan must be acceptable to Owner. Owner expressly reserves the right to inspect any and all portions of the Work at any time during the Project. Contractor shall provide access to the Work as needed by Owner

or its representatives, including the use of scaffolding, platforms, or lifts. All corrections or observations noted by Owner shall be logged by Contractor for correction, tracking and documentation to the satisfaction of Owner.

7.4 Contractor to actively manage and supervise Work. Contractor shall review and inspect the Work of Subcontractors on a regular basis for defects and deficiencies in their Work and for conformance with the Construction Documents and other Contract Documents, and shall stop the Work of Subcontractors, if necessary. Contractor shall provide notification at regularly scheduled progress meetings of any major defects or deficiencies and recommend remedial action.

7.5 Use of Third Party Neutral. Owner and Contractor intend to utilize a Third Party Neutral to assist in addressing and resolving disputes that may arise during the Project. The Third Party Neutral will be jointly engaged and will have the roles and responsibilities set forth in a Third Party Neutral Agreement, which shall be established in accordance with Section 00 80 10, Third Party Neutral.

Article 8

Enumeration of the Contract Documents

8.1 The Contract Documents. The Contract Documents, except for modifications issued after execution of this Agreement, are enumerated as follows:

8.1.1 This executed Agreement, any attached Exhibits and other documents listed in this Agreement.

8.1.2 The General Conditions for Washington State Facility Construction with Washington State University Amendments, and any Supplementary Conditions of the Contract.

8.1.3 The Addenda, if any, are as follows:

Number

Date

Pages

8.1.4 Other documents, if any, forming part of the Contract Documents are as follows:

See Contract Documents.

Department of Labor and Industries Prevailing Wage Rates.

**OWNER:
WASHINGTON STATE UNIVERSITY**

**CONTRACTOR:
FIRM NAME
WA CONTRACTOR LICENSE NUMBER**

(Signature)

(Date)

(Signature)

(Date)

(Printed Name)
(Title)

(Printed Name)
(Title)

END OF SECTION 00 50 00

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WSU amendments to the Washington State Facility Construction
General Conditions are identified by a bar on the right hand side of modified paragraphs

**GENERAL CONDITIONS
FOR WASHINGTON STATE FACILITY CONSTRUCTION
WITH WASHINGTON STATE UNIVERSITY AMENDMENTS**

PART 1 - GENERAL PROVISIONS

1.01 DEFINITIONS

- A. "Application for Payment" means a written request submitted by Contractor to Owner for payment of Work completed in accordance with the Contract Documents and approved Schedule of Values, supported by such substantiating data as Owner may require.
- B. "Architect," "Engineer," or "A/E" means a person or entity lawfully entitled to practice architecture or engineering, representing Owner within the limits of its delegated authority.
- C. An "Allowance" is an amount included in the Contract Sum for a stated part of the Work that is not fully defined and/or quantified at the time the Contract Sum is established. When that part of the Work is adequately defined and/or quantified, the Contract Sum will be adjusted to account for the difference between the Allowance and the actual cost of the item. Following the adjustment, that part of the Work will no longer be an Allowance item. Although not capitalized in Section 5.02B, "allowance" shall mean "Allowance."
- D. "Change Order" means a written instrument signed by Owner and Contractor stating their agreement upon all of the following: (1) a change in the Work; (2) the amount of the adjustment in the Contract Sum, if any, and (3) the extent of the adjustment in the Contract Time, if any.
- E. "Claim" means Contractor's exclusive remedy for resolving disputes with Owner arising out of or relating to the Contract Documents or the breach thereof or requesting an adjustment in the Contract Sum or Contract Time, as more fully set forth in Part 8. As used in the Contract Documents, the exclusive meaning of "equitable adjustment" is the ability of Contractor to follow the contractual dispute resolution process in Part 8, including the requirement for submitting a timely Notice, substantiation, and Claim.
- F. The "Contract" is the agreement between Owner and Contractor and is formed by the Contract Documents. The Contract represents the entire and integrated agreement between Owner and Contractor and supersedes prior negotiations, representations or agreements, either written or oral.
- G. "Contract Award Amount" is the sum of the Base Bid and any accepted Alternates, if any, for Design-Bid-Build projects and is the accepted initial Guaranteed Maximum Price for Design-Build and GC/CM projects.
- H. "Contract Documents" means the General Conditions, modifications to the General Conditions, Supplemental Conditions, Agreement, Drawings and Specifications, and all addenda and modifications thereof.
- I. "Contract Sum" is the total amount payable by Owner to Contractor for performance of the Work in accordance with the Contract Documents, including all taxes imposed by law and properly chargeable to the Work, except Washington State sales tax.
- J. "Contract Time" is the number of Days or other time period allotted in the Contract Documents from the Notice to Proceed for achieving Substantial Completion of the Work.
- K. "Contractor" means the person or entity who has agreed with Owner to perform the Work in accordance with the Contract Documents.
- L. "Day(s)" means calendar day(s) unless otherwise specified.

**FOR WASHINGTON STATE FACILITY CONSTRUCTION
WITH WASHINGTON STATE UNIVERSITY AMENDMENTS**

- M. "Drawings" are the graphic and pictorial portions of the Contract Documents showing the design, location, and dimensions of the Work, and may include plans, elevations, sections, details, schedules, and diagrams.
- N. "Final Acceptance" means the written acceptance of the Work by Owner, as more fully set forth in Section 6.08B.
- O. "Final Completion" means that the Work is fully and finally complete in accordance with the Contract Documents and Contractor has submitted its final Application for Payment, as more fully set forth in Section 6.09A.
- P. "Force Majeure" means those acts entitling Contractor to request an equitable adjustment in the Contract Time, as more fully set forth in paragraph 3.05A.
- Q. "Notice" means a written notice which has been delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended or, if delivered or sent by registered or certified mail, to the last business address known to the party giving notice. Although not capitalized in the following provisions, "notice" shall mean "Notice" in Sections 3.03B, 3.03C, 3.06A, 5.01D, 5.02C, 5.03, 5.09A, 5.10A, 5.15A, 5.16F, 5.17, 9.01A, 9.02A, and 9.02B.
- R. "Notice to Proceed" means a written Notice from Owner to Contractor that permits pre-construction and construction activities to commence upon specified terms and defines the date on which the Contract Time begins to run.
- S. "Owner" means the Washington State University Board of Regents, which has the authority to enter into, administer, and/or terminate the Work in accordance with the Contract Documents. Owner shall designate in writing a Representative who shall have authority to bind Owner with respect to all matters requiring Owner's approval or authorization. A/E does not have such authority.
- T. "Person" means a corporation, partnership, business association of any kind, trust, company, or individual.
- U. "Prior Occupancy" means Owner's use of all or parts of the Project before Substantial Completion, as more fully set forth in Section 6.08A.
- V. "Progress Schedule" means a schedule of the Work, in a form satisfactory to Owner, as further set forth in Section 3.02.
- W. "Project" means the total construction of which the Work performed in accordance with the Contract Documents may be the whole or a part and which may include construction by Owner or by separate contractors.
- X. "Project Record" means the separate set of Drawings and Specifications as further set forth in paragraph 4.02A.
- Y. "Schedule of Values" means a written breakdown allocating the total Contract Sum to each principal category of Work, in such detail and format as requested by Owner.
- Z. "Specifications" are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.

**GENERAL CONDITIONS
FOR WASHINGTON STATE FACILITY CONSTRUCTION
WITH WASHINGTON STATE UNIVERSITY AMENDMENTS**

- AA. "Subcontract" means a contract between Contractor and a Subcontractor for the purpose of obtaining supplies, materials, equipment, work or services of any kind for or in connection with the Work. Although not capitalized in the following provisions, "subcontract" shall mean "Subcontract" in Sections 5.10A, 5.20E, 9.01B, and 9.02B.
- BB. "Subcontractor" means any Person of any tier, other than Contractor, who agrees to furnish or furnishes by contract with, or through Contractor, any supplies, materials, equipment, or services of any kind in connection with the Work. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor. Although not capitalized in the following provisions, "subcontractor" shall mean "Subcontractor" in Sections 5.04B, 5.04C, 5.04G, 5.20A, and 5.21B.
- CC. "Substantial Completion" means that stage in the progress of the Work (or portion of the Work designated and approved by Owner) when the construction is sufficiently complete, in accordance with the Contract Documents, so that Owner can fully occupy or utilize the Work (or portion designated by Owner) for its intended use, as more fully set forth in Section 6.07. There may be separate dates of Substantial Completion specified in the Contract Documents for various phases or portions of the Work.
- DD. "Work" means the construction and services required by the Contract Documents, and includes, but is not limited to, labor, materials, supplies, equipment, services, permits, and the manufacture and fabrication of components, performed, furnished, or provided in accordance with the Contract Documents. Although not capitalized in the following provisions, "work" shall mean "Work" in Sections 3.02D, 5.04B, 5.04C, 5.07D, 5.12A, 6.02 and 7.02A.
- EE. A "Work Directive" ("WD") is a binding written order prepared by Owner that directs Work prior to total agreement on adjustment, if any, in the Contract Sum or Contract Time, or both.
- FF. "Work Site" means the space identified and circumscribed on construction documents. The work site is controlled by the Contractor and the Contractor is responsible for compliance to regulatory requirements within the circumscribed area. Changes to the work site shall be submitted by Contractor and approved by Owner.

1.02 ORDER OF PRECEDENCE

Any conflict or inconsistency in the Contract Documents shall be resolved by giving the documents precedence in the following order, with a revision to a Contract Document having precedence over the original document and a later document having precedence over an earlier document:

1. Signed Agreement, with any Change Orders having precedence.
2. Supplemental Conditions.
3. Modifications to the General Conditions.
4. General Conditions.
5. Specifications and Drawings. The Specifications and Drawings are complementary and shall have equal precedence. Thus, anything mentioned in the Specifications but not shown on the Drawings, or shown on the Drawings but not mentioned in the Specifications, shall be of like effect as if shown or mentioned in both. If there is any inconsistency between the Specifications and Drawings, Contractor will make an inquiry to Owner to determine how to proceed. Unless otherwise directed, Contractor will provide the better quality or greater quantity of any Work or materials, as reasonably interpreted by Owner, at no change in the Contract Sum or Contract

**GENERAL CONDITIONS
FOR WASHINGTON STATE FACILITY CONSTRUCTION
WITH WASHINGTON STATE UNIVERSITY AMENDMENTS**

Time. In case of conflict within the Specifications, provisions in Division 1 shall take precedence over provisions of any other Division. In case of conflict within the Drawings, large scale Drawings shall take precedence over small scale Drawings.

1.03 EXECUTION AND INTENT

Contractor Representations: Contractor makes the following representations to Owner:

1. Contract Sum and Contract Time reasonable: The Contract Sum is reasonable compensation for the Work and the Contract Time is adequate for the performance of the Work, as represented by the Contract Documents;
2. Contractor familiar with project: Contractor has carefully reviewed the Contract Documents, visited and examined the Project site, become familiar with the local conditions in which the Work is to be performed, and satisfied itself as to the nature, location, character, quality and quantity of the Work, the labor, materials, equipment, goods, supplies, work, services and other items to be furnished and all other requirements of the Contract Documents, as well as the surface and subsurface conditions and other matters that may be encountered at the Project site or affect performance of the Work or the cost or difficulty thereof;
3. Contractor financially capable: Contractor is financially solvent, able to pay its debts as they mature, and possesses sufficient working capital to complete the Work and perform Contractor's obligations required by the Contract Documents; and
4. Contractor can complete Work: Contractor is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform the obligations required by the Contract Documents and has sufficient experience and competence to do so.

PART 2 - INSURANCE AND BONDS

2.01 CONTRACTOR'S LIABILITY INSURANCE

General insurance requirements: Prior to commencement of the Work, Contractor shall obtain all the insurance required by the Contract Documents and provide evidence satisfactory to Owner that such insurance has been procured, including but not limited to (1) Certificates of Insurance on ACORD Form 25, and/or ACORD Form 27 or their equivalents, and which shall list any applicable self-insured retentions, (2) the actual costs (expressed as a percentage) of Contractor's liability insurance under Section 2.01A.1 below, (3) applicable endorsements evidencing proof of compliance with the requirements listed below, (4) evidence of State Workers' Compensation coverage, and (5) a copy of any builder's risk policy required by the Contract Documents. All policies, endorsements and certificates must be signed copies and shall contain a provision that policies will not be cancelled without first giving thirty (30) days (or in the event of non-payment of premium, ten (10) days) prior written Notice to Owner. Contractor shall furnish to Owner copies of any subsequently issued endorsements amending, modifying, altering or restricting coverage terms or limits. Review of Contractor's insurance by Owner shall not relieve or decrease the liability of Contractor. Companies writing the insurance to be obtained by Part 2 shall be licensed to do business under Chapter 48 RCW or comply with the Surplus Lines Law of the State of Washington. Contractor shall include in the Contract Sum the cost of all insurance and bond costs required for the Work. Insurance carriers providing insurance shall be acceptable to Owner, and its A. M. Best rating shall be indicated on the insurance certificates.

- A. Term of insurance coverage: Contractor shall maintain the following insurance coverage during the Work and for one year after Substantial Completion. Contractor shall also maintain the following insurance coverage during the performance of any corrective Work required by Section 5.16.

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1. General Liability Insurance: Commercial General Liability (CGL) on an occurrence-based ISO Form CG 00 01 or broader, including products and completed operations, personal and advertising injury, bodily injury and property damage liability arising from Contractor's operations or Work, including operations or Work Contractor may subcontract or sublet to others.

The policy shall be purchased from a company or companies lawfully authorized to do business in the State of Washington possessing an A.M. Best's policyholder's rating of A or better and a financial rating of no less than XI.

Contractor's policy shall be designated primary and non-contributory to Owner's policies, and shall include a waiver of subrogation against Owner. Any self-insured retentions or deductibles must be disclosed and approved by Owner, and Contractor agrees to be responsible for payment of any and all self-insured retentions or deductibles.

2. Automobile Liability Insurance: Automobile liability on ISO Form CA 00 01 covering Code 1 (any auto).
3. Stop Gap Liability Insurance for damages because of bodily injuries to Contractor's employees.

- B. Industrial Insurance compliance: Contractor shall comply with the Washington State Industrial Insurance Act and, if applicable, the Federal Longshoremen's and Harbor Workers' Act and the Jones Act.

- C. Insurance to protect for the following: All insurance coverages shall protect against claims for damages for personal and bodily injury or death, as well as claims for property damage, which may arise from operations in connection with the Work whether such operations are by Contractor or any Subcontractor.

- D. Owner as Additional Insured: All insurance coverages shall be endorsed to include Owner, its officers, and employees, and any required governmental agencies as additional named insureds with coverage at least as broad as ISO Forms CG 20 10, CG 20 37, and CA 20 48, with no self-insured retentions applicable to the additional insureds.

- E. Subcontractor Coverage: Contractor shall ensure and require that Subcontractors have insurance coverage to cover bodily injury and property damage on all operations and all vehicles owned or operated by Subcontractors. Subcontractors shall name Contractor and Owner, any required governmental agencies, and others designated in the Contract Documents as well as their officers and employees, as additional insureds and give at least thirty (30) Days' Notice of cancellation.

2.02 COVERAGE LIMITS

Insurance amounts: The coverage limits shall be not less than the amounts specified in the Agreement; if limits are not specified in the Agreement, coverage limits shall be not less than as follows:

- A. \$1,000,000 per occurrence for bodily injury, property damage, personal and advertising injury.
- B. \$2,000,000 general aggregate to apply separately to each project or location.
- C. \$2,000,000 annual aggregate for products and completed operations.
- D. \$1,000,000 combined single limit each automobile accident or loss.

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- E. \$1,000,000 per accident for bodily injury or occupational disease of Contractor's employees

Coverages and Minimums: Owner's review, specification or approval of the insurance in this Contract or of its coverage or amount shall not relieve or decrease the liability of Contractor under the Contract Documents or otherwise. Coverages are the minimum to be provided and are not limitations of liability under the Contract, indemnification, or applicable law provisions. Contractor may, at its expense, purchase larger coverage amounts.

2.03 PROOF OF INSURANCE COVERAGE

- A. Certificate & endorsements required: Prior to commencement of the Work, Contractor shall furnish to Owner completed certificates of insurance coverage and endorsements evidencing compliance with the additional insured, cancellation, and waiver of subrogation requirements..
- B. List Project info: All insurance certificates shall name Owner's Project number and Project title.
- C. Policy: In the event of a claim or loss, Contractor shall promptly provide Owner with a complete copy of all applicable policies.

2.04 PAYMENT AND PERFORMANCE BONDS

Conditions for bonds: Payment and performance bonds for 100% of the Contract Award Amount, plus Washington State sales tax, shall be furnished for the Work, using the current version of the Payment Bond and Performance Bond form published by and available from the American Institute of Architects (AIA) – form A312. No payment or performance bond is required if the Contract Sum is \$150,000 or less and Contractor requests and the Owner agrees that Owner may, in lieu of the bond, retain 10% of the Contract Sum for the period specified in RCW 39.08.010.

2.05 ALTERNATIVE SURETY

When alternative surety required: Contractor shall promptly furnish payment and performance bonds from an alternative surety if:

- A. Owner has a reasonable objection to the surety; or
- B. Any surety fails to furnish reports on its financial condition if required by Owner.

2.06 BUILDER'S RISK

- A. Owner to buy builder's risk insurance: Owner shall purchase and maintain builder's risk insurance in the amount of the Contract Sum, including all Change Orders, for the Work on a replacement cost basis until Substantial Completion. For projects not involving new building construction, an "Installation Floater" is an acceptable substitute for the builder's risk insurance. The insurance shall cover the interests of Owner, Contractor, and any Subcontractors, as their interests may appear.
- B. Losses covered: Builder's risk insurance shall be placed on an "all risk" basis or equivalent policy form and insure against the perils of fire and extended coverage and physical loss or damage including theft, vandalism, malicious mischief, collapse, false work, temporary buildings, debris removal including demolition, wind, and at Owner's option may include flood and/or earthquake. The policy shall cover reasonable compensation for A/E's services and expenses required as a result of an insured loss. Losses up to the deductible amount shall be the responsibility of Contractor.

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- C. Waiver of subrogation rights: Owner and Contractor waive all subrogation rights against each other, any Subcontractors, A/E, A/E's subconsultants, separate contractors described in Section 5.19, if any, and any of their subcontractors, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this Section 2.06 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by Owner as fiduciary. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective to a Person or entity even though that Person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the Person or entity had an insurable interest in the property damaged.

PART 3 - TIME AND SCHEDULE

3.01 PROGRESS AND COMPLETION

Contractor to meet schedule: Contractor shall diligently prosecute the Work, with adequate forces, achieve Substantial Completion within the Contract Time, and achieve Final Completion within the time period specified in the Contract Documents. If Contractor fails to perform in a timely manner in accordance with the Contract Documents and, through the fault of Contractor or Subcontractor(s), fails to meet the Progress Schedule, Contractor shall be in default and shall take such steps as may be necessary to immediately improve its progress without change in the Contract Sum or Contract Time.

3.02 CONSTRUCTION SCHEDULE

- A. Preliminary Progress Schedule: Unless otherwise provided in Division 1, Contractor shall, within 14 Days after issuance of the Notice to Proceed, submit a preliminary Progress Schedule consistent with the requirements of the Contract Documents. The Progress Schedule shall not exceed time limits specified by the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work, and shall show the sequence in which Contractor proposes to perform the Work, and the dates on which Contractor plans to start and finish major portions of the Work, including dates for submission of Submittals per Section 4.03, which shall be coordinated with the Progress Schedule and identify dates for Owner review, and for acquiring materials and equipment.
- B. Form of Progress Schedule: Unless otherwise provided in Division 1, the Progress Schedule shall be in the form of a bar chart, or a critical path method analysis, as specified by Owner. The preliminary Progress Schedule may be general, showing the major portions of the Work, with a more detailed Progress Schedule submitted as directed by Owner.
- C. Owner comments on Progress Schedule: Owner shall return comments on the preliminary Progress Schedule to Contractor within 14 Days of receipt. Review by Owner of Contractor's schedule does not constitute an approval or acceptance of Contractor's construction means, methods, logic or sequencing, or its ability to complete the Work within the Contract Time. Contractor shall revise and resubmit its schedule, as necessary. Owner may withhold a portion of progress payments until a Progress Schedule has been submitted that meets the requirements of this Section 3.02.
- D. Monthly updates and compliance with Progress Schedule: Contractor shall utilize and comply with the Progress Schedule. On a monthly basis, or as otherwise directed by Owner, Contractor shall submit an updated Progress Schedule at its own expense to Owner indicating actual progress. If, in the opinion of Owner, Contractor is not in conformance with the Progress Schedule for reasons other than acts of Force Majeure as identified in Section 3.05, Contractor shall take such steps as are necessary to bring the actual completion dates of its work activities into conformance with the Progress Schedule, and if directed by Owner, Contractor shall submit a

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corrective action plan or revise the Progress Schedule to reconcile with the actual progress of the Work.

- E. Contractor to notify Owner of delays: Contractor shall perform the Work in accordance with the most recent Progress Schedule submitted to Owner. Contractor shall promptly notify Owner in writing of any actual or anticipated event that is delaying or could delay achievement of any milestone or performance of any critical path activity of the Work. Contractor shall indicate the expected duration of the delay, the anticipated effect of the delay on the Progress Schedule, and the action being or to be taken to correct the problem. Provision of such Notice does not relieve Contractor of its obligation to complete the Work within the Contract Time.

3.03 OWNER'S RIGHT TO SUSPEND THE WORK FOR CONVENIENCE

- A. Owner may suspend Work: Owner may, at its sole discretion, order Contractor, in writing, to suspend all or any part of the Work for up to 90 Days, or for such longer period as mutually agreed.
- B. Compliance with suspension; Owner's options: Upon receipt of a written notice suspending the Work, Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of cost of performance directly attributable to such suspension. Within a period up to 90 Days after the notice is delivered to Contractor, or within any extension of that period to which the parties shall have agreed, Owner shall either:
1. Cancel the written notice suspending the Work; or
 2. Terminate the Work covered by the notice as provided in the termination provisions of Part 9.
- C. Resumption of Work: If a written notice suspending the Work is cancelled or the period of the notice or any extension thereof expires, Contractor shall resume Work.
- D. Equitable Adjustment for suspensions: Contractor shall be entitled to an equitable adjustment in the Contract Time, or Contract Sum, or both, for increases in the time or cost of performance directly attributable to such suspension, provided Contractor complies with all requirements set forth in Part 7.

3.04 OWNER'S RIGHT TO STOP AND/OR CARRY OUT THE WORK FOR CAUSE

- A. Owner may stop Work for Contractor's failure to perform: If Contractor fails or refuses to perform its obligations in accordance with the Contract Documents, Owner may order Contractor, in writing, to stop the Work, or any portion thereof, until Owner has accepted satisfactory corrective action.
- B. Owner may carry out the Work after Contractor's failure to perform: If Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a 14-Day period after receipt of written Notice from Owner to commence and continue to make reasonable progress toward the correction of such default or neglect with diligence and promptness, Owner may, without prejudice to other remedies Owner may have, correct such deficiencies, and an appropriate Change Order shall be issued deducting from payments then or thereafter due Contractor the reasonable cost of correcting the deficiencies, including Owner's expenses and compensation for A/E's additional services made necessary by the default, neglect or failure. If payments then or thereafter due Contractor are not sufficient to cover such amounts, Contractor shall pay the difference to Owner.

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- C. No equitable adjustment for Contractor's failure to perform: Contractor shall not be entitled to an equitable adjustment in the Contract Time or Contract Sum for any increased cost or time of performance attributable to Contractor's failure or refusal to perform or from any reasonable remedial action taken by Owner based upon such failure.

3.05 DELAY

- A. Force Majeure actions not a default; Force Majeure defined: Any delay in or failure of performance by Owner or Contractor shall not constitute a default if and to the extent the cause for such delay or failure of performance was unforeseeable and beyond the control of the party. Acts of Force Majeure include, but are not limited to:

1. Acts of God or the public enemy;
2. Acts or omissions of any government entity not the fault of Owner or Contractor;
3. Fire or other casualty for which Contractor is not responsible;
4. Quarantine or epidemic;
5. Industry-wide strike or defensive lockout;
6. Unusually severe weather conditions which could not have been reasonably anticipated; and
7. Unusual delay in receipt of supplies or products which were ordered and expedited and for which no substitute reasonably acceptable to Owner was available.
 - a. "Unusually severe weather" shall mean weather conditions that are abnormal for the period of time for which Force Majeure is claimed, that could not reasonably have been anticipated or avoided, and that had an adverse effect on the Progress Schedule. Neither the Contract Time nor the Contract Sum will be adjusted for normal inclement weather or if the Work was behind schedule (unless behind schedule for a reason not the responsibility of the Contractor) at the time the unusually severe weather occurred. The Contractor shall be entitled to a change in the Contract Time only (but not a change in the Contract Sum) if the Contractor can substantiate to the reasonable satisfaction of the Owner that there was unusually severe weather as compared to normal using a ten (10) year average of accumulated record mean values from climatological data compiled by the U.S. Department of Commerce National Oceanic and Atmospheric Administration for the locale closest to the Project, and that the abnormal inclement weather actually impacted and extended the critical path of the Work. Unusual is defined as a 10-year weather event of either or both precipitation or temperature extremes that fall outside the upper and lower ranges within a 10-year periodicity

- B. Contract Time adjustment for Force Majeure: Contractor shall be entitled to an equitable adjustment in the Contract Time for changes in the time of performance directly attributable to an act of Force Majeure, provided it makes a request for equitable adjustment. Contractor shall not be entitled to an adjustment in the Contract Sum resulting from an act of Force Majeure.

- C. Contract Time or Contract Sum adjustment if Owner at fault: Contractor shall be entitled to an equitable adjustment in Contract Time, and may be entitled to an equitable adjustment in

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Contract Sum, if the cost or time of Contractor's performance is changed due to the fault or negligence of Owner, provided the Contractor makes a request for equitable adjustment.

- D. No Contract Time or Contract Sum adjustment if Contractor at fault: Contractor shall not be entitled to an adjustment in Contract Time or in the Contract Sum for any delay or failure of performance to the extent such delay or failure was caused by Contractor or anyone for whose acts Contractor is responsible.
- E. Contract Time adjustment only for concurrent fault: To the extent any delay or failure of performance was concurrently caused by the Owner and Contractor, Contractor shall be entitled to an adjustment in the Contract Time for that portion of the delay or failure of performance that was concurrently caused, provided it makes a request for equitable adjustment, but shall not be entitled to an adjustment in Contract Sum.
- F. Contractor to mitigate delay impacts: Contractor shall make all reasonable efforts to prevent and mitigate the effects of any delay, whether occasioned by an act of Force Majeure or otherwise. Contractor shall not recover damages, an equitable adjustment or an increase in the Contract Sum or Contract Time from Owner where Contractor could have reasonably avoided the delay by the exercise of due diligence.
- G. Types of damages permitted: If Contractor and its Subcontractors are entitled to a change in the Contract Sum, the amount of the change shall be the actual costs incurred by the Contractor and Subcontractors directly related to the change calculated in accordance with Section 7.02. Contractor and its Subcontractors shall not otherwise (not reflected by the actual costs incurred as calculated in accordance with Section 7.02) be entitled to damages arising out of actual or alleged loss of efficiency; morale, fatigue, attitude, or labor rhythm; constructive acceleration; home office overhead; expectant underrun; trade stacking; reassignment of workers; rescheduling of Work, concurrent operations; dilution of supervision; learning curve; beneficial or joint occupancy; logistics; ripple; season change; extended overhead; profit upon damages for delay; impact damages including cumulative impacts; or similar damages. Any effect that such alleged events may have on Contractor or its Subcontractors, to the extent not otherwise paid, is subsumed in and fully compensated through the percentage Fee on Change Orders paid through Section 7.02A.3.e and any liquidated damages paid hereunder.

3.06 NOTICE TO OWNER OF LABOR DISPUTES

- A. Contractor to notify Owner of labor disputes: If Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay timely performance in accordance with the Contract Documents, Contractor shall immediately give notice, including all relevant information, to Owner.
- B. Pass through notification provisions to Subcontractors: Contractor agrees to insert a provision in its Subcontracts and to require insertion in all sub-subcontracts, that in the event timely performance of any such contract is delayed or threatened by delay by any actual or potential labor dispute, the Subcontractor or Sub-subcontractor shall immediately notify the next higher tier Subcontractor or Contractor, as the case may be, of all relevant information concerning the dispute.

3.07 DAMAGES FOR FAILURE TO ACHIEVE TIMELY COMPLETION

- A. Liquidated Damages:
 - 1. Reason for Liquidated Damages: Timely performance and completion of the Work is essential to Owner and time limits stated in the Contract Documents are of the essence.

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Owner will incur serious and substantial damages if Substantial Completion of the Work does not occur within the Contract Time. However, it would be difficult if not impossible to determine the exact amount of such damages. Consequently, provisions for liquidated damages are included in the Contract Documents.

2. Calculation of Liquidated Damages amount: The liquidated damage amounts set forth in the Contract Documents will be assessed not as a penalty, but as liquidated damages for breach of the Contract Documents. This amount is fixed and agreed upon by and between the Contractor and Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain. This amount shall be construed as the actual amount of damages sustained by the Owner, and may be retained by the Owner and deducted from periodic payments to the Contractor.
 3. Contractor responsible even if Liquidated Damages assessed: Assessment of liquidated damages shall not release Contractor from any obligations or liabilities pursuant to the Contract Documents. If Contractor substantially fails to perform in a timely manner in accordance with the Contract Documents and, through the fault of Contractor or Subcontractor(s), fails to achieve Substantial Completion within the Contract Time, Contractor shall be in default.
- B. Actual Damages: If no liquidated damages are established, actual damages may be assessed for failure to achieve both Substantial Completion and Final Completion within the time provided. Actual damages will be calculated on the basis of direct architectural, administrative, and other related costs attributable to the Project from the date when Substantial and/or Final Completion should have been achieved, as applicable. Owner may offset these costs against any payment due Contractor.

PART 4 - SPECIFICATIONS, DRAWINGS, AND OTHER DOCUMENTS

4.01 DISCREPANCIES AND CONTRACT DOCUMENT REVIEW

- A. Specifications and Drawings are basis of the Work: The intent of the Specifications and Drawings is to describe a complete Project to be constructed in accordance with the Contract Documents. Contractor shall furnish all labor, materials, equipment, tools, transportation, permits, and supplies, and perform the Work required in accordance with the Drawings, Specifications, and other provisions of the Contract Documents.
- B. Parts of the Contract Documents are complementary: The Contract Documents are complementary. What is required by one part of the Contract Documents shall be binding as if required by all. Anything mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be of like effect as if shown or mentioned in both.
- C. Contractor to report discrepancies in Contract Documents: Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by Owner. If, during the performance of the Work, Contractor finds a conflict, error, inconsistency, or omission in the Contract Documents, it shall promptly and before proceeding with the Work affected thereby, report such conflict, error, inconsistency, or omission to A/E in writing.
- D. Contractor knowledge of discrepancy in documents – responsibility: Contractor shall do no Work without applicable Drawings, Specifications, and, where required, accepted shop drawings and other Submittals, unless instructed to do so in writing by Owner. If Contractor performs any construction activity, and it knows or reasonably should have known that any of the Contract

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Documents contain a conflict, error, inconsistency, or omission, Contractor shall be responsible for the performance and shall bear the cost for its correction.

- E. Contractor to perform Work implied by Contract Documents: Contractor shall provide any work or materials the provision of which is clearly implied and is within the scope of the Contract Documents even if the Contract Documents do not mention them specifically.
- F. Interpretation questions referred to A/E: Questions regarding interpretation of the requirements of the Contract Documents shall be referred to the A/E.

4.02 PROJECT RECORD

- A. Contractor to maintain Project Record Drawings and Specifications: Contractor shall legibly mark in ink on a separate set of the Drawings and Specifications all actual construction, including depths of foundations, horizontal and vertical locations of internal and underground utilities and appurtenances referenced to permanent visible and accessible surface improvements, field changes of dimensions and details, actual suppliers, manufacturers and trade names, models of installed equipment, changes made to the building enclosure, and Change Order Proposals. This separate set of Drawings and Specifications shall be the "Project Record." The Project Record shall include all Architectural, Mechanical, Electrical, Structural and Civil as-built drawings, whether or not any changes occur and shall also include Addenda, Change Orders, WDs and other modifications to the Contract, in good order and marked currently to indicate field changes and selections made during construction, as well as one copy of accepted shop drawings, product data, samples and other required Submittals.
- B. Update Project Record weekly and keep on site: The Project Record shall be maintained on the Project site throughout the construction and shall be clearly labeled "PROJECT RECORD." The Project Record shall be available to A/E and Owner at all times. The Project Record shall be updated at least weekly noting all changes and shall be available to Owner at all times.
- C. Final Project Record to A/E before Final Acceptance: Contractor shall submit the completed and finalized Project Record to A/E prior to Final Acceptance.

4.03 SUBMITTALS

- A. Definition of Submittals: "Submittals" means documents and other information required to be submitted to A/E by Contractor pursuant to the Contract Documents, showing in detail: the proposed fabrication and assembly of structural elements; and the installation (i.e. form, fit, and attachment details) of materials and equipment. Submittals can include, but are not limited to, drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, samples, and similar materials furnished by Contractor to explain in detail specific portions of the Work required by the Contract Documents. For materials and equipment to be incorporated into the Work, Contractor submittal shall include the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the item. When directed, Contractor shall submit all samples at its own expense. Owner may duplicate, use, and disclose Submittals provided in accordance with the Contract Documents.
- B. Approval of Submittals by Contractor and A/E: Contractor shall coordinate all Submittals with the Progress Schedule per Section 3.02A, shall review them for accuracy, completeness, and compliance with the Contract Documents, and shall indicate its approval thereon as evidence of such coordination and review. Where required by law, Submittals shall be stamped by an appropriate professional licensed by the state of Washington. Submittals submitted to A/E without evidence of Contractor's approval shall be returned for resubmission. Contractor shall

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review, approve, and submit Submittals with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of Owner or separate contractors. Contractor's submittal schedule shall allow a reasonable time for A/E review. A/E will review, approve, or take other appropriate action on the Submittals. Contractor shall perform no portion of the Work requiring submittal and review of Submittals until the respective submittal has been reviewed and the A/E has approved or taken other appropriate action. Owner and A/E shall respond to Submittal with reasonable promptness. Any Work by Contractor shall be in accordance with reviewed Submittals. Submittals made by Contractor which are not required by the Contract Documents may be returned without action.

- C. Contractor not relieved of responsibility when Submittals approved: Approval, or other appropriate action with regard to Submittals, by Owner or A/E shall not relieve Contractor of responsibility for any errors or omissions in such Submittals, nor from responsibility for compliance with the requirements of the Contract Documents. Unless specified in the Contract Documents, review by Owner or A/E shall not constitute an approval of the safety precautions employed by Contractor during construction, or constitute an approval of Contractor's means or methods of construction. If Contractor fails to obtain approval before installation and the item or work is subsequently rejected, Contractor shall be responsible for all costs of correction.
- D. Variations between Submittals and Contract Documents: Submittals, including product data, samples and similar submissions, are not Contract Documents. If Submittals vary from the requirements of the Contract Documents, Contractor shall describe such variations in writing, separate from the Submittals, at the time it submits the Submittals containing such variations. If Owner approves any such variation, an appropriate Change Order will be issued. If the variation is minor and does not involve an adjustment in the Contract Sum or Contract Time, a Change Order need not be issued; however, the modification shall be approved by Owner in writing and recorded upon the Project Record. Approval for substitutions shall not be sought and shall not be approved through the submission of Submittals.
- E. Contractor to submit 5 copies of Submittals: Unless otherwise provided in Division 1, Contractor shall submit to A/E for approval 5 copies of all Submittals. Unless otherwise indicated, 3 sets of all Submittals shall be retained by A/E and 2 sets shall be returned to Contractor.

4.04 ORGANIZATION OF SPECIFICATIONS

Specification organization by trade: Specifications are prepared in sections which conform generally with trade practices. These sections are for Owner and Contractor convenience and shall not control Contractor in dividing the Work among the Subcontractors or in establishing the extent of the Work to be performed by any trade.

4.05 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS, AND OTHER DOCUMENTS

- A. A/E, not Contractor, owns Copyright of Drawings and Specifications: The Drawings, Specifications, and other documents prepared by A/E are instruments of A/E's service through which the Work to be executed by Contractor is described. Neither Contractor nor any Subcontractor shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by A/E, and A/E shall be deemed the author of them and will, along with any rights of Owner, retain all common law, statutory, and other reserved rights, in addition to the copyright. All copies of these documents, except Contractor's set, shall be returned or suitably accounted for to A/E, on request, upon completion of the Work.
- B. Drawings and Specifications to be used only for this Project: The Drawings, Specifications, and other documents prepared by the A/E, and copies thereof furnished to Contractor, are for use solely with respect to this Project. They are not to be used by Contractor or any Subcontractor on

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other projects or for additions to this Project outside the scope of the Work without the specific written consent of Owner and A/E. Contractor and Subcontractors are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications, and other documents prepared by A/E appropriate to and for use in the execution of their Work.

- C. License granted to Owner: Contractor and all Subcontractors grant a non-exclusive license to Owner, without additional cost or royalty, to use for its own purposes (including reproduction) all Submittals, together with the information and diagrams contained therein, prepared by Contractor or any Subcontractor. In providing Submittals, Contractor and all Subcontractors warrant that they have authority to grant to Owner a license to use the Submittals, and that such license is not in violation of any copyright or other intellectual property right. Contractor agrees to defend and indemnify Owner pursuant to the indemnity provisions in Section 5.03 and 5.22 from any violations of copyright or other intellectual property rights arising out of Owner's use of the Submittals hereunder, or to secure for Owner, at Contractor's own cost, licenses in conformity with this section.
- D. Submittals to be used only for this Project: Submittals prepared by Contractor, Subcontractors of any tier, or its or their equipment or material suppliers, and copies thereof furnished to Contractor, are for use solely with respect to this Project. They are not to be used by Contractor or any Subcontractor of any tier, or material or equipment supplier, on other projects or for additions to this Project outside the scope of the Work without the specific written consent of Owner. The Contractor, Subcontractors of any tier, and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Submittals appropriate to and for use in the execution of their Work under the Contract Documents.
- E. Electronic Files: If the parties intend to transmit the instruments of service or any other information or documentation in digital form (other than PDF), they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Contract Documents.

PART 5 - PERFORMANCE

5.01 CONTRACTOR CONTROL AND SUPERVISION

- A. Contractor responsible for Means and Methods of construction: Contractor shall supervise and direct the Work, using its best skill and attention, and shall perform the Work in a skillful manner. 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, unless the Contract Documents give other specific instructions concerning these matters. Contractor shall disclose its means and methods of construction when requested by Owner.
- B. Competent superintendent required: Contractor, as soon as practicable after award of the Contract, shall furnish in writing to Owner the name and qualifications of its proposed superintendent. Owner may reply within 14 Days to Contractor in writing stating (1) whether Owner has reasonable objection to the proposed superintendent or (2) that Owner requires additional time to review. Failure of Owner to reply within the 14-Day period shall constitute Notice of no reasonable objection. The superintendent shall not be employed on any other project during the course of the Work. Unless approved by the Owner's representative and only when overseeing projects on the same campus or location where oversight and supervision will not be degraded. Performance of the Work shall be directly supervised by a competent superintendent who shall be in attendance at the Project site during performance of the Work and who has authority to act on behalf of Contractor. Communications given to the superintendent shall be as binding as if given to Contractor. The superintendent must be satisfactory to Owner and shall not be changed without the prior written consent of Owner. Owner may require

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Contractor to remove the superintendent from the Work or Project site, if Owner reasonably deems the superintendent incompetent, careless, or otherwise objectionable, provided Owner has first notified Contractor in writing and allowed a reasonable period for transition.

- C. Contractor responsible for acts and omissions of self and agents: Contractor shall be responsible to Owner for acts and omissions of Contractor, Subcontractors, and their employees and agents.
- D. Contractor to employ competent and disciplined workforce: Contractor shall enforce strict discipline and good order among all of the Contractor's employees and other persons performing the Work. Contractor shall not permit employment of persons not skilled in tasks assigned to them. Contractor's employees shall at all times conduct business in a manner which assures fair, equal, and nondiscriminatory treatment of all persons. Owner may, by written notice, request Contractor to remove from the Work or Project site any employee Owner reasonably deems incompetent, careless, or otherwise objectionable.
- E. Contractor to keep project documents on site: Contractor shall keep on the Project site a copy of the Drawings, Specifications, addenda, reviewed Submittals, and permits and permit drawings.
- F. Contractor to comply with ethical standards: Contractor shall ensure that its owner(s) and employees, and those of its Subcontractors, comply with the Ethics in Public Service Act RCW 42.52, which, among other things, prohibits state employees from having an economic interest in any public works contract that was made by, or supervised by, that employee. Contractor shall remove, at its sole cost and expense, any of its, or its Subcontractors' employees, if they are in violation of this act.

5.02 PERMITS, FEES, AND NOTICES

- A. Contractor to obtain and pay for permits: Unless otherwise provided in the Contract Documents, Contractor shall secure and pay for the building, any land use permits and all other permits, licenses, and inspections necessary for proper execution and completion of the Work. Prior to Final Acceptance, the approved, signed permits shall be delivered to Owner.
- B. Allowances for permit fees: If allowances for permits or utility fees are called for in the Contract Documents and set forth in Contractor's bid, and the actual costs of those permits or fees differ from the allowances in the Contract Documents, the difference shall be adjusted by Change Order.
- C. Contractor to comply with all applicable laws: Contractor shall comply with and give notices required by all federal, state, and local laws, ordinances, rules, regulations, and lawful orders of public authorities applicable to performance of the Work.
- D. Taxes: Contractor shall pay sales, consumer, use, business and occupation, income and similar taxes for the Work that are legally enacted when the initial Contract Sum is agreed.

5.03 PATENTS AND ROYALTIES

Payment, indemnification, and notice: Contractor is responsible for, and shall pay, all royalties and license fees. Contractor shall defend, indemnify, and hold Owner harmless from any costs, expenses, and liabilities arising out of the infringement by Contractor of any patent, copyright, or other intellectual property right used in the Work; however, provided that Contractor gives prompt notice, Contractor shall not be responsible for such defense or indemnity when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents. If Contractor has reason to believe that use of the required design, process, or product constitutes an infringement of a patent or copyright, it shall promptly notify Owner of such potential infringement.

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- A. Contractor to pay Prevailing Wages: Contractor shall pay the prevailing rate of wages to all workers, laborers, or mechanics employed in the performance of any part of the Work in accordance with RCW 39.12 and the rules and regulations of the Department of Labor and Industries. The schedule of prevailing wage rates for the locality or localities of the Work, is determined by the Industrial Statistician of the Department of Labor and Industries. It is the Contractor's responsibility to verify the applicable prevailing wage rate.
- B. Statement of Intent to Pay Prevailing Wages: Before payment is made by the Owner to the Contractor for any work performed by the Contractor and subcontractors whose work is included in the application for payment, the Contractor shall submit, or shall have previously submitted to the Owner for the Project, a Statement of Intent to Pay Prevailing Wages, approved by the Department of Labor and Industries, certifying the rate of hourly wage paid and to be paid each classification of laborers, workers, or mechanics employed upon the Work by Contractor and Subcontractors. Such rates of hourly wage shall not be less than the prevailing wage rate.
- C. Affidavit of Wages Paid: Prior to release of retainage, the Contractor shall submit to the Owner an Affidavit of Wages Paid, approved by the Department of Labor and Industries, for the Contractor and every subcontractor that performed work on the Project.
- D. Disputes: Disputes regarding prevailing wage rates shall be referred for arbitration to the Director of the Department of Labor and Industries. The arbitration decision shall be final and conclusive and binding on all parties involved in the dispute as provided for by RCW 39.12.060.
- E. Statement with pay application; Post Statements of Intent at job site: Each Application for Payment submitted by Contractor shall state that prevailing wages have been paid in accordance with the prefilled statement(s) of intent, as approved. Copies of the approved intent statement(s) shall be posted on the job site with the address and telephone number of the Industrial Statistician of the Department of Labor and Industries where a complaint or inquiry concerning prevailing wages may be made.
- F. Contractor to pay for Statements of Intent and Affidavits: In compliance with chapter 296-127 WAC, Contractor shall pay to the Department of Labor and Industries the currently established fee(s) for each statement of intent and/or affidavit of wages paid submitted to the Department of Labor and Industries for certification.
- G. Certified Payrolls: Consistent with WAC 296-127-320, the Contractor and any subcontractor shall submit a certified copy of payroll records if requested.

5.05 HOURS OF LABOR

- A. Overtime: Contractor shall comply with all applicable provisions of RCW 49.28 and they are incorporated herein by reference.

5.06 NONDISCRIMINATION

- A. Discrimination prohibited by applicable laws: Discrimination in all phases of employment is prohibited by, among other laws and regulations, Title VII of the Civil Rights Act of 1964, the Vietnam Era Veterans Readjustment Act of 1974, Sections 503 and 504 of the Vocational Rehabilitation Act of 1973, the Equal Employment Act of 1972, the Age Discrimination Act of 1967, the Americans with Disabilities Act of 1990, the Civil Rights Act of 1991, Presidential Executive Order 11246, Executive Order 11375, the Washington State Law Against Discrimination, RCW 49.60, and Gubernatorial Executive Order 85-09. These laws and

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regulations establish minimum requirements for affirmative action and fair employment practices which Contractor must meet.

B. During performance of the Work:

1. Protected Classes: Contractor shall not discriminate against any employee or applicant for employment because of race, creed, color, national origin, citizenship or immigration status, sex, sexual orientation, gender identity, age, marital status, or the presence of any physical, sensory, or mental disability, Vietnam era veteran status, or disabled veteran status, honorably discharged veteran or military status, or the use of a trained dog guide or service animal by a person with a disability, nor commit any other unfair practices as defined in RCW 49.60.
2. Advertisements to state nondiscrimination: Contractor shall, in all solicitations or advertisements for employees placed by or for it, state that all qualified applicants will be considered for employment, without regard to race, creed, color, national origin, citizenship or immigration status, sex, sexual orientation, gender identity, age, marital status, or the presence of any physical, sensory, or mental disability, honorably discharged veteran or military status, or the use of a trained dog guide or service animal by a person with a disability.
3. Contractor to notify unions and others of nondiscrimination: Contractor shall send to each labor union, employment agency, or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice advising the labor union, employment agency, or workers' representative of Contractor's obligations according to the Contract Documents and RCW 49.60.
4. Owner and State access to Contractor records: Contractor shall permit access to its books, records, and accounts, and to its premises by Owner, and by the Washington State Human Rights Commission, for the purpose of investigation to ascertain compliance with this section of the Contract Documents.
5. Pass through provisions to Subcontractors: Contractor shall include the provisions of this section in every Subcontract.

5.07 SAFETY PRECAUTIONS

- A. Contractor responsible for safety: Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Work. Contractor shall be solely and completely responsible for conditions of the Project site, including safety of all persons and property, during performance of the Work. Contractor shall maintain the Project site and perform the Work in a manner that meets statutory and common-law requirements for the provision of a safe place to work. This requirement shall apply continuously and not be limited to working hours. Any review by Owner or A/E of Contractor's performance shall not be construed to include a review of the adequacy of Contractor's safety measures in, on or near the site of the Work.
- B. Contractor safety responsibilities: In carrying out its responsibilities according to the Contract Documents, Contractor shall protect the lives and health of employees performing the Work and other persons who may be affected by the Work; prevent damage to materials, supplies, and equipment whether on site or stored off-site; and prevent damage to other property at the site or adjacent thereto. Contractor shall comply with all applicable laws, ordinances, rules, regulations, and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss; shall erect and maintain all necessary safeguards for such

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safety and protection; and shall notify owners of adjacent property and utilities when prosecution of the Work may affect them.

- C. Contractor to maintain safety records: Contractor shall maintain an accurate record of exposure data on all incidents relating to the Work resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment. Contractor shall immediately report any such incident to Owner. Owner shall, at all times, have a right of access to all records of exposure.
- D. Contractor to provide HazMat training: Contractor shall provide all persons working on the Project site with information and training on hazardous chemicals in their work at the time of their initial assignment, and whenever a new hazard is introduced into their work area.
1. Information. At a minimum, Contractor shall inform persons working on the Project site of:
 - a. WAC: The requirements of chapter 296-62 WAC, General Occupational Health Standards;
 - b. Presence of hazardous chemicals: Any operations in their work area where hazardous chemicals are present; and
 - c. Hazard communications program: The location and availability of written hazard communication programs, including the required list(s) of hazardous chemicals and material safety data sheets required by chapter 296-62 WAC.
 2. Training. At a minimum, Contractor shall provide training for persons working on the Project site which includes:
 - a. Detecting hazardous chemicals: Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
 - b. Hazards of chemicals: The physical and health hazards of the chemicals in the work area;
 - c. Protection from hazards: The measures such persons can take to protect themselves from these hazards, including specific procedures Contractor, or its Subcontractors, or others have implemented to protect those on the Project site from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and
 - d. Hazard communications program: The details of the hazard communications program developed by Contractor, or its Subcontractors, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.
- E. Hazardous, toxic or harmful substances: Contractor's responsibility for hazardous, toxic, or harmful substances shall include the following duties:
1. Illegal use of dangerous substances: Contractor shall not keep, use, dispose, transport, generate, or sell on or about the Project site, any substances now or hereafter designated as, or which are subject to regulation as, hazardous, toxic, dangerous, or

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harmful by any federal, state or local law, regulation, statute or ordinance (hereinafter collectively referred to as "hazardous substances"), in violation of any such law, regulation, statute, or ordinance, but in no case shall any such hazardous substance be stored more than 90 Days on the Project site.

2. Contractor notifications of spills, failures, inspections, and fines: Contractor shall promptly notify Owner of all spills or releases of any hazardous substances which are otherwise required to be reported to any regulatory agency and pay the cost of cleanup. Contractor shall promptly notify Owner of all failures to comply with any federal, state, or local law, regulation, or ordinance; all inspections of the Project site by any regulatory entity concerning the same; all regulatory orders or fines; and all responses or interim cleanup actions taken by or proposed to be taken by any government entity or private party on the Project site.
- F. Public safety and traffic: All Work shall be performed with due regard for the safety of the public. Contractor shall perform the Work so as to cause a minimum of interruption of vehicular traffic or inconvenience to pedestrians. All arrangements to care for such traffic shall be Contractor's responsibilities. All expenses involved in the maintenance of traffic by way of detours shall be borne by Contractor.
- G. Contractor to act in an emergency: In an emergency affecting the safety of life or the Work or of adjoining property, Contractor is permitted to act, at its discretion, to prevent such threatened loss or injury, and Contractor shall so act if so authorized or instructed.
- H. No duty of safety by Owner or A/E: Nothing provided in this Section 5.07 shall relieve Contractor of sole and complete responsibility for safety at the Project site, for sole and complete responsibility for any violation of safety or property protection requirements or the correction thereof, or impose any duty upon Owner or A/E with regard to, or as constituting any express or implied assumption of control or responsibility over, any other safety conditions relating to employees or agents of Contractor or any of its Subcontractors, or the public. Any Notice Owner or A/E gives to Contractor of a safety or property protection violation will not: (1) relieve Contractor of sole and complete responsibility for the violation and the correction thereof, or for sole liability for the consequences of said violation; (2) impose any obligation upon Owner or A/E to inspect or review Contractor's safety program or precautions or to enforce Contractor's compliance with the requirements of this Section 5.07; or (3) impose any continuing obligation upon Owner or A/E to provide such Notice to Contractor or any other persons or entity.

5.08 OPERATIONS, MATERIAL HANDLING, AND STORAGE AREAS

- A. Limited storage areas: Contractor shall confine all operations, including storage of materials, to Owner-approved areas.
- B. Temporary buildings and utilities at Contractor expense: Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be provided by Contractor only with the consent of Owner and without expense to Owner. The temporary buildings and utilities shall be removed by Contractor at its expense upon completion of the Work.
- C. Roads and vehicle loads: Contractor shall use only established roadways or temporary roadways authorized by Owner. When materials are transported in prosecuting the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by federal, state, or local law or regulation.
- D. Ownership and reporting by Contractor of demolished materials: Ownership and control of all materials or facility components to be demolished or removed from the Project site by Contractor

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shall immediately vest in Contractor upon severance of the component from the facility or severance of the material from the Project site. Contractor shall be responsible for compliance with all laws governing the storage and ultimate disposal. Contractor shall provide Owner with a copy of all manifests and receipts evidencing proper disposal when required by Owner or applicable law.

- E. Contractor responsible for care of materials and equipment on-site: Contractor shall be responsible for the proper care and protection of its materials and equipment delivered to the Project site. Materials and equipment may be stored on the premises subject to approval of Owner. When Contractor uses any portion of the Project site as a shop, Contractor shall be responsible for any repairs, patching, or cleaning arising from such use.
- F. Contractor responsible for loss of materials and equipment: Contractor shall protect and be responsible for any damage or loss to the Work, or to the materials or equipment until the date of Substantial Completion, and shall repair or replace without cost to Owner any damage or loss that may occur, except damages or loss caused by the acts or omissions of Owner. Contractor shall also protect and be responsible for any damage or loss to the Work, or to the materials or equipment, after the date of Substantial Completion, and shall repair or replace without cost to Owner any such damage or loss that might occur, to the extent such damages or loss are caused by the acts or omissions of Contractor, or any Subcontractor.

5.09 PRIOR NOTICE OF EXCAVATION

- A. Excavation defined; Use of locator services: "Excavation" means an operation in which earth, rock, or other material on or below the ground is moved or otherwise displaced by any means, except the tilling of soil less than 12 inches in depth for agricultural purposes, or road ditch maintenance that does not change the original road grade or ditch flow line. Before commencing any excavation, Contractor shall provide notice of the scheduled commencement of excavation to all owners of underground facilities or utilities, through locator services.

5.10 UNFORESEEN PHYSICAL CONDITIONS

- A. Notice requirement for concealed or unknown conditions: If Contractor encounters conditions at the site which are subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents, or unknown physical conditions of an unusual nature which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then Contractor shall give written notice to Owner promptly and in no event later than 7 Days after the first observance of the conditions. Conditions shall not be disturbed prior to such notice.
- B. Adjustment in Contract Time and Contract Sum: If such conditions differ materially and cause a change in Contractor's cost of, or time required for, performance of any part of the Work, the Contractor may be entitled to an equitable adjustment in the Contract Time or Contract Sum, or both, provided it makes a request therefore as provided in Part 7.

5.11 PROTECTION OF EXISTING STRUCTURES, EQUIPMENT, VEGETATION, UTILITIES AND IMPROVEMENTS

- A. Contractor to protect and repair property: At all times until Owner's occupancy of the Work or a designated portion of the Work, Contractor shall protect the Work from damage, weather, deterioration, theft, vandalism and malicious mischief and shall bear the risk of any uninsured loss or destruction of, or injury or damage to, all materials, equipment, tools, and other items incorporated or to be incorporated in the Work or designated portion, or consumed or used in the performance of the Work or designated portion, including all Work in process and completed

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Work. Contractor shall protect from damage all existing structures, equipment, improvements, utilities, streets, curbs, walks and vegetation at or near the Project site or on adjacent property of a third party, the locations of which are made known to or should be known by Contractor. Contractor shall repair any damage, including that to the property of a third party, resulting from failure to comply with the requirements of the Contract Documents or failure to exercise reasonable care in performing the Work. If Contractor fails or refuses to repair the damage promptly, Owner may have the necessary work performed and charge the cost to Contractor. If a governmental authority having jurisdiction requires that the repairing and patching be done with its own labor and/or materials, Contractor shall abide by such regulations, and it shall pay for this work at no additional cost to Owner.

- B. Tree and vegetation protection: Contractor shall only remove trees when specifically authorized to do so, and shall protect vegetation that will remain in place.
- C. Special site conditions: If, in the course of the Work, Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, Contractor shall immediately suspend any operations that would affect them and shall notify Owner and A/E. Upon receipt of such Notice, Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. Contractor shall continue to suspend these operations until otherwise instructed by Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Part 8.

5.12 LAYOUT OF WORK

- A. Advanced planning of the Work: Contractor shall plan and lay out the Work in advance of operations so as to coordinate all work without delay or revision.
- B. Layout responsibilities: Contractor shall lay out the Work from Owner-established baselines and bench marks indicated on the Drawings, and shall be responsible for all field measurements in connection with the layout. Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the Work. Contractor shall be responsible for executing the Work to the lines and grades that may be established. Contractor shall be responsible for maintaining or restoring all stakes and other marks established.

5.13 MATERIAL AND EQUIPMENT

- A. Contractor to provide new and equivalent equipment and materials: All equipment, material, and articles incorporated into the Work shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in the Contract Documents. References in the Specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard quality and shall not be construed as limiting competition. Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of A/E and after submittal and approval of a substitute request, is equal to that named in the Specifications, unless otherwise specifically provided in the Contract Documents.
- B. Contractor responsible for fitting parts together: Contractor shall do all cutting, fitting, or patching that may be required to complete the Work or to make its several parts fit together properly, or receive or be received by work of others set forth in, or reasonably implied by, the Contract Documents. Contractor shall not damage or endanger any work of Owner or separate contractors by cutting, excavating, or otherwise altering the Work and shall not cut or alter the

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work of any other contractor unless approved in advance by Owner. Contractor shall restore all areas requiring cutting, fitting and patching to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

- C. Owner may reject defective Work: Should any of the Work be found defective, or in any way not in accordance with the Contract Documents, this Work, in whatever stage of completion, may be rejected by Owner. However, neither this authority of Owner nor a decision made either to exercise or not to exercise such authority shall give rise to a duty or responsibility of Owner or its representatives to Contractor, Subcontractors, their agents or employees, or other persons or entities performing portions of the Work.

5.14 AVAILABILITY AND USE OF UTILITY SERVICES

- A. Owner to provide and charge for utilities: Owner shall make all reasonable utilities available to Contractor from existing outlets and supplies, as specified in the Contract Documents. Unless otherwise provided in the Contract Documents, the utility service consumed shall be charged to or paid for by Contractor at prevailing rates charged to Owner or, where the utility is produced by Owner, at reasonable rates determined by Owner. Contractor will carefully conserve any utilities furnished.
- B. Contractor to install temporary connections and meters: Contractor shall, at its expense and in a skillful manner satisfactory to Owner, install and maintain all necessary temporary connections and distribution lines, together with appropriate protective devices, and all meters required to measure the amount of each utility used for the purpose of determining charges. Prior to the date of Final Acceptance, Contractor shall remove all temporary connections, distribution lines, meters, and associated equipment and materials.

5.15 TESTS AND INSPECTION

- A. Contractor to provide for all testing and inspection of Work: Contractor shall maintain an adequate testing and inspection program and perform such tests and inspections as are necessary or required to ensure that the Work conforms to the requirements of the Contract Documents. Contractor shall be responsible for inspection and quality surveillance of all its Work and all Work performed by any Subcontractor. Unless otherwise provided, Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. Contractor shall give Owner timely notice of when and where tests and inspections are to be made. Contractor shall maintain complete inspection records and make them available to Owner.
- B. Owner may conduct tests and inspections: Owner may, at any reasonable time, conduct such inspections and tests as it deems necessary to ensure that the Work is in accordance with the Contract Documents. Owner shall promptly notify Contractor if an inspection or test reveals that the Work is not in accordance with the Contract Documents. Unless the subject items are expressly accepted by Owner, such Owner inspection and tests are for the sole benefit of Owner and do not:
1. Constitute or imply acceptance;
 2. Relieve Contractor of responsibility for providing adequate quality control measures;
 3. Relieve Contractor of responsibility for risk of loss or damage to the Work, materials, or equipment;

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4. Relieve Contractor of its responsibility to comply with the requirements of the Contract Documents; or
 5. Impair Owner's right to reject defective or nonconforming items, or to avail itself of any other remedy to which it may be entitled.
- C. Inspections or inspectors do not modify Contract Documents: Neither observations by an inspector retained by Owner, the presence or absence of such inspector on the site, nor inspections, tests, or approvals by others, shall relieve Contractor from any requirement of the Contract Documents, nor is any such inspector authorized to change any term or condition of the Contract Documents.
- D. Contractor responsibilities on inspections: Contractor shall promptly furnish, without additional charge, all facilities, labor, material and equipment reasonably needed for performing such safe and convenient inspections and tests as may be required by Owner. Owner may charge Contractor any additional cost of inspection or testing when Work is not ready at the time specified by Contractor for inspection or testing, or when prior rejection makes reinspection or retest necessary. Owner shall perform its inspections and tests in a manner that will cause no undue delay in the Work.

5.16 CORRECTION OF NONCONFORMING WORK

- A. Work covered by Contractor without inspection: If a portion of the Work is covered contrary to the request of Owner or the requirements in the Contract Documents or a governmental authority having jurisdiction, it must, if required in writing by Owner, be uncovered for Owner's observation and be replaced at Contractor's expense and without change in the Contract Sum or Contract Time.
- B. Payment provisions for uncovering covered Work: If, at any time prior to Final Completion, Owner desires to examine the Work, or any portion of it, which has been covered, Owner may request to see such Work and it shall be uncovered by Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an adjustment in the Contract Sum for the costs of uncovering and replacement, and, if completion of the Work is thereby delayed, an adjustment in the Contract Time, provided it makes such a request as provided in Part 7. If such Work is not in accordance with the Contract Documents, the Contractor shall pay the costs of examination and reconstruction.
- C. Contractor to correct and pay for non-conforming Work: Contractor shall promptly correct Work found by Owner not to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed, or completed. Contractor shall bear all costs of correcting such nonconforming Work, including additional testing and inspections.
- D. Contractor's compliance with correction and warranty provisions: If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or within one year after the date for commencement of any system warranties established under Section 6.08, or within the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, Contractor shall correct it promptly after receipt of written Notice from Owner to do so. Owner shall give such Notice promptly after discovery of the condition. This period of one year shall be extended, with respect to portions of Work first performed after Substantial Completion, by the period of time between Substantial Completion and the actual performance of the Work. Contractor's duty to correct with respect to Work repaired or replaced shall run for one year from the date of repair or

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replacement. Obligations under this Section 5.16D shall survive Final Acceptance and are in addition to other warranties provided by contract or law.

- E. Contractor to remove non-conforming Work: Contractor shall remove from the Project site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by Contractor nor accepted by Owner.
- F. Owner may charge Contractor for non-conforming Work: If Contractor fails to correct nonconforming Work within a reasonable time after written notice to do so, Owner may replace, correct, or remove the nonconforming Work and charge the cost thereof to the Contractor.
- G. Contractor to pay for damaged Work during correction: Contractor shall bear the cost of correcting destroyed or damaged Work, whether completed or partially completed, caused by Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.
- H. No Period of limitation on other requirements: Nothing contained in this section shall be construed to establish a period of limitation with respect to other obligations which Contractor might have according to the Contract Documents. Establishment of the time period of one year as described in Section 5.16D relates only to the specific obligation of Contractor to correct the Work, and has no relationship to the time within which the Contractor's obligation to comply with the Contract Documents may be sought to be enforced, including the time within which such proceedings may be commenced.
- I. Owner may accept non-conforming Work and charge Contractor: If Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, Owner may do so instead of requiring its removal and correction, in which case the Contract Sum may be reduced as appropriate and equitable.

5.17 CLEAN UP

Contractor to keep site clean and leave it clean: Contractor shall at all times keep the Project site, including hauling routes, infrastructures, utilities, and storage areas, free from accumulations of waste materials. Before completing the Work, Contractor shall remove from the premises its rubbish, tools, scaffolding, equipment, and materials. Upon completing the Work, Contractor shall leave the Project site in a clean, neat, and orderly condition satisfactory to Owner. If Contractor fails to clean up as provided herein, and after reasonable notice from Owner, Owner may do so and the cost thereof shall be charged to Contractor.

5.18 ACCESS TO WORK

Owner and A/E access to Work site: Contractor shall provide Owner and A/E access to the Work in progress wherever located.

5.19 OTHER CONTRACTS

Owner may award other contracts; Contractor to cooperate: Owner may undertake or award other contracts for additional work at or near the Project site. Owner shall help coordinate the activities of Owner's own forces and of each separate contractor engaged by Owner with the Work of Contractor, who shall reasonably cooperate with the other contractors and with Owner's employees and shall carefully adapt scheduling and perform the Work in accordance with these Contract Documents to reasonably accommodate the other work.

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5.20 SUBCONTRACTORS AND SUPPLIERS

- A. Subcontractor Responsibility: The Contractor shall include the language of this paragraph in each of its first tier subcontracts, and shall require each of its subcontractors to include the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. Upon request of the Owner, the Contractor shall promptly provide documentation to the Owner demonstrating that the subcontractor meets the subcontractor responsibility criteria below. The requirements of this paragraph apply to all subcontractors regardless of tier. At the time of subcontract execution, the Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:
1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;
 2. Have a current Washington Unified Business Identifier (UBI) number;
 3. If applicable, have:
 - a. Industrial Insurance (workers' compensation) coverage for the subcontractor's employees working in Washington, as required in Title 51 RCW;
 - b. A Washington Employment Security Department number, as required in Title 50 RCW;
 - c. A Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
 - d. An electrical contractor license, if required by Chapter 19.28 RCW;
 - e. An elevator contractor license, if required by Chapter 70.87 RCW.
 4. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065 (3).
 5. On a project subject to the apprenticeship utilization requirements in RCW 39.04.320, not have been found out of compliance by the Washington state apprenticeship and training council for working apprentices out of ratio, without appropriate supervision, or outside their approved work processes as outlined in their standards of apprenticeship under chapter 49.04 RCW for the one-year period immediately preceding the date of the Owner's first advertisement of the project.
 6. Meet all supplemental responsibility criteria set forth in the Contract Documents.
- B. Provide names of Subcontractors and use qualified firms: Before submitting the first Application for Payment, Contractor shall furnish in writing to Owner the names, addresses, and telephone numbers of all Subcontractors, as well as suppliers providing materials in excess of \$2,500. Contractor shall utilize Subcontractors and suppliers which are experienced and qualified, and meet the requirements of the Contract Documents, if any. Contractor shall not utilize any Subcontractor or supplier to whom Owner has a "reasonable objection," and shall obtain Owner's written consent before making any substitutions or additions. A "reasonable objection" shall include without limitation:
- .1 a proposed Subcontractor differing from the entity listed with a proposal or bid,

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- .2 lack of "responsibility" of the proposed Subcontractor, as defined in RCW 39.04.350 or otherwise in the Contract Documents, or
 - .3 lack of qualification, including technical qualification, as required by the Specifications.
- C. Subcontracts in writing and pass through provision: All Subcontracts must be in writing. By appropriate written agreement, Contractor shall require each Subcontractor, so far as applicable to the Work to be performed by the Subcontractor, to be bound to Contractor by terms of the Contract Documents, and to assume toward Contractor all the obligations and responsibilities which Contractor assumes toward Owner in accordance with the Contract Documents. Each Subcontract shall preserve and protect the rights of Owner in accordance with the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights. Where appropriate, Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. However, nothing in this paragraph shall be construed to alter the contractual relations between Contractor and its Subcontractors with respect to insurance or bonds.
- D. Coordination of Subcontractors; Contractor responsible for Work: Contractor shall schedule, supervise, and coordinate the operations of all Subcontractors. No Subcontracting of any of the Work shall relieve Contractor from its responsibility for the performance of the Work in accordance with the Contract Documents or any other obligations of the Contract Documents.
- E. Automatic assignment of subcontracts: Each subcontract agreement for a portion of the Work is hereby assigned by Contractor to Owner provided that:
1. Effective only after termination and Owner approval: The assignment is effective only after termination by Owner for cause pursuant to Section 9.01 and only for those Subcontracts which Owner accepts by notifying the Subcontractor in writing; and
 2. Owner assumes Contractor's responsibilities: After the assignment is effective, Owner will assume all future duties and obligations toward the Subcontractor which Contractor assumed in the Subcontract.
 3. Impact of bond: The assignment is subject to the prior rights of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.

5.21 WARRANTY OF CONSTRUCTION

- A. Contractor warranty of Work: In addition to any special warranties provided elsewhere in the Contract Documents, Contractor warrants that all Work conforms to the requirements of the Contract Documents and is free of any defect in equipment, material, or design furnished, or workmanship performed by Contractor.
- B. Contractor responsibilities: With respect to all warranties, express or implied, for Work performed or materials furnished according to the Contract Documents, Contractor shall:
1. Obtain warranties: Obtain, assign if requested, and furnish directly to Owner, all warranties that would be given in normal commercial practice or that are required by the Contract Documents, first executed by the applicable Subcontractor and those suppliers and manufacturers furnishing materials for the Work, and subsequently countersigned by Contractor, which shall extend to Owner all rights, claims, benefits and interests that Contractor may have under express or implied warranties or guarantees against the Subcontractor, supplier or manufacturer for defective or non-conforming Work;

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2. Warranties for benefit of Owner: Require all warranties to be executed, in writing, for the benefit of Owner;
 3. Enforcement of warranties: Enforce all warranties for the benefit of Owner, if directed by Owner; and
 4. Contractor responsibility for subcontractor warranties: Be responsible to enforce any subcontractor's, manufacturer's, or supplier's warranties should they extend beyond the period specified in the Contract Documents.
- C. Warranties beyond Final Acceptance: The obligations under this section shall survive Final Acceptance.

5.22 INDEMNIFICATION

- A. Contractor to indemnify Owner: To the fullest extent permitted by law, Contractor shall defend, indemnify, and hold Owner and A/E, their consultants, and agents and employees, directors, officers, lenders, successors and assigns of any of them (collectively, the "Indemnified Parties"), harmless from and against all third-party claims, demands, losses, damages, or costs, including but not limited to damages arising out of bodily injury or death to persons and damage to property, direct and indirect, or consequential (including but not limited to costs and attorneys' fees incurred on such claims or in proving the right to indemnification), arising out of, caused by or resulting from:
1. Sole negligence of Contractor: The sole negligence or willful misconduct of Contractor or any of its Subcontractors, their agents and anyone directly or indirectly employed by them or anyone for whose acts they may be liable ("Indemnitor");
 2. Concurrent negligence: The concurrent negligence of Indemnitor, but only to the extent of the negligence of Indemnitor; and
 3. Patent infringement: The use of any design, process, or equipment that constitutes an infringement of any United States patent presently issued, or violates any other proprietary interest, including copyright, trademark, and trade secret, unless specifically directed to use such design, process, or equipment by Owner.

The obligations of Contractor under this Section 5.22 shall not be construed to negate, abridge, or otherwise reduce any other right or obligations of indemnity that would otherwise exist as to any party or person described in this Section. To the extent the wording of this Section 5.22 would reduce or eliminate the insurance coverage of Owner or Contractor, this Section 5.22 shall be considered modified to the extent that such insurance coverage is not affected. To the extent that any portion of this Section 5.22 is stricken by a court or arbitrator for any reason, all remaining provisions shall retain their vitality and effect. The provisions of this Section 5.22 shall survive completion, acceptance, final payment and termination of the Contract.

- B. Employee action and RCW Title 51: In any action against Owner and any other entity indemnified in accordance with this section, by any employee of Contractor, its Subcontractors, Sub-subcontractors, agents, or anyone directly or indirectly employed by any of them, the indemnification obligation of this section shall not be limited by a limit on the amount or type of damages, compensation, or benefits payable by or for Contractor or any Subcontractor under RCW Title 51, the Industrial Insurance Act, or any other employee benefit acts. In addition, Contractor waives immunity as to Owner and A/E only, in accordance with RCW Title 51.

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PART 6 - PAYMENTS AND COMPLETION

6.01 CONTRACT SUM

Owner shall pay Contract Sum: Owner shall pay Contractor the Contract Sum plus Washington State sales tax for performance of the Work, in accordance with the Contract Documents.

6.02 SCHEDULE OF VALUES

Contractor to submit Schedule of Values: Before submitting its first Application for Payment, Contractor shall submit to Owner for approval a breakdown allocating the total Contract Sum to each principal category of work, in such detail as requested by Owner ("Schedule of Values"). The approved Schedule of Values shall allocate at least the percentage of the original Contract Sum so designated in the Contract Documents to that portion of the Work between Substantial Completion and Final Completion to recognize not-yet-earned costs for demobilization, Project Record, O&M manuals, and any other requirements for Project closeout and in advancing the Work from Substantial Completion to Final Completion. The approved Schedule of Values shall be used by Owner as a basis for reviewing progress payments. Payment for Work shall be made only for and in accordance with those items included in the Schedule of Values.

6.03 APPLICATION FOR PAYMENT

- A. Monthly Application for Payment with substantiation: At monthly intervals, unless determined otherwise by Owner, Contractor shall submit to Owner an itemized Application for Payment for Work (using Owner's form) completed in accordance with the Contract Documents and the approved Schedule of Values. Each application shall be supported by such substantiating data as Owner may require.
- B. Contractor certifies Subcontractors paid: By submitting an Application for Payment, Contractor is certifying that all Subcontractors have been paid, less earned retainage in accordance with RCW 60.28.011, as their interests appeared in the last preceding Application for Payment. By submitting an Application for Payment, Contractor is recertifying that the representations set forth in Section 1.03 are true and correct, to the best of Contractor's knowledge, as of the date of the Application for Payment. Owner has the right to request written evidence from Contractor that Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by Owner to Contractor for subcontracted Work. Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Owner shall not have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.
- C. Reconciliation of Work with Progress Schedule: At the time it submits an Application for Payment, Contractor shall analyze and reconcile, to the satisfaction of Owner, the actual progress of the Work with the Progress Schedule. The submission of an Application for Payment constitutes a certification that the Work is current on the Progress Schedule.
- D. Payment for material delivered to site or stored off-site: If authorized by Owner, the Application for Payment may include request for payment for material delivered to the Project site and suitably stored, or for completed preparatory work. Payment may similarly be requested for material stored off the Project site, provided Contractor complies with or furnishes satisfactory evidence of the following:
 - 1. Suitable facility or location: The material will be placed in a facility or location that is structurally sound, dry, lighted and suitable for the materials to be stored or otherwise approved by Owner;

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2. Facility or location within 10 miles of Project: The facility or location is located within a 10-mile radius of the Project. Other locations may be utilized, if approved in writing, by Owner;
3. Facility or location exclusive to Project's materials: Only materials for the Project are stored within the facility or location (or a secure portion of a facility or location set aside for the Project);
4. Insurance provided on materials in facility or location: Contractor furnishes Owner a certificate of insurance extending Contractor's insurance coverage for damage, fire, and theft to cover the full value of all materials stored, or in transit;
5. Facility or location locked and secure: The facility or location (or secure portion thereof) is continuously under lock and key, and only Contractor's authorized personnel shall have access;
6. Owner right of access to facility or location: Owner shall at all times have the right of access in company of Contractor;
7. Contractor assumes total responsibility for stored materials: Contractor and its surety assume total responsibility for the stored materials; and
8. Contractor provides documentation and Notice when materials moved to site: Contractor furnishes to Owner certified lists of materials stored, bills of lading, invoices, and other information as may be required, and shall also furnish Notice to Owner when materials are moved from storage to the Project site.

6.04 PROGRESS PAYMENTS

- A. Owner to pay within 30 Days: Owner shall make progress payments, in such amounts as Owner determines are properly due, within 30 Days after receipt of a properly executed Application for Payment. Owner shall notify Contractor in accordance with chapter 39.76 RCW if the Application for Payment does not comply with the requirements of the Contract Documents.
- B. Withholding retainage; Options for retainage: Owner shall retain 5% of the amount of each progress payment until 45 Days after Final Acceptance and receipt of all documents required by law or the Contract Documents, including, at Owner's request, consent of surety to release of the retainage. In accordance with chapter 60.28 RCW, Contractor may request that monies reserved be retained in a fund by Owner, deposited by Owner in a bank or savings and loan, or placed in escrow with a bank or trust company to be converted into bonds and securities to be held in escrow with interest to be paid to Contractor. Owner may permit Contractor to provide an appropriate bond in lieu of the retained funds.
- C. Title passes to Owner upon payment: Title to all Work and materials covered by a progress payment shall pass to Owner at the time of such payment free and clear of all liens, claims, security interests, and encumbrances. Passage of title shall not, however, relieve Contractor from any of its duties and responsibilities for the Work or materials, or waive any rights of Owner to insist on full compliance by Contractor with the Contract Documents. A progress payment, or partial or entire use or occupancy of the Project by Owner, shall not constitute acceptance of Work.
- D. Interest on unpaid balances: Payments due and unpaid in accordance with the Contract Documents shall bear interest as specified in chapter 39.76 RCW.

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6.05 PAYMENTS WITHHELD

- A. Owner's right to withhold payment: Owner may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any payment to such extent as may be necessary to protect Owner from loss or damage for reasons including but not limited to:
1. Non-compliant Work: Work not in accordance with the Contract Documents;
 2. Remaining Work to cost more than unpaid balance: Reasonable evidence that the Work required by the Contract Documents cannot be completed for the unpaid balance of the Contract Sum;
 3. Owner correction or completion of Work: Work by Owner to correct defective Work or complete the Work in accordance with Section 5.16;
 4. Third party claims for which Contractor may be responsible: Claims (except where an insurer has unconditionally accepted coverage without prior payment of any deductibles or self-insured retentions) filed or reasonable evidence indicating probable filing of such claims unless Contractor provides security acceptable to Owner;
 5. Failure to pay Subcontractor: The failure of Contractor to make payments to Subcontractors for labor, materials or equipment;
 6. Damages: Damage to Owner or a separate contractor (except where an insurer has unconditionally accepted coverage);
 7. Affidavits of Wages Paid: Failure to submit affidavits pertaining to wages paid as requested or otherwise required by statute;
 8. Progress Schedule: Failure to submit a properly updated Progress Schedule;
 9. Maintenance of Project Record: Failure to properly maintain as the Project Record;
 10. Other construction records: Failure to properly submit any other required construction reports or records;
 11. Certified payrolls: Failure to properly submit certified payrolls when requested;
 12. Contractor's failure to perform: Contractor's failure otherwise to perform in accordance with the Contract Documents; or
 13. Contractor's negligent acts or omissions: Cost or liability that may occur to Owner as the result of Contractor's fault or negligent acts or omissions.
- B. Owner to notify Contractor of withholding for unsatisfactory performance: In any case where part or all of a payment is going to be withheld for unsatisfactory performance, Owner shall notify Contractor in accordance with chapter 39.76 RCW.

6.06 RETAINAGE, BOND CLAIM RIGHTS, AND LIENS

- A. Chapters 39.08 RCW and 60.28 RCW incorporated by reference: Chapters 39.08 RCW and 60.28 RCW, concerning the rights and responsibilities of Contractor and Owner with regard to the performance and payment bonds and retainage, are made a part of the Contract Documents by reference as though fully set forth herein.

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- B. Liens: Contractor shall promptly pay (and secure the discharge of any liens asserted by) all persons properly furnishing labor, equipment, materials or other items in connection with the performance of the Work (including, but not limited to, any Subcontractors) to the extent that Owner has paid Contractor for this Work. Owner may, at its option, withhold payment, in whole or in part, to Contractor until lien and claim releases are furnished. Contractor may provide other security acceptable to Owner, such as a bond, in lieu of paying disputed liens or claims. Contractor shall defend, indemnify, and hold harmless Owner from any liens, including all expenses and attorneys' fees, except to the extent a lien has been recorded because of a failure of payment by Owner for the Work implicated in any such lien.

6.07 SUBSTANTIAL COMPLETION

- A. Substantial Completion defined: Substantial Completion is the stage in the progress of the Work (or portion thereof designated and approved by Owner) when the construction is sufficiently complete, in accordance with the Contract Documents, so Owner has full and unrestricted use and benefit of the facilities (or portion thereof designated and approved by Owner) for the use for which it is intended, the Project has been constructed in substantial accordance with the Contract Documents, and at a minimum the following elements have been accomplished (see also, Section 01 70 00 Project Completion):

1. A written punch list has been prepared;
2. The Authority Having Jurisdiction has granted a certificate of occupancy; and
3. The first final draft of the Operation and Maintenance manuals has been submitted to Owner.

All Work other than incidental corrective or punch list work shall be completed. Substantial Completion shall not have been achieved if the Work cannot achieve Final Completion within the time specified in the Agreement. The date Substantial Completion is achieved shall be established in writing by Owner. Contractor may request an early date of Substantial Completion which must be approved by Change Order. Owner's occupancy of the Work or designated portion thereof does not necessarily indicate that Substantial Completion has been achieved.

- B. Contractor to provide weekly reports before Substantial Completion: Beginning at least 30 Days before the scheduled date of Substantial Completion, Contractor shall prepare reports weekly, identifying items to be completed in order to obtain necessary occupancy certificates and permits, and make recommendations to Owner for effectuating the earliest possible completion. When Contractor considers that the Work, or a portion thereof that Owner agrees to accept separately, has achieved Substantial Completion, Contractor shall prepare and submit to Owner a comprehensive list of items to be completed or corrected prior to final payment. Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on the list does not alter the responsibility of Contractor to complete all Work in accordance with the Contract Documents.
- C. Owner to determine if Work is complete: Upon receipt of Contractor's list, Owner will make an inspection to determine whether the Work or designated portion thereof has achieved Substantial Completion. If Owner's inspection discloses any item, whether or not included on Contractor's list, that is not sufficiently complete in accordance with the Contract Documents so that Owner can occupy or utilize the Work or designated portion thereof for its intended use, Contractor shall, before the occurrence of Substantial Completion, complete or correct the item upon notification by Owner, and Contractor shall then submit a request for another inspection by Owner to determine Substantial Completion. If Owner determines that the Work or designated portion has not achieved Substantial Completion, Contractor shall expeditiously complete the Work or

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designated portion, again request an inspection, and pay the costs associated with the re-inspection.

- D. Owner may take over punch list: If, at 30 Days after the date of Substantial Completion, Owner considers that the remaining items on its list ("punch list") are unlikely to be completed within the time period specified in the Contract Documents for Final Completion, Owner may, upon seven Days' written Notice to Contractor, take over and perform some or all of the punch list items. If Contractor fails to correct the deficiencies within the time period specified, Owner may deduct the actual cost of performing this punch list work, including any design costs, plus ten 10% to account for Owner's transaction costs, from the Contract Sum.
- E. Owner to establish date of Substantial Completion: When the Work or designated portion thereof has achieved Substantial Completion, Owner shall establish the date of Substantial Completion in writing, establish responsibilities of Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and fix the time within which Contractor shall finish all items on the list accompanying the document. The writing establishing Substantial Completion shall be submitted to Contractor for its written acceptance of the responsibilities assigned to it. Any items not included in the document but required or necessary for Final Completion of the Work shall be supplied and installed by Contractor as a part of the Contract Sum, notwithstanding their not being included in the punch list. Upon written acceptance of the writing establishing Substantial Completion by Contractor and Owner, and upon Contractor's Application for Payment, Owner shall make payment as provided in the Contract Documents. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents. No further payment will be due or owing until the payment following Final Completion.
- F. Contractor to complete punch list in timely manner: Contractor shall prepare, continue to monitor, and cause to be completed, all punch lists with respect to the activity of each Subcontractor and report weekly to Owner on outstanding punch list items.

6.08 PRIOR OCCUPANCY

- A. Prior Occupancy defined; Restrictions: Owner may, when legally permissible to do so and upon written Notice to Contractor, take possession of or use any completed or partially completed portion of the Work ("Prior Occupancy") at any time prior to Substantial Completion, and Contractor shall cooperate with such occupancy and use and the establishment of a punch list. Unless otherwise agreed in writing, Prior Occupancy shall not: be deemed an acceptance of any portion of the Work; accelerate the time for any payment to Contractor; prejudice any rights of Owner provided by any insurance, bond, guaranty, or the Contract Documents; relieve Contractor of the risk of loss or any of the obligations established by the Contract Documents; establish a date of Substantial or Final Completion; establish a date for termination or partial termination of the assessment of liquidated damages; or constitute a waiver of claims.
- B. Damage; Duty to repair and warranties: Notwithstanding anything in the preceding paragraph, Owner shall be responsible for loss of or damage to the Work resulting from Prior Occupancy. Contractor's one year duty to repair any system warranties shall begin on building systems activated and used by Owner as agreed in writing by Owner and Contractor.

6.09 FINAL COMPLETION, ACCEPTANCE, AND PAYMENT

- A. Final Completion defined: Final Completion shall be achieved when the Work is fully and finally complete in accordance with the Contract Documents. The date Final Completion is achieved shall be established by Owner in writing, but in no case shall it constitute Final Acceptance, which is a subsequent, separate, and distinct action (see also, Section 01 70 00 Project Completion).

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- B. Final Acceptance defined: Unless otherwise determined by Owner, Final Acceptance shall be achieved after Contractor has completed all the requirements of the Contract Documents. The date Final Acceptance is achieved shall be established by Owner in writing. Pursuant to RCW 60.28, "Lien for Labor, Materials, Taxes on Public Works," completion of the Contract Work shall occur upon Final Acceptance. Neither Final Acceptance nor final payment shall release Contractor or its sureties from any obligations of these Contract Documents or the payment and performance bonds, or constitute a waiver of any claims by Owner arising from Contractor's failure to perform the Work in accordance with the Contract Documents (see also, Section 01 70 00 Project Completion).
- C. Final payment waives Claim rights: Acceptance of final payment by Contractor or any Subcontractor shall constitute a waiver and release to Owner of all claims by Contractor or any such Subcontractor for an increase in the Contract Sum or the Contract Time, and for every act or omission of Owner relating to or arising out of the Work, except for those Claims made in accordance with the procedures, including the time limits, set forth in Part 8.

PART 7 - CHANGES

7.01 CHANGE IN THE WORK

- A. Changes in the Work: Changes in the Work may be accomplished after execution of the Contract without invalidating the Contract. Changes in the Work that adjust the Contract Sum and/or Contract Time are incorporated into the Contract solely by Change Order and are subject to the limitations stated in this Part 7 and elsewhere in the Contract Documents. A Change Order may be bilateral or unilateral, as described below. Change Orders may be initiated by mutual agreement or through a Contract Change Proposal ("CCP") or Work Directive ("WD").
- B. Change Orders:
1. A Bilateral Change Order is signed by Owner and Contractor to record their agreement on the terms of a change in the Work. A Bilateral Change Order may reflect the agreement of Owner and Contractor on a standalone issue, or it may incorporate one or more mutually agreed upon CCPs or WDs. A Bilateral Change Order shall constitute full payment and final settlement of all claims for time and cost, including direct, indirect, impact and consequential costs, related to the Change Order and Work covered by, affected by and related to the events giving rise to the Change Order.
 2. A Unilateral Change Order is initially signed only by Owner to set forth, subject to the Contract, the terms of a change in the Work based upon one or more CCPs and/or WDs to which the parties have not yet fully agreed. Within 7 Days of its receipt of a Unilateral Change Order, Contractor shall notify Owner in writing either (a) of its acceptance of its terms, in which case the Unilateral Change Order will automatically become a Bilateral Change Order, or (b) of Contractor's rejection, in which case Contractor must submit a written rejection within 14 Days after Contractor delivered written Notice of rejection to Owner as noted above. The written rejection must fully explain the reasons for rejecting the Unilateral Change Order and include all necessary supporting documentation. The rejection will then be considered in accordance with Section 8.02 (Informal Resolution of Disputes). Failure to submit a written Notice of rejection within 7 Days of Contractor's receipt of a Unilateral Change Order or a written rejection within 14 Days shall constitute Contractor's acceptance of the terms of the Unilateral Change Order.

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C. Change Orders via Contract Change Proposal:

1. Contractor shall be responsible for maintaining an Issues Log. If Contractor at any time believes that a change in the Work has or may have occurred, Contractor shall add such item to the Issues Log. At a minimum, the Issues Log shall identify:
 - a. Detailed scope of the change in the Work;
 - b. Contract Time impact noting specifically how it impacted the critical path of the project, if any;
 - c. The amount of any anticipated, proposed, or approved change in the Contract Sum;
 - d. Date first included on the Issues Log;
 - e. Owner-initiated or Contractor-initiated; and
 - f. Action status.
2. If the Contractor believes an item on the Issues Log warrants a CCP, Contractor shall provide written Notice to Owner in accordance with Section 8.02, and shall submit a written CCP in accordance with this Section. All CCPs shall be substantiated and submitted within 7 Days of being added to the Issues Log along with a revised progress schedule identifying the time impact affecting the critical path, if any. The CCP shall identify the proposed full compensation for implementing the proposed change in the Work, including any adjustment in the Contract Sum or Contract Time. Upon receipt of the CCP, Owner may accept the proposal and incorporate it into a Bilateral Change Order, reject the proposal and either issue a WD or elect not to proceed with the proposal, request further documentation, or negotiate acceptable terms with Contractor.

D. Work Directives:

1. A WD is a written order prepared by Owner that directs Contractor to perform Work prior to total agreement on an adjustment, if any, in the Contract Sum and/or Contract Time. Owner may direct Contractor, at any time and without invalidating the Contract, through a WD to proceed with a change in the Work or to perform Work that Contractor contends to be a change in the Work, with or without the agreement of Contractor and prior to agreement of the basis for adjustment, if any, to the Contract. Owner's use of a WD does not constitute agreement that the directive constitutes a change in the Work, the Contract Sum or the Contract Time.
2. A WD normally includes:
 - a. The scope of the directed Work,
 - b. Any proposed adjustment to the Contract Sum or not-to-exceed amount,
 - c. Any proposed change to the Contract Time,
 - d. The proposed method of determining any change in the Contract Sum and/or Contract Time, and

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- e. The supporting data that Contractor must submit in accordance with the requirements of Part 7 of the General Conditions.
- 3. Upon receipt of a WD, Contractor shall promptly commence and proceed diligently with performance of the directed Work. Within 7 Days of its receipt of a WD, Contractor shall notify Owner in writing either (a) of its acceptance of its terms, in which case the terms will become effective, and the WD will be incorporated into a Bilateral Change Order, or (b) of Contractor's rejection of the terms, in which case Contractor must submit a written rejection within 14 Days after Contractor delivered written Notice to Owner as noted above. The written rejection must fully explain the reasons for rejecting the WD and include all necessary supporting documentation. The rejection will then be considered in accordance with Section 8.02. Contractor's rejection of a WD shall not relieve Contractor of its obligation to comply promptly with the WD.
- E. Contractor fault or negligence alleged as basis for change in Contract Sum: No change in the Contract Sum shall be allowed to the extent Contractor's changed cost of performance is due to the fault or negligence of Contractor or anyone for whose acts Contractor is responsible; or to the extent Contractor is responsible for change concurrently caused by Contractor and Owner; or to the extent the change is caused by an act of Force Majeure as defined in Section 3.05.

7.02 CHANGE IN THE CONTRACT SUM

A. General Application

- 1. Contract Sum changes only by Change Order: The Contract Sum shall only be changed by a Change Order.
- 2. Allowances: Any Allowances stated in the Contract Documents shall be included in the Contract Sum. Items covered by Allowances shall be supplied for such amounts and by such persons or entities as Owner may direct, but Contractor shall not be required to employ persons or entities to whom Contractor has made reasonable and timely objection. Owner shall select materials and equipment under an Allowance with reasonable promptness. Allowances shall cover the net cost to Contractor of materials and equipment delivered and/or installed at the site, as identified in the Allowance, and all required taxes, less applicable trade discounts. Whenever actual costs are more than or less than Allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect the difference between actual, reasonable costs and the Allowances.
- 3. Pricing Components: Contractor shall maintain and submit a complete itemization of the costs incurred as a result of any change in the Work, including labor, material, Subcontractor costs, and fee. The total cost of any change in the Work or of any other increase or decrease in the Contract Sum, including a Claim, shall be limited to the actual, reasonable amounts for the following components, itemized in the manner set forth below and submitted on breakdown sheets in a form approved by Owner. If the total cost of the change in the Work does not exceed \$5,000.00, Contractor shall not be required to submit a breakdown if the description of the change in the Work is sufficiently definitive for Owner to determine fair value.
 - a. Labor costs: The labor cost component is determined by multiplying the estimated or actual additional number of hours needed to perform the change in the Work by the fully burdened hourly labor costs. The fully burdened hourly costs shall include the following:

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- (1) Basic wages and benefits: Hourly rates and benefits as stated on the Department of Labor and Industries approved "Statement of Intent to Pay Prevailing Wages" shall be applicable unless a high, documented amount is actually paid by a contractor for the laborers, apprentices, journeymen, foremen, and other staff performing and/or directly supervising the change in the Work at the site. Any amount in excess of approved "Statement of Intent to Pay Prevailing Wages" shall be substantiated and subject to audit.
 - (2) Worker's insurance: Direct contributions to the State of Washington for industrial insurance; medical aid; and supplemental pension, by the class and rates established by the Department of Labor and Industries.
 - (3) Federal insurance: Direct contributions required by the Federal Insurance Compensation Act; Federal Unemployment Tax Act; and the State Unemployment Compensation Act.
 - (4) Supervision: The labor cost component may include the actual, demonstrated additional supervision hours (not already compensated by Owner) directly related to a change in the Work.
 - (5) Travel and Per Diem allowance: Travel allowance and/or subsistence, if applicable, required by regional labor union agreements, which are itemized and identified separately.
- b. Material costs: The material cost component must be itemized and include material invoices or reasonable lump-sum estimates of the quantity and cost of additional materials needed to perform the change in the Work. Material costs shall be developed first from actual known costs; second from supplier quotations; and, if neither of these is available, then from standard industry pricing guides acceptable to Owner. Material costs shall consider all available discounts. Freight costs, express charges, or special delivery charges shall be itemized.
- c. Equipment costs: The equipment cost component must be itemized by the type of equipment and include the estimated or actual length of time the construction equipment appropriate for the Work is or will be used on the change in the Work on site. Costs will be allowed for construction equipment only to the extent used solely for the changed Work, or for additional rental costs actually incurred by Contractor solely for the changed Work. Equipment charges shall be computed on the basis of actual invoice costs or, if owned, from the current edition of the Associated General Contractors Washington State Department of Transportation (AGC WSDOT) Equipment Rental Agreement current edition as of the Contract execution date. The EquipmentWatch Rental Rate Blue Book shall be used as a basis for establishing rental rates of equipment not listed in the above source. The maximum rate for standby equipment shall not exceed that shown in the AGC WSDOT Equipment Rental Agreement. The rate for Contractor-owned equipment necessarily standing by for future use on the changed Work shall be no more than 50% of the rate established above unless otherwise approved by Owner. The total rental cost shall not exceed the cost of purchasing the equipment outright.
- d. Subcontractor costs: The Subcontractor cost component consists of payments Contractor makes to Subcontractors for the cost of changed Work performed by

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Subcontractors. Subcontractors' costs shall be calculated and itemized in the same manner as prescribed herein for Contractor.

- e. Fee: The Fee component is compensation for all items and costs not listed in subparagraphs a through d above, and is added to the total cost to Owner of the sum of these items. The Fee shall compensate Contractor, Subcontractor and suppliers for, among other things, combined overhead, profit and other costs, including all office, home office and site overhead, employee per diem, subsistence and travel costs not separately reimbursable under subparagraph a above, warranty, safety costs, printing and copying, quality control/assurance, purchasing, small or hand tool (a tool that costs \$250 or less and is normally furnished by the performing contractor) or expendable charges, temporary construction facilities, field engineering, schedule updating, Project Record, home office cost, taxes (including all taxes except B&O tax and Washington State sales tax payable based on the amount of the approved Application for Payment), office engineering, estimating costs, additional overhead because of extended time, Claim and change preparation, direct and indirect delay, acceleration or impact, and any other cost incidental to the change in the Work. The Fee shall be strictly limited in all cases to the rates below.
- (1). Contractor markup on Contractor Work: Contractor is allowed a Fee for any Work actually performed by Contractor's own forces of 16% of the first \$50,000 of the cost of such Work and 4% of the remaining cost, if any.
 - (2). Subcontractor markup for Subcontractor Work: Each Subcontractor (including lower-tier Subcontractors) is allowed a Fee for any Work actually performed by its own forces of 16% of the first \$50,000 of the cost of such Work and 4% of the remaining cost, if any.
 - (3). Contractor markup for Subcontractor Work: Contractor is allowed a Fee for any Work performed by its Subcontractor(s) of 6% of the first \$50,000 of the amount due each Subcontractor for such Work and 4% of the remaining amount, if any.
 - (4). Subcontractor markup for lower-tier Subcontractor Work: Each Subcontractor is allowed a Fee for any Work performed by its Subcontractor(s) of any lower-tier of 4% of the first \$50,000 of the amount due the lower-tier Subcontractor for such Work and 2% of the remaining amount, if any.
 - (5). Basis of cost applicable for markup: The cost of the Work to which the Fee is to be applied shall be based on the cost components in subparagraphs 7.02.A 3.a – d.
 - (6). Application of Fee: The Fee shall not be included on deductive changes in the Work. Where a change in the Work involves additive and deductive work by Contractor or the same Subcontractor, the Fee as well as bond and insurance markups will apply to the net difference.
- f. Insurance and bond premiums: The cost of any change in insurance or bond premium is added to the sum of the cost components in subparagraphs 7.02.A 3.a – e and is limited to the following:

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- (1) Contractor's liability insurance: The cost of any changes in Contractor's contractually required liability insurance arising directly from the Change Order; and
- (2) Payment and Performance Bond: The cost of any additional premium for Contractor's contractually required bond arising directly from the Change Order.
- g. Tax: Washington State sales tax and B&O tax arising directly from the Change Order shall be added to the cost of the Change Order.
- h. Unit Prices: If Unit Prices, including pre-agreed rates for material quantities, are applicable to a change in the Work, the Unit Prices shall be applied to the quantities of the items involved as determined in Section 7.02A. Quantities must be supported by field measurement statements signed by Owner. Owner shall be afforded access and be permitted to measure quantities. Contractor shall not exceed any cost limit(s) without Owner's prior written approval. Unit Prices shall include reimbursement for all direct and indirect costs of the Work, but exclude Fee (7.02 A.e), bond, and insurance costs (7.02 A.f).s.

7.03 CHANGE IN THE CONTRACT TIME

- A. Changes in Contract Time: The Contract Time shall only be changed by a Change Order.
- B. Time extension permitted only if delay is not Contractor's fault: If Contractor is delayed at any time in the commencement or progress of the Work (1) by an act or neglect of Owner or anyone for whose acts Owner is responsible; or (2) by changes ordered by Owner in the Work; or (3) by Force Majeure; or (4) by delay authorized by Owner pending dispute resolution; or (5) by other causes that Owner determines may justify delay, then Contractor shall reasonably attempt to mitigate the delay, and the Contract Time shall be extended by Change Order for such reasonable time as Owner may reasonably determine consistent with the provisions of the Contract Documents. No adjustment in the Contract Time shall be allowed to the extent Contractor's changed time of performance is due to the fault or negligence of Contractor or anyone for whose acts Contractor is responsible.
- C. Contractor must demonstrate impact on critical path of schedule: Any change in the Contract Time covered by a Change Order or Claim shall be limited to the change in the critical path of the Work attributable to the change or event(s) giving rise to the Change Order or Claim. Contractor shall be responsible for showing clearly on the Progress Schedule that the change or event had a specific impact on the critical path and, except in case of concurrent delay, was the sole cause of such impact, and could not have been avoided by resequencing of the Work or other reasonable alternatives in accordance with Section 01 32 13 Project Schedule.
- D. Cost arising from change in Contract Time: Contractor is entitled to compensation for the cost of a change in Contract Time only if all the following conditions are met:
 - 1. Must be solely fault of Owner: The change in Contract Time must solely be caused by the fault or negligence of Owner or others for whom Owner is responsible;
 - 2. Procedures: Contractor must follow the procedure set forth in Section 7.03B and Section 8.02;
 - 3. Demonstrate impact on critical path: Contractor must establish the extent of the change in Contract Time in accordance with Section 7.03C and Section 01 32 13 Project

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Schedule. Owner is not obligated directly or indirectly for damages or an increase in the Contract Sum for any delay suffered by a Subcontractor that does not increase the Contract Time; and

4. Cost measured exclusively by the pricing components of Section 7.02A.3: If Contractor or a Subcontractor of any tier is entitled to compensation arising from or related to a change in Contract Time, the pricing components of Section 7.02A.3 shall exclusively be used to measure the actual costs incurred as a result of the change in Contract Time. Neither Contractor nor a Subcontractor of any tier is entitled to payment for costs arising out of actual or alleged loss of efficiency; morale, fatigue, attitude, or labor rhythm; home office overhead; expectant underrun; trade stacking; reassignment of workers; rescheduling of work; concurrent operations; dilution of supervision; learning curve; beneficial or joint occupancy; logistics; ripple; season change; extended overhead; profit upon damages for delay; impact damages, including cumulative impact; or similar damages.

PART 8 - CLAIMS AND DISPUTE RESOLUTION

8.01 CLAIMS

- A. Definition: A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of the Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract Documents. The term "Claim" also includes other disputes and matters in question between Owner and Contractor arising out of or relating to the Contract Documents. Claims must be initiated in writing and be made in accordance with the Contract Documents. Neither a CCP, a Request for Information, a Bilateral or Unilateral Change Order, a reservation of rights, minutes of a meeting, a daily report, or a log entry shall constitute a Claim or Notice of a Claim. However, Owner and Contractor may agree in a signed writing to supplement how Contractor can provide a Notice of Claim as specified in this Part 8.
- B. Continuing Contract performance: Pending final resolution of a Claim, including the dispute resolution process in Part 8, and except as otherwise agreed in writing or in the Contract Documents, Contractor shall proceed diligently with performance of the Work and maintain the Progress Schedule, and Owner shall continue to make payments of undisputed amounts in accordance with the Contract Documents.
- C. Claims for additional cost: If Contractor wishes to make a Claim for an increase in the Contract Sum, written Notice as provided herein shall be given before proceeding to execute the Work, and written Notice and a written Claim must be made in accordance with this Part 8, or it will be waived.
- D. Claims for additional time: If Contractor wishes to make a Claim for an increase in the Contract Time, written Notice as provided herein shall be given, and a written Claim must be made in accordance with this Part 8, or it will be waived.
- E. Claims for consequential damages: Contractor and Owner waive certain Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes damages incurred by Owner for profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and damages incurred by Contractor for principal and home office overhead and expenses including but not limited to the compensation of personnel stationed there, for loss of financing, business and/or reputation, for losses on other projects, for loss of profit, and for interest or financing costs. This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination. Nothing contained in this subparagraph E, however, shall be deemed to preclude an

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award of liquidated or other delay damages, when applicable, in accordance with the Contract Documents, or to preclude or limit Contractor's obligation to procure and maintain the insurance policies required by this Contract or indemnify Owner for damages, including direct, indirect or consequential damages, alleged by a third party.

8.02 INFORMAL RESOLUTION OF DISPUTES

- A. Procedure to reduce disputes: In an effort to reduce the incidence and cost to all parties of extended disputes, all disputes, direct or indirect, arising out of or relating to the Contract Documents or the breach thereof, except those that have been waived under the terms of the Contract Documents, shall be decided exclusively by the dispute resolution procedure of Part 8 unless the parties mutually agree in writing otherwise. To the extent that Owner and Contractor agree to a partnering or dispute review process to help address disputes, these processes shall be in addition to, and not in place of, the mandatory contractual dispute resolution procedures.
- B. Notice: Except for disputes requiring Notice before proceeding with the affected Work as otherwise described in the Contract Documents, Contractor shall submit a written Notice of any Claim to Owner's Project Manager, consistent with the requirements of the Contract Documents, within 7 Days of the occurrence of the event giving rise to a dispute. If Contractor did not have actual knowledge of such an event, the written Notice shall be submitted within 7 Days of the date that Contractor reasonably should have been aware of the event. The Notice shall set forth, at a minimum, a description of the event(s) leading to or causing the dispute, the nature of the impacts to Contractor and its Subcontractors, if any, and an estimate of any claimed adjustments in the Contract Sum and/or Contract Time. Without waiving any rights, Owner and Contractor may discuss and attempt to resolve a dispute identified in a Notice of Claim directly with each other or with a third-party neutral or dispute review board if utilized on a Project.
- C. Substantiation: If an issue remains unresolved, Contractor shall submit timely written substantiation to support Contractor's position relating to the Notice of Claim. Such substantiation, which shall include an explanation of Contractor's position and any supporting documentation, shall be provided within 30 Days of submitting a Notice. Contractor may delay submitting data by an additional 14 Days if it notifies Owner that substantial data must be assembled.
- D. Owner's Project Manager to make initial decision on all disputes: After Contractor has submitted written substantiation to Owner that complies with all applicable provisions of Parts 7 and 8, as well as Section 01 32 13, Project Schedule, Owner's Project Manager will endeavor to respond, in writing, to Contractor within 7 Days of the date substantiation is received, or with Notice to Contractor of the date by which Owner's Project Manager expects to render a decision. If necessary to fully and fairly evaluate an issue, the Project Manager may request additional information or extend the time in which to respond. If the issue is not resolved, or if Project Manager does not respond within the later of 7 Days of the date written substantiation is received or the date specified for rendering a decision, the dispute may be escalated by Contractor to Owner's Assistant Vice President, Facilities Services, Capital as set forth in Section 8.02E below.
- E. Contractor may respond to initial decision: The initial decision of the Project Manager will be final and conclusive unless, within 7 Days of the date Contractor receives the initial decision or the date specified for rendering a decision, Contractor notifies Owner's Project Manager in writing of Contractor's disagreement with the initial decision, in which case Contractor must then submit a written rejection to Owner's Assistant Vice President, Facilities Services, Capital within 14 Days. The written rejection must attach the submitted Notice and substantiation and fully explain the reasons for Contractor's disagreement with the initial decision. It must also include all applicable supporting documentation. Failure to submit a written rejection to Owner's Assistant Vice

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President, Facilities Services, Capital within 14 Days shall constitute Contractor's acceptance of the initial decision.

- F. Assistant Vice President, Facilities Services, Capital decision: Following Contractor's full compliance with the procedure above, Owner's Assistant Vice President, Facilities Services, Capital will endeavor to respond in writing to Contractor with a decision within 7 Days of delivery of the Contractor's rejection or with Notice to Contractor of the date by which Owner's Assistant Vice President, Facilities Services, Capital expects to render a decision. If Owner's Assistant Vice President, Facilities Services, Capital does not respond within the later of 7 Days after delivery of the rejection or the date specified to render a decision, the dispute will be deemed denied and Contractor may further escalate the dispute as set forth in Section 8.02G below.
- G. Claim: If Contractor disagrees with the decision of the Assistant Vice President, Facilities Services, Capital, or if no decision is timely received, Contractor shall timely submit a Claim if it wishes to pursue formal dispute resolution or seek additional relief against Owner of any kind. A Claim must be consistent with the Notice, substantiation and rejection previously provided, be submitted to Owner in writing within 14 Days of the date the decision of the Assistant Vice President, Facilities Services, Capital is received by Contractor or due, and comply with Section 8.04. Any claim of a Subcontractor of any tier may be brought only through, and after review by, Contractor. Contractor acknowledges and agrees that no additional documentation from what was submitted to Owner's Assistant Vice President, Facilities Services, Capital (per part 'F' of this section) may be submitted and considered in any subsequent dispute resolution proceeding. Contractor's failure to provide timely information for Owner's consideration during the dispute resolution procedure of Part 8 has a substantial impact upon and prejudices Owner, including but not limited to its inability to fully investigate or verify a Claim, mitigate damages, choose alternative options, adjust the budget, delete or modify the impacted Work, and/or monitor time, cost and quantities.

8.03 FORMAL RESOLUTION OF CLAIMS

- A. Option for direct discussions: At any time following Contractor's initiation of formal dispute resolution, Owner may require that an officer of Contractor and Owner's Assistant Vice President, Facilities Services, Capital (all with authority to settle) meet, confer, and attempt to resolve the Claim. If the Claim is not resolved during such meeting, or if no such meeting is requested, Contractor may bring no litigation against Owner unless Contractor complies with the procedures described in Sections 8.03B and C. This requirement cannot be waived except by an explicit written waiver signed by Owner and Contractor.
- B. Mediation:
1. Mediation required: Claims, disputes, or other matters in controversy arising out of or related to the Contract shall be subject to mediation as a condition precedent to the initiation of binding dispute resolution. This requirement cannot be waived except by an explicit written waiver signed by both Owner and Contractor. Unless Owner and Contractor mutually agree in writing otherwise, all unresolved Claims shall be considered at a single mediation session that shall occur after Substantial Completion and prior to Final Acceptance by Owner.
 2. Mediation procedure: The parties shall endeavor to resolve Claims by mediation. A request for mediation shall be delivered in writing to the other party to the Contract, and the parties shall promptly attempt to mutually agree on a mediator. If the parties do not agree on a mediator within 30 Days of a party's demand, the mediation, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect

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on the date of the Agreement. Mediation shall proceed in advance of binding dispute resolution proceedings.

3. Mediation fee to be shared: The parties to the mediation shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction.
 4. Representatives with authority must attend mediation: Representatives of Contractor and Owner must attend the mediation session in person with authority to settle the Claim. To the extent there are other parties in interest, such as A/E, insurers or Subcontractors, their representatives, also with authority to settle the Claim, shall also attend the mediation session in person.
- C. Litigation: Contractor may bring no litigation on a Claim unless the Claim has been raised and considered in accordance with the procedures of this Part 8, including mandatory mediation. Contractor shall have the burden to demonstrate in any litigation that it has complied with all requirements of this Part 8. All unresolved Claims of Contractor shall be waived and released unless Contractor has complied with the time limits of the Contract Documents, and litigation is served and filed within 180 Days after the Date of Substantial Completion approved in writing by Owner. This requirement cannot be waived except by an explicit, written waiver signed by Owner and Contractor. The pendency of a mediation, which shall mean the time period between a party's receipt of a written mediation demand and the date of the initial mediation session, shall stay this deadline for serving and filing a lawsuit. The deadline may also be stayed for an additional period by agreement of the parties or court order. Neither Contractor nor a Subcontractor, whether claiming under a bond or lien statute or otherwise, shall be entitled to attorneys' fees directly or indirectly from Owner (but may recover attorneys' fees from the bond or statutory retainage fund itself to the extent allowable under law).

8.04 CLAIMS PROCESS

- A. Notice and Claims: Any Notice and any Claim of Contractor, whether under the Contract or otherwise, must be made pursuant to and in strict accordance with the applicable provisions of the Contract Documents. No act, omission, or knowledge, actual or constructive, of Owner or anyone for whose acts Owner is responsible shall in any way be deemed to be a waiver of the requirement for timely written Notice and a timely written Claim unless Owner and Contractor sign an explicit, unequivocal written waiver. The fact that Owner and Contractor may consider, discuss, or negotiate a Claim that has or may have been procedurally or substantively defective or untimely under the Contract shall not constitute a waiver of the provisions of the Contract Documents unless Owner and Contractor sign an explicit, unequivocal written waiver. Contractor acknowledges and agrees that Contractor's failure to timely submit required Notices and/or timely submit Claims has a substantial impact upon and prejudices Owner, including but not limited to its inability to fully investigate or verify the Claim, mitigate damages, choose alternative options, adjust the budget, delete or modify the impacted Work, and/or monitor time, cost and quantities.
- B. Claim must cover all costs and be documented: A Claim shall be deemed to cover all changes in cost and time (including direct, indirect, impact, and consequential) to which Contractor (and Subcontractors) may be entitled and may not contain reservations of rights without Owner's written approval; any such unapproved reservations of rights shall be without effect. Any requests by Contractor for an adjustment in both the Contract Sum and Contract Time that arise out of the same event(s) shall be submitted together. A Claim must be fully substantiated and documented. At a minimum, a Claim shall contain the following information:

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1. Factual statement of Claim: A detailed factual statement of the Claim for additional compensation and/or time, if any, providing all necessary dates, locations, and items of Work affected by the Claim, that confirms not only that Contractor suffered the damages claimed, but that the damages claimed were actually a result of the act, event, or condition complained of;
 2. Dates: The date on which event(s) arose which gave rise to the Claim;
 3. Owner and A/E employee's knowledgeable about Claim: The name of each employee of Owner and/or A/E believed to be knowledgeable about the Claim;
 4. Support from Contract Documents: The specific provisions of the Contract Documents that support the Claim;
 5. Identification of other supporting information: The identification of any documents and the substance of any oral communications that support the Claim;
 6. Copies of supporting documentation: Data and copies of any identified documents, other than the Contract Documents, that support the Claim, including without limitation a complete explanation as to why the relief sought is not within the scope of the Contract Documents;
 7. Details on Claim for Contract Time: If an adjustment in the Contract Time is sought, the specific days and dates for which it is sought; the specific reasons Contractor believes an extension in the Contract Time should be granted, and Contractor's analysis of its Progress Schedule to demonstrate the reason for the extension in Contract Time showing cause and analysis of the resultant delay to the critical path and other information required by the Contract Documents and Section 01 32 13, Project Schedule;
 8. Details on Claim for adjustment of Contract Sum: If an adjustment in the Contract Sum is sought, the exact amount sought and a breakdown of that amount into the categories and with the detail required by Section 7.02; and
 9. Statement certifying Claim: A statement certifying, under penalty of perjury, that the Claim is made in good faith, that the supporting cost and pricing data are true and accurate to the best of Contractor's knowledge and belief, that the Claim is fully supported by the accompanying data, and that the amount requested accurately reflects the adjustment in the Contract Sum or Contract Time for which Contractor believes Owner is responsible.
- C. False Claims: Contractor shall not make any negligent or fraudulent misrepresentations, concealments, errors, omissions, or inducements to Owner in the formation or performance of this Contract. If Contractor or a Subcontractor submits false or frivolous substantiation or a Claim to Owner, which for purposes of this Section 8.01C is defined as substantiation or a Claim based in whole or in part upon a materially incorrect fact, statement, representation, assertion, or record, Owner shall be entitled to collect from Contractor by offset or otherwise (without prejudice to any right or remedy of Owner) any and all costs and expenses, including investigation and consultant costs, incurred by Owner in investigating, responding to, and defending against such false or frivolous substantiation or Claim.
- D. Notification of surety: Owner may, but is not obligated to, notify Contractor's surety, if any, of the nature and amount of any claim it may assert against Contractor. If the claim relates to a possibility of Contractor's default, Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

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- E. Liens: If a Claim relates to or is the subject of a lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice and filing deadlines.
- F. All Claims must be submitted for final resolution within the time period specified by applicable law: Owner and Contractor shall commence all Claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of this Part 8 and within the time period specified by applicable law.
- G. Waiver of rights: Any Claim of Contractor against Owner shall be conclusively deemed to have been waived by Contractor unless made in accordance with the requirements of Part 8.
- H. Owner may investigate: To assist in the review of a Claim, Owner may at any time visit the Project site, communicate directly with Subcontractors, or request additional information (including requesting an audit as authorized below) in order to fully evaluate the issues raised by the Claim.
- I. Owner may audit Claims: All Claims filed against Owner shall be subject to audit at any time following the filing of the Claim. Failure of Contractor or Subcontractors of any tier to permit Owner access to the books and records of Contractor or Subcontractors of any tier, or to maintain and retain sufficient records to allow Owner to verify all or a portion of the Claim, shall constitute a waiver of the Claim and shall bar any recovery.
- J. Contractor to make documents promptly available: In support of Owner's audit of any Claim, Contractor and any Subcontractor shall, upon request, promptly make available to Owner within seven Days of Owner's request, at the office of Contractor or any requested Subcontractor during normal business hours, at least the following documents and other documents requested by Owner; failure to fully comply with this requirement shall constitute a material breach of contract and waiver of any Claim:
1. Daily time sheets and supervisor's daily reports;
 2. Collective bargaining agreements;
 3. Insurance, welfare, and benefits records;
 4. Payroll registers;
 5. Earnings records;
 6. Payroll tax forms;
 7. Material invoices, requisitions, and delivery confirmations;
 8. Material cost distribution worksheet;
 9. Equipment records (list of company equipment, rates, etc.);
 10. Vendors', rental agencies', Subcontractors', and agents' invoices;
 11. Contracts between Contractor and each of its Subcontractors, and all lower-tier Subcontractor contracts and supplier contracts;
 12. Subcontractors' and agents' payment certificates;

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13. Cancelled checks (payroll and vendors);
 14. Job cost reports, including job cost summary and job cost detail reports, related labor and equipment reports, and monthly totals;
 15. Job payroll ledger;
 16. Planned resource loading schedules and summaries;
 17. General ledger;
 18. Cash disbursements journal;
 19. Financial statements for all years during performance of the Work. In addition, Owner may require, if it deems it appropriate, additional financial statements for 3 years preceding execution of the Work;
 20. Depreciation records on all company equipment whether these records are maintained by the company involved, its accountant, or others;
 21. If a source other than depreciation records is used to develop costs for Contractor's internal purposes in establishing the actual cost of owning and operating equipment, all such other source documents;
 22. All non-privileged documents which relate to each and every Claim together with all documents which support the amount of any adjustment in the Contract Sum or Contract Time sought by each Claim;
 23. Work sheets or software used to prepare and establish the cost components for items of the Claim, including but not limited to labor, benefits and insurance, materials, equipment, Subcontractors, all documents that establish the time periods, individuals involved, the hours for the individuals, and the rates for the individuals;
 24. Work sheets, software, and all other documents used by Contractor to prepare its bid;
 25. The above items for its Subcontractors; and
 26. Any other information in any form or media not expressly protected from discovery by applicable law.
- K. Contractor to cooperate and provide facilities for audit: The audit may be performed by employees or representatives of Owner. Contractor and its Subcontractors shall provide adequate facilities acceptable to Owner for the audit during normal business hours. Contractor and all Subcontractors shall make a good faith effort to cooperate with Owner's auditors.
- L. Reciprocal RCW 42.56 rights: Contractor agrees, on behalf of itself and Subcontractors, that any invocation of RCW 42.56 at any time by Contractor or a Subcontractor, or their respective representatives, shall initiate an equivalent right to disclosures from Contractor and Subcontractors for the benefit of Owner. Failure to fully comply with these requirements shall constitute a material breach of the Contract and shall constitute a waiver of all Claims by Contractor and any Subcontractor that does not fully comply.

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PART 9 - TERMINATION OF THE WORK

9.01 TERMINATION BY OWNER FOR CAUSE

- A. 7 Day Notice to Terminate for Cause: Owner may, upon 7 Days written notice to Contractor and to its surety, terminate (without prejudice to any right or remedy of Owner) the Work, or any part of it, for cause upon the occurrence of any one or more of the following events:
1. Contractor fails to prosecute Work: Contractor fails to prosecute the Work or any portion thereof with sufficient diligence to ensure Substantial Completion of the Work within the Contract Time;
 2. Contractor bankrupt: Contractor is adjudged bankrupt, makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency;
 3. Contractor fails to correct Work: Contractor fails in a material way to replace or correct Work not in conformance with the Contract Documents;
 4. Contractor fails to supply workers or materials: Contractor repeatedly fails to supply skilled workers or proper materials or equipment;
 5. Contractor failure to pay Subcontractors or labor: Contractor repeatedly fails to make prompt payment due to Subcontractors or for labor;
 6. Contractor violates laws: Contractor materially disregards or fails to comply with laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction; or
 7. Contractor in material breach of Contract: Contractor is otherwise in material breach of any provision of the Contract Documents.
- B. Owner's actions upon termination: Upon termination, Owner may at its option:
1. Take possession of Project site: Take possession of the Project site and take possession of or use all materials, equipment, tools, and construction equipment and machinery thereon owned by Contractor to maintain the orderly progress of, and to finish, the Work;
 2. Accept assignment of Subcontracts: Accept assignment of subcontracts pursuant to Section 5.20; and
 3. Finish the Work: Finish the Work by whatever other reasonable method it deems expedient.
- C. Surety's role: Owner's rights and duties upon termination are subject to the prior rights and duties of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.
- D. Contractor's required actions: When Owner terminates the Work in accordance with this section, Contractor shall take the actions set forth in paragraph 9.02B, and shall not be entitled to receive further payment until the Work is accepted.
- E. Contractor to pay for unfinished Work: Contractor shall not be entitled to receive further payment until the Work is finished. If the unpaid balance of the Contract Sum exceeds the cost of finishing the Work, including compensation for A/E's services and expenses made necessary thereby and any other extra costs or damages incurred by Owner in completing the Work, or as a result of

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Contractor's actions, such excess shall be paid to Contractor. If such costs exceed the unpaid balance, Contractor shall pay the difference to Owner. These obligations for payment shall survive termination.

- F. Contractor and Surety still responsible for Work performed: Termination of the Work in accordance with this section shall not relieve Contractor or its surety of any responsibilities for Work performed.
- G. Conversion of "Termination for Cause" to "Termination for Convenience": If Owner terminates Contractor for cause and it is later determined that none of the circumstances set forth in paragraph 9.01A exist, then such termination shall be deemed a termination for convenience pursuant to Section 9.02.

9.02 TERMINATION BY OWNER FOR CONVENIENCE

- A. Owner Notice of Termination for Convenience: Owner may, upon written notice, terminate (without prejudice to any right or remedy of Owner) the Work, or any part of it, for the convenience of Owner.
- B. Contractor response to termination Notice: Unless Owner directs otherwise, after receipt of a written notice of termination for either cause or convenience, Contractor shall promptly:
 - 1. Cease Work: Stop performing Work on the date and as specified in the notice of termination;
 - 2. No further orders or Subcontracts: Place no further orders or subcontracts for materials, equipment, services or facilities, except as may be necessary for completion of such portion of the Work as is not terminated;
 - 3. Cancel orders and Subcontracts: Cancel all orders and subcontracts, upon terms acceptable to Owner, to the extent that they relate to the performance of Work terminated;
 - 4. Assign orders and Subcontracts to Owner: Assign to Owner all of the right, title, and interest of Contractor in all orders and subcontracts;
 - 5. Take action to protect the Work: Take such action as may be necessary or as directed by Owner to preserve and protect the Work, Project site, and any other property related to this Project in the possession of Contractor in which Owner has an interest; and
 - 6. Continue performance not terminated: Continue performance only to the extent not terminated.
- C. Terms of adjustment in Contract Sum if Contract terminated: If Owner terminates the Work or any portion thereof for convenience, Contractor shall be entitled to make a request for an equitable adjustment for its reasonable direct costs incurred prior to the effective date of the termination, plus reasonable allowance for overhead and profit on Work performed prior to termination, plus the reasonable administrative costs of the termination, but shall not be entitled to any other costs or damages, whatsoever, provided however, the total sum payable upon termination shall not exceed the Contract Sum reduced by prior payments. Contractor shall be required to make its request in accordance with the provisions of Part 7.
- D. Owner to determine whether to adjust Contract Time: If Owner terminates the Work or any portion thereof for convenience, the Contract Time shall be adjusted as determined by Owner.

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9.03 TERMINATION BY CONTRACTOR FOR CAUSE

- A. Contractor termination: Except as provided by RCW 60.28.080, Contractor may terminate the Contract for any of the following reasons:
1. Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped permanently;
 2. An act of government, such as a declaration of national emergency, that requires all Work to be stopped permanently;
 3. Because Owner has improperly not made payment of undisputed amounts within the time stated in the Contract Documents; or
 4. The Work is stopped for a period of 60 consecutive Days through no act or fault of Contractor, a Subcontractor, or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with Contractor,
- B. Contractor termination procedure: If one of these reasons exists, Contractor may, upon seven Days' written Notice to Owner (during which period Owner has the opportunity to cure), terminate the Contract and recover from Owner payment for Work executed in accordance with the Contract Documents, including reasonable overhead and profit on Work executed and costs incurred by reason of such termination. The total recovery of Contractor shall not exceed the unpaid balance of the Contract Sum.

PART 10 - MISCELLANEOUS PROVISIONS

10.01 GOVERNING LAW

Applicable law and venue: The Contract Documents and the rights of the parties herein shall be governed by the internal laws of the state of Washington, without regard to its choice-of-law provisions. Venue shall be in the county in which the Project is located, unless otherwise specified.

10.02 SUCCESSORS AND ASSIGNS

Bound to successors; Assignment of Contract: Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to the partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party shall assign the Contract without written consent of the other, except that Contractor may assign the Work for security purposes to a bank or lending institution authorized to do business in the state of Washington. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations set forth in the Contract Documents. If a majority of the ownership or the control of Contractor is acquired by a third party, and such acquisition reasonably imperils performance or creates a conflict of interest that Owner, in its sole discretion, cannot reasonably reconcile, then Owner may terminate this Contract at any time for cause under Section 9.01.

10.03 MEANING OF WORDS

Meaning of words used in Contract Documents: Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Reference to standard Specifications, manuals, or codes of any technical society, organization, or association, or to the code of any governmental authority, whether such reference is specific or by implication, shall be to the latest

**GENERAL CONDITIONS
FOR WASHINGTON STATE FACILITY CONSTRUCTION
WITH WASHINGTON STATE UNIVERSITY AMENDMENTS**

standard specification, manual, or code in effect on the date for submission of bids, except as may be otherwise specifically stated. Wherever in the Drawings and Specifications an article, device, or piece of equipment is referred to in the singular manner, such reference shall apply to as many such items as are shown on the Drawings, or required to complete the installation.

10.04 RIGHTS AND REMEDIES

- A. No waiver of rights: Waiver of any provisions of the Contract Documents must be in writing and authorized by Owner. No other waiver is valid on behalf of Owner. No action, delay in acting, or failure to act by Owner or A/E shall constitute a waiver of a right or duty afforded under the Contract Documents, nor shall action, delay in acting, or failure to act constitute approval or an acquiescence in a breach therein, or otherwise prejudice the right of Owner to enforce a right or remedy at any subsequent time, except as may be specifically agreed in writing.
- B. Rights under Contract do not limit other rights: Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.
- C. If portion of Contract is void, remainder is enforceable: If any portion of this Contract is held to be void or unenforceable, the remainder of the Contract shall be enforceable without such portion.

10.05 CONTRACTOR REGISTRATION AND COMPLIANCE

- A. Contractor must be registered and licensed: Pursuant to RCW 39.06, Contractor shall be registered and licensed as required by the laws of the State of Washington, including but not limited to RCW 18.27. Contractor shall also have a current state unified business identifier number; have industrial insurance coverage for Contractor's employees working in Washington as required in Title 51 RCW; have an employment security department number as required in Title 50 RCW; have a state excise tax registration number as required in Title 82 RCW; and not be disqualified from bidding on any public works contract under RCW 39.06.010 (unregistered or unlicensed contractors) or RCW 39.12.065(3) (prevailing wage violations).
- B. Employer contributions: Pursuant to RCW 50.24, "Contributions by Employers," in general and RCW 50.24.130 in particular, Contractor shall pay contributions for wages for personal services performed under this Contract or arrange for a bond acceptable to the Commissioner.
- C. Apprenticeship requirements: If the Contract Sum for the Project exceeds one million dollars, Contractor shall comply with all applicable apprenticeship requirements.

10.06 TIME COMPUTATIONS

Computing time: When computing any period of time, the day of the event from which the period of time begins shall not be counted. The last day is counted unless it falls on a weekend or legal holiday, in which event the period runs until the end of the next day that is not a weekend or holiday. When the period of time allowed is less than 7 days, intermediate Saturdays, Sundays, and legal holidays are excluded from the computation.

10.07 RECORDS RETENTION

Six year records retention period: The wage, payroll, and cost records of Contractor, and its Subcontractors, and all records subject to audit in accordance with Section 8.03, shall be retained for a period of not less than 6 years after the date of Final Acceptance.

**GENERAL CONDITIONS
FOR WASHINGTON STATE FACILITY CONSTRUCTION
WITH WASHINGTON STATE UNIVERSITY AMENDMENTS**

10.08 THIRD-PARTY AGREEMENTS

No third party relationships created: The Contract Documents shall not be construed to create a contractual relationship of any kind between: A/E and Contractor; Owner and any Subcontractor; or any persons other than Owner and Contractor.

10.09 ANTITRUST ASSIGNMENT

Contractor assigns overcharge amounts to Owner: Owner and Contractor recognize that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by the purchaser. Therefore, Contractor hereby assigns to Owner any and all claims for such overcharges as to goods, materials, and equipment purchased in connection with the Work performed in accordance with the Contract Documents, except as to overcharges which result from antitrust violations commencing after the Contract Sum is established and which are not passed on to Owner under a Change Order. Contractor shall put a similar clause in its Subcontracts, and require a similar clause in its sub-Subcontracts, such that all claims for such overcharges on the Work are passed to Owner by Contractor.

10.10 HEADINGS AND CAPTIONS

Headings for convenience only: All headings and captions used in these General Conditions are only for convenience of reference, and shall not be used in any way in connection with the meaning, effect, interpretation, construction, or enforcement of the General Conditions, and do not define the limit or describe the scope or intent of any provision of these General Conditions.

10.11 INDEPENDENT CONTRACTOR

Contractor is independent contractor: Contractor shall be and operate as an independent contractor in the performance of the Work and shall have complete control over and responsibility for all personnel performing the Work. Contractor is not authorized to enter into any agreements or undertakings for or on behalf of Owner or to act as or be an agent or employee of Owner.

10.12 OWNER'S ROLE

Owner's role is limited. Owner will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely Contractor's responsibility under the Contract Documents. The presence of Owner at the Project site shall not in any manner be construed as assurance that the Work is being completed in compliance with the Contract Documents, nor as evidence that any requirement of the Contract Documents of any kind, including Notice, has been met or waived. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Owner will not have control over or charge of and will not be responsible for acts or omissions of Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

END OF SECTION 00 72 00

Washington State University • Asbestos Management Program

***Reasonable Certainty
of Non-Disturbance of Asbestos***

Purpose - For WSU public works projects that are not anticipated to disturb asbestos, this form may be completed and placed in the Contract Documents in-lieu of a good faith asbestos survey.

Instructions - For any WSU public works project, the WSU Project Manager, WSU Project Engineer, Architect, or Project Engineer must complete and sign this form to certify that asbestos disturbance is not expected to occur. Alternatively, an AHERA Asbestos Building Inspector from Environmental Health and Safety (EH&S) can be contacted to certify that asbestos disturbance is not expected to occur if a finalized scope of work is provided to review. If the statements below cannot be certified, an asbestos good faith survey must be completed for the project.

A copy of this form or good faith inspection report must be made available to all bidders on the project and available for inspection on-site during work.

Certification - Check all that apply

☐

1. The project is not anticipated to disturb any building materials.

Note: If the disturbance of building materials is determined to be required during the construction phase, a good faith inspection must be arranged or this form must be revisited prior to disturbance.

☒

2. The project only involves the disturbance of metal, glass, wood, structural concrete (e.g. concrete slabs, columns, foundations) which are not suspected to contain asbestos.

☐

3. The project involves earthwork that is not anticipated to disturb asbestos.

Limitation - buried utilities or waste that contain asbestos may be present in soils on campus. If suspect asbestos materials are encountered in the soil during earthwork activities, stop work and contact the WSU Construction Manager.

I have reviewed the project scope-of-work and certify that to the best of my knowledge, the above conditions are true.

Signature: _____

Matthew McKibbin

Name: Matthew McKibbin

Position: Industrial Hygienist

Phone/email 509-730-5548

Project: New Addition

Building: Golf Storage Bldg (365B)

PART 1 GENERAL

1.01 SUMMARY

- A. Contractor shall perform the entire Work in accordance with the Contract Documents.
- B. Without limiting the requirements of the Contract Documents, the Work of the Contract can be summarized as follows:

Expand existing golf indoor practice facility with a 375 sq ft addition to face of building. Addition to include storage area, vestibule, and restroom. Refer to the attached project drawings and specifications.

- C. Expected Owner-supplied Contractor-installed Work:

- 1. Toilet Tissue (Roll) Dispenser
- 2. Paper Towel Dispenser
- 3. Soap Dispenser
- 4. Sanitary-Napkin Disposal & Dispenser Units
- 5. Exterior Cougar Head Sign (OFCI)

- D. Expected Work by Owner:

- 6. Interior Wall Graphic (OFOI)

1.02 SCHEDULE OF ALTERNATES – NOT USED

1.03 SCHEDULE OF ALLOWANCES – NOT USED

1.04 SCHEDULE OF UNIT PRICES – NOT USED

1.05 GENERAL INFORMATION

- A. Owner and Owner's Designated Representative:

- 1. Owner: Board of Regents
Washington State University
Pullman, WA 99164-1045
- 2. Owner's Designated Representative:
 - a. All Owner capital projects are administered by the Department of Facilities Services, Capital. Project specific designated representatives are listed within the Agreement.
- 3. Consulting Services: Owner has retained an Architect/Engineer to. The Architect/Engineer is identified below, as are others involved as members of the Owner team working on the Project:

- a. Architect/Engineer: Design West Architects, Pullman, WA
- b. Civil Engineer: SynTier Engineering, Pullman, WA
- c. Structural Engineer: LSB Consulting Engineers, Spokane, WA
- d. Mechanical Engineer: MSI Engineers, Spokane, WA
- e. Electrical Engineer: MSI Engineers, Spokane, WA
- f. Testing: GeoProfessional Innovation Corporation (GPI), Pullman, WA

1.06 SPECIAL CONDITIONS

- A. Site Access: Shared vehicle/pedestrian access via gravel road off NE Fairway Rd. Maintain access to side door of practice facility, putting green, and storage building (refer to map included in 01 31 23, 1.05A).
- B. Schedule and Phasing: No Scheduling Constraints
- C. Owner Occupancy: Existing practice facility to remain occupied.

END OF SECTION 01 11 00

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the administrative and procedural requirements for executing changes in the Work. This Section is subject to and governed by the Agreement and General Conditions. In the event of any conflict, the Agreement and General Conditions will have a higher precedence as established in the General Conditions.

1.02 SUBMITTALS

- A. Contractor shall submit a breakdown of its actual wage rates prior to commencement of construction activities. The breakdown must show:
 - 1. Basic wage rate (Based on L&I Intent to Pay Prevailing Wages);
 - 2. Fringe Package (Based on L&I Intent to Pay Prevailing Wages);
 - 3. FUI (Federal Unemployment Insurance);
 - 4. FICA (Federal Insurance Compensation Act);
 - 5. SUI (State Unemployment Compensation Act);
 - 6. Medicare; and
 - 7. WC (Workers Compensation).
- B. Contractor shall submit detailed supporting documentation to verify the above rates, if requested by Owner. All such rates shall be subject to audit.
- C. Contractor shall submit prior to commencement of construction activities a list of all equipment that it anticipates will be used on the Project and the actual operating cost of each piece of equipment. The General Conditions describe allowable equipment charges. All costs shall be subject to audit.

1.03 CONTRACT CHANGE PROPOSAL PROCEDURES

- A. Contractor shall maintain an Issues Log/ CCP Log as described in the General Conditions:
 - 1. The action status shall indicate which party is currently responsible and when it is appropriate to submit a CCP to Owner. Contractor shall submit a Contract Change Proposal (CCP) with Substantiating Documentation, as described in subsection C below, to Owner within 7 Days of this action status change.
 - 2. Upon final agreement and authorization by Owner a CCP may be incorporated into the Contract via Change Order and shall be reflected on the Issues Log.

B. Direction to perform Work:

1. Owner may directly order Work by a written Work Directive (WD). WDs may be unilateral or bilateral as described in the General Conditions and may be issued on a fixed price or on a "cost-not-to-exceed" basis. The WD may include the following:
 - a. A detailed description of the proposed change, products, and location of modification to the Work;
 - b. Supplementary or revised Drawings and/or Specifications; and
 - c. Projected time for making the change and a statement as to whether overtime work is, or is not, acceptable.

C. Substantiating Documentation required with all CCPs:

1. Contractor shall provide back-up documentation required to substantiate any proposed change in the following format:
 - a. CCP narrative, including:
 - 1) Description of proposed change. In order to allow for efficient review of a change proposal Contractor shall provide enough narrative to the line item breakdown to allow Owner to properly assess that the change is fair and reasonable;
 - 2) Cause of or reason for making change with a statement of why proposed change is not covered by Contract Documents
 - 3) Both credited and additive elements relating to a change in Contract Sum and/or Contract Time;
 - 4) A specific period of time during which Contractor's pricing will be considered valid;
 - 5) Any schedule considerations that may trigger further impact to the Contract Time if acceptance of the proposed change is delayed beyond a specific date; and
 - 6) Date change Work is to be completed.
 - b. Owner supplied Change Proposal Submittal Form.
 - c. CCP Cost Estimate Detail Sheet(s), or other form acceptable to Owner, including:
 - 1) Line-item estimate detailing material, labor, equipment, Subcontractor, and supplier costs and quantities; and
 - 2) Subcontractor and supplier proposals with supporting line-item estimates.
 - d. CCP Progress Schedule with Contemporaneous Period Analysis detailing if any impact to the planned progress of the Work and

critical path.

- e. Other supporting documentation, as appropriate.

D. Correlation with Contractor's Submittals:

1. Application for Payment forms shall record each Unilateral and Bilateral Change Order as a separate item of Work.
2. The Progress Schedule shall be revised to reflect changes in the Contract Time.
3. Project Record shall incorporate all changed Work.

END OF SECTION 01 26 00

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes procedures for preparation and submittal of Applications for Payment.

1.02 SUBMITTALS

- A. Prior to submitting its first Application for Payment, Contractor shall:
 - 1. Submit a preliminary Progress Schedule per Section 01 32 13 – Progress Schedule.
 - 2. If requested, submit a projected monthly cash-flow analysis for the duration of the Project.
 - 3. Submit an approved Intent to Pay Prevailing Wages form prior to commencing the Work. An approved Intent to Pay Prevailing Wages form must be on file with Owner for each classification of laborers, workers, or mechanics employed by Contractor or Subcontractors whose Work is included in an Application for Payment.
 - 4. “Washington State Prevailing Wage Rates for Public Works Contracts/Whitman County” are made a part of the Contract Documents and are included at the end of this Section. It is Contractor’s responsibility to verify with the Washington State Department of Labor and Industries the most current and applicable prevailing wage rates for this Project.
 - 5. Submit and receive approval of the Schedule of Values per Section 01 29 73 – Schedule of Values, and the General Conditions. All Applications for Payment shall be in the same format.
 - 6. Submit a list of all Subcontractors with points of contact and other contact information, including phone number, email address, and mailing address.
 - 7. Submit a list of all major material suppliers with points of contact and other contact information, including phone number, email address, and mailing address.
 - 8. Submit Retainage Option Form to Owner for the disposition of retainage funds.
 - a. In accordance with Chapter 60.28 of the Revised Code of Washington (RCW), Owner shall reserve retainage not to exceed 5% of the monies earned by Contractor as a trust fund for the protection and payment of:
 - 1) The claims of any person and/or Owner arising out of or relating to Work performed on the Project; and
 - 2) The State with respect to taxes, fees, or penalties that may

be imposed and due from Contractor (see General Conditions).

- b. Retainage will be released per Section 01 70 00 - Project Close-Out.
- c. At the option of Contractor, the moneys reserved by Owner shall be:
 - 1) Retained in a fund by Owner;
 - 2) Bonded for all of the retainage using a bond form acceptable to Owner;
 - 3) Placed in escrow with a bank or trust company by Owner.
 - a) Escrow: If the retained funds are to be placed in escrow, Contractor will select the escrow agent, subject to approval by Owner. The selected agent must be a bank or trust company in the State of Washington.
 - b) Escrow Agent: If Contractor elects the escrow option, an escrow agreement shall be executed by Contractor, Owner, and bank or trust company. Three copies of the agreement should be completed and executed by Contractor and returned to Owner for execution; Owner will forward copies to the bank or trust company for receipt, acceptance, and execution. The bank or trust company will retain one copy and return one copy each to Contractor and Owner. A completed and signed escrow agreement must be on file with Owner before Contractor's first Application for Payment is processed.
 - c) Escrow Investments: The bank or trust company may invest the retained funds in bonds and other securities selected by Contractor, except stocks, subject to the written approval of Owner.
 - d) The investments selected must mature on or prior to the date 45 Days following Final Acceptance of the Work. Interest on such investments may be paid to Contractor as it accrues.
 - e) Escrow Costs and Fees: All escrow costs and fees shall be paid by Contractor.
 - f) Release of Escrow Investments to Contractor: Retainage will be released per Section 01 70 00 - Project Close-Out. Once Contractor has fully complied with the Contract Documents and statute, Owner shall issue written instructions to the bank or trust company to release to Contractor the investment held in escrow.

B. Draft Application for Payment:

1. Contractor shall submit a draft, itemized Application for Payment within the last 7 Days of the month.
2. The draft application does not constitute a payment request and shall not be signed.
3. Contractor shall carefully check all extensions, totals, and required information for accuracy before submittal.
4. Contractor and Owner may meet to confer regarding the current progress of the Work and the amount of payment to which Contractor is entitled. Owner may request that Contractor provide supporting documentation substantiating its right to payment. Contractor is not entitled to make a final payment request, nor is any payment due Contractor, until such data is furnished. Contractor may include in its Application for Payment projected costs to the end of the month.
 - a. Fill in the following information within Owner's Application for Payment form:
 - 1) Percentage of Work completed based upon the approved schedule of values.
 - 2) List Change Orders approved by Owner prior to submission date. Use Owner's designations. Do not bill for changed Work until a fully executed Change Order has been received.
 - 3) Certification of Participation WBE and MBEs, all certification types acceptable, supply this regardless of having firms to report upon.
 - 4) List all Subcontractors that have performed Work at the site during the pay period.
 - 5) If applicable, Apprentice/Journeyman Participation.
5. Contractor shall submit or make available for review the following prior to the draft Application for Payment:
 - a. Project Record; (see Section 01 78 39 – Project Record)
 - b. Updated Progress Schedule in native format (see section 01 32 13 – Progress Schedule);
 - c. Contractor Quality Control Reports (see Section 01 45 00 - Quality Control); and
 - d. Stored Materials: Requests for payment of stored materials may only be made for materials properly stored on or off-site and in full compliance with the General Conditions.

C. Application for Payment:

1. Contractor may not submit the approved Application for Payment (or payment will be withheld) until all requirements of the draft application for payment are met.
 2. Upon approval of the Draft Application for Payment, contractor will be authorized to submit the agreed upon Application for Payment for processing and payment. This application for payment shall be signed by hand by a responsible officer of the Contractor and may be submitted in scanned format electronically.
 3. Formal submittal must include all parts of the Application for Payment form.
 4. Owner shall make progress payments in such amounts as it determines are properly due within 30 Days of receipt of a properly executed Application for Payment.
 5. Owner shall notify Contractor in accordance with Chapter 39.76 RCW if the Application for Payment does not comply with the requirements of the Contract Documents.
- D. Disputed Amounts: If Contractor believes it is entitled to payment for Work performed during the prior calendar month in addition to the agreed-upon amount, Contractor may, also within the same period, submit to Owner along with the approved Application for Payment a separate, written payment request specifying the exact additional amount claimed due, the category in the Schedule of Values in which the payment is claimed due, the specific Work for which the additional amount is due, and why the additional payment is due. Furthermore, for the submittal to be considered, Contractor and all Subcontractors shall file with Owner by the same date certified copies of all payroll records relating to the additional amount due, pursuant to WAC 296-127-320.
- E. Payments to Subcontractors: Contractor shall pay each Subcontractor no later than 10 Days after receipt of payment from Owner the amount to which the Subcontractor is entitled. Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to lower-tier Subcontractors in a similar manner.
1. Applications for Payment shall not request payment for portions of the Work that Contractor does not intend to pay a Subcontractor, unless such Work has been performed by others whom Contractor intends to pay.
 2. If, after making an Application for Payment but before paying a Subcontractor for its performance covered by the Application, Contractor discovers that part or all of the payment otherwise due to the Subcontractor is subject to withholding from the Subcontractor under the Subcontract (such as for unsatisfactory performance or non-payment of lower-tier Subcontractors), Contractor may withhold the amount as allowed under the Subcontract, but it shall:
 - a. Give the Subcontractor and Owner written notice of the withholding as soon as practicable once Contractor determines

- the cause for the withholding but before the due date of the Subcontractor payment;
- b. Include the reasons for the withholding and the actions the Subcontractor must take to release the payment; and
 - c. Once Subcontractor has taken the required remedial actions, pay Subcontractor within 8 Days.
3. Owner may, at its sole option, issue joint checks to Contractor and to any Subcontractor. If Owner makes payments by joint check, such value shall be reflected on the next Application for Payment.
- F. Subcontractor Payment Reporting: Contractor and all tiers of subcontractors will utilize Access Equity accessed at the Office of Minority and Women's Business Enterprises (OMWBE) at <https://omwbe.diversitycompliance.com/> to report subcontractor payment information. The Contractor shall:
1. Complete the OMWBE user training.
 2. Register and enter all required Subcontractor information into Access Equity upon Owner creation of the contract record.
 3. Monitor and report amount and date of all payments:
 - a. Received from Owner;
 4. Made to Subcontractor(s); Resolve any discrepancies between reported and received payments.
 5. Require each Subcontractor to:
 - a. Register in Access Equity and complete the user training.
 - b. Verify amounts and date of receipt of payments from Prime Contractor or higher tier Subcontractor.
 - c. Report any payments made to a lower tier Subcontractor.
 - d. Resolve any discrepancies between reported and received payments.
- G. Application for Final Payment:
1. Application for Final Payment will be accepted for processing only after Contractor has completed the requirements of Final Completion as described in Section 01 70 00 – Project Close-Out.
- H. Release of Retainage:
1. Retainage will be released per Section 01 70 00 - Project Close-Out.

END OF SECTION 01 29 00

State of Washington
Department of Labor & Industries
Prevailing Wage Section - Telephone 360-902-5335
PO Box 44540, Olympia, WA 98504-4540

Washington State Prevailing Wage

The PREVAILING WAGES listed here include both the hourly wage rate and the hourly rate of fringe benefits. On public works projects, worker's wage and benefit rates must add to not less than this total. A brief description of overtime calculation requirements are provided on the Benefit Code Key.

Journey Level Prevailing Wage Rates for the Effective Date: 03/05/2024

<u>County</u>	<u>Trade</u>	<u>Job Classification</u>	<u>Wage</u>	<u>Holiday</u>	<u>Overtime</u>	<u>Note</u>	<u>*Risk Class</u>
Whitman	Asbestos Abatement Workers	Journey Level	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Boilermakers	Journey Level	\$74.29	<u>5N</u>	<u>1C</u>		View
Whitman	Brick Mason	Journey Level	\$57.54	<u>5A</u>	<u>1M</u>		View
Whitman	Building Service Employees	Janitor	\$16.28		<u>1</u>		View
Whitman	Building Service Employees	Shampooer	\$16.28		<u>1</u>		View
Whitman	Building Service Employees	Waxer	\$16.28		<u>1</u>		View
Whitman	Building Service Employees	Window Cleaner	\$16.28		<u>1</u>		View
Whitman	Cabinet Makers (In Shop)	Journey Level	\$16.28		<u>1</u>		View
Whitman	Carpenters	Acoustical Worker	\$55.87	<u>7E</u>	<u>4X</u>	<u>8N</u>	View
Whitman	Carpenters	Bridge, Dock & Wharf Carpenter	\$61.94	<u>7E</u>	<u>4X</u>	<u>8N</u>	View
Whitman	Carpenters	Floor Layer & Floor Finisher	\$55.87	<u>7E</u>	<u>4X</u>	<u>8N</u>	View
Whitman	Carpenters	Form Builder	\$55.87	<u>7E</u>	<u>4X</u>	<u>8N</u>	View
Whitman	Carpenters	General Carpenter	\$55.87	<u>7E</u>	<u>4X</u>	<u>8N</u>	View
Whitman	Carpenters	Heavy Construction Carpenter	\$59.87	<u>7E</u>	<u>4X</u>	<u>9E</u>	View
Whitman	Carpenters	Scaffold/Shoring Erecting & Dismantling	\$59.87	<u>7E</u>	<u>4X</u>	<u>8N</u>	View
Whitman	Cement Masons	Journey Level	\$54.94	<u>7B</u>	<u>1N</u>		View
Whitman	Divers & Tenders	Assistant Tender	\$62.89	<u>7E</u>	<u>4X</u>		View
Whitman	Divers & Tenders	Bell/Vehicle or Submersible Operator Not Under Pressure	\$66.15	<u>7E</u>	<u>4X</u>		View
Whitman	Divers & Tenders	Dive Supervisors	\$119.70	<u>7E</u>	<u>4X</u>		View
Whitman	Divers & Tenders	Diver	\$118.20	<u>7E</u>	<u>4X</u>	<u>8V</u>	View
Whitman	Divers & Tenders	Diver on Standby	\$67.15	<u>7E</u>	<u>4X</u>		View
Whitman	Divers & Tenders	Diver Tender	\$66.15	<u>7E</u>	<u>4X</u>		View
Whitman	Divers & Tenders	Diving Master	\$78.86	<u>7E</u>	<u>4X</u>		View
Whitman	Divers & Tenders	Manifold Operator	\$66.15	<u>7E</u>	<u>4X</u>		View
Whitman	Divers & Tenders	Manifold Operator Mixed Gas	\$70.15	<u>7E</u>	<u>4X</u>		View
Whitman	Divers & Tenders	Remote Operated Vehicle Operator	\$66.15	<u>7E</u>	<u>4X</u>		View

Whitman	Divers & Tenders	Remote Operated Vehicle Tender / Technician	\$62.94	7E	4X		View
Whitman	Dredge Workers	Assistant Engineer	\$79.62	5D	3F		View
Whitman	Dredge Workers	Assistant Mate (Deckhand)	\$79.01	5D	3F		View
Whitman	Dredge Workers	Boatmen	\$79.62	5D	3F		View
Whitman	Dredge Workers	Engineer Welder	\$81.15	5D	3F		View
Whitman	Dredge Workers	Leverman, Hydraulic	\$82.77	5D	3F		View
Whitman	Dredge Workers	Mates	\$79.62	5D	3F		View
Whitman	Dredge Workers	Oiler	\$79.01	5D	3F		View
Whitman	Drywall Applicator	Journey Level	\$56.68	15Q	11S		View
Whitman	Drywall Tapers	Journey Level	\$56.68	15Q	11S		View
Whitman	Electrical Fixture Maintenance Workers	Journey Level	\$16.28		1		View
Whitman	Electricians - Inside	Journeyman	\$64.10	7G	1E		View
Whitman	Electricians - Motor Shop	Craftsman	\$16.28		1		View
Whitman	Electricians - Motor Shop	Journey Level	\$16.28		1		View
Whitman	Electricians - Powerline Construction	Cable Splicer	\$93.00	5A	4D		View
Whitman	Electricians - Powerline Construction	Certified Line Welder	\$85.42	5A	4D		View
Whitman	Electricians - Powerline Construction	Groundperson	\$55.27	5A	4D		View
Whitman	Electricians - Powerline Construction	Heavy Line Equipment Operator	\$85.42	5A	4D		View
Whitman	Electricians - Powerline Construction	Journey Level Lineperson	\$85.42	5A	4D		View
Whitman	Electricians - Powerline Construction	Line Equipment Operator	\$73.35	5A	4D		View
Whitman	Electricians - Powerline Construction	Meter Installer	\$55.27	5A	4D	8W	View
Whitman	Electricians - Powerline Construction	Pole Sprayer	\$85.42	5A	4D		View
Whitman	Electricians - Powerline Construction	Powderperson	\$63.50	5A	4D		View
Whitman	Electronic Technicians	Journey Level	\$53.20	5I	1B		View
Whitman	Elevator Constructors	Mechanic	\$111.26	7D	4A		View
Whitman	Elevator Constructors	Mechanic In Charge	\$120.27	7D	4A		View
Whitman	Fabricated Precast Concrete Products	Journey Level	\$16.28		1		View
Whitman	Fabricated Precast Concrete Products	Journey Level - In-Factory Work Only	\$16.28		1		View
Whitman	Fence Erectors	Fence Erector	\$49.52	7B	1M	8Z	View
Whitman	Flaggers	Journey Level	\$46.68	7B	1M	8Z	View
Whitman	Glaziers	Journey Level	\$43.70	7L	4L		View
Whitman	Heat & Frost Insulators And Asbestos Workers	Journey Level	\$62.55	5K	1U		View
Whitman	Heating Equipment Mechanics	Journey Level	\$69.36	6Z	1B		View
Whitman	Hod Carriers & Mason Tenders	Journey Level	\$51.11	7B	1M	8Z	View
Whitman	Industrial Power Vacuum Cleaner	Journey Level	\$16.28		1		View

Whitman	Inland Boatmen	Journey Level	\$16.28		<u>1</u>		View
Whitman	Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Cleaner Operator, Foamer Operator	\$16.28		<u>1</u>		View
Whitman	Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Grout Truck Operator	\$16.28		<u>1</u>		View
Whitman	Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Head Operator	\$16.28		<u>1</u>		View
Whitman	Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Technician	\$16.28		<u>1</u>		View
Whitman	Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Tv Truck Operator	\$16.28		<u>1</u>		View
Whitman	Insulation Applicators	Journey Level	\$55.87	<u>7E</u>	<u>4X</u>	<u>8N</u>	View
Whitman	Ironworkers	Journeyman	\$71.42	<u>15K</u>	<u>11N</u>		View
Whitman	Laborers	Air And Hydraulic Track Drill	\$50.13	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Asphalt Raker	\$50.13	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Asphalt Roller, Walking	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Brick Pavers	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Brush Hog Feeder	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Brush Machine	\$50.13	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Caisson Worker, Free Air	\$50.13	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Carpenter Tender	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Cement Finisher Tender	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Cement Handler	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Chain Saw Operator & Faller	\$50.13	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Clean-up Laborer	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Compaction Equipment	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Concrete Crewman	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Concrete Saw, Walking	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Concrete Signalman	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Concrete Stack	\$50.13	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Confined Space Attendant	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Construction Specialist	\$50.33	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Crusher Feeder	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Demolition	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Demolition Torch	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Dope Pot Fireman, Non-mechanical	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Driller Helper (when Required To Move & Position Machine)	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Drills With Dual Masts	\$50.44	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Dry Stack Walls	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Dumpman	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Erosion Control Laborer	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Firewatch	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View

Whitman	Laborers	Form Cleaning Machine Feeder, Stacker	\$49.52	7B	1M	8Z	View
Whitman	Laborers	Form Setter, Paving	\$49.83	7B	1M	8Z	View
Whitman	Laborers	General Laborer	\$49.52	7B	1M	8Z	View
Whitman	Laborers	Grade Checker	\$52.34	7B	1M	8Z	View
Whitman	Laborers	Grout Machine Header Tender	\$49.52	7B	1M	8Z	View
Whitman	Laborers	Guard Rail	\$49.52	7B	1M	8Z	View
Whitman	Laborers	Guniting	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Hazardous Waste Worker (level A)	\$50.44	7B	1M	8Z	View
Whitman	Laborers	Hazardous Waste Worker (level B)	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Hazardous Waste Worker (level C)	\$49.83	7B	1M	8Z	View
Whitman	Laborers	Hazardous Waste Worker (level D)	\$49.52	7B	1M	8Z	View
Whitman	Laborers	Hdpe Or Similar Liner Installer	\$49.52	7B	1M	8Z	View
Whitman	Laborers	High Scaler	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Industrial Technician	\$67.55	7B	1M	8Z	View
Whitman	Laborers	Jackhammer Operator Miner, Class "b"	\$49.83	7B	1M	8Z	View
Whitman	Laborers	Laser Beam Operator	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Miner, Class "a"	\$49.52	7B	1M	8Z	View
Whitman	Laborers	Miner, Class "c"	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Miner, Class "d"	\$50.44	7B	1M	8Z	View
Whitman	Laborers	Monitor Operator, Air Track Or Similar Mounting	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Mortar Mixer	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Nipper	\$49.52	7B	1M	8Z	View
Whitman	Laborers	Nozzleman	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Nozzleman, Water (to Include Fire Hose), Air Or Steam	\$49.83	7B	1M	8Z	View
Whitman	Laborers	Pavement Breaker, 90 Lbs. & Over	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Pavement Breaker, Under 90 Lbs.	\$49.83	7B	1M	8Z	View
Whitman	Laborers	Pilot Car	\$46.68	7B	1M	8Z	View
Whitman	Laborers	Pipelayer	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Pipelayer, Corrugated Metal Culvert And Multi-Plate	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Pipewrapper	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Plasterer Tenders	\$50.13	7B	1M	8Z	View
Whitman	Laborers	Pot Tender	\$49.83	7B	1M	8Z	View
Whitman	Laborers	Powderman	\$51.97	7B	1M	8Z	View
Whitman	Laborers	Powderman Helper	\$49.83	7B	1M	8Z	View
Whitman	Laborers	Power Buggy Operator	\$49.83	7B	1M	8Z	View
Whitman	Laborers	Power Tool Operator, Gas, Electric, Pneumatic	\$49.83	7B	1M	8Z	View
Whitman	Laborers	Rad-Con Technician	\$67.55	7B	1M	8Z	View

Whitman	Laborers	Railroad Equipment, Power Driven, Except Dual Mobile	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Railroad Power Spiker Or Puller, Dual Mobile	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Remote Equipment Operator	\$50.44	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Remote Equipment Operator (i.e Compaction And Demolition)	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Rigger/signal Person	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Riprap Person	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Rodder & Spreader	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Sand Hogs Under Compressed Air Conditions	\$282.20	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Sandblast Tailhoseman	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Scaffold Erector, Wood Or Steel	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Scaleman	\$46.68	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Stake Jumper	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Structural Mover	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Tailhoseman (water Nozzle)	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Timber Bucker & Faller (by Hand)	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Track Laborer (rr)	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Traffic Control Laborer	\$46.68	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Traffic Control Supervisor	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Trencher, Shawnee	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Trenchless Technology Technician	\$50.13	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Truck Loader	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Truck Mounted Attenuator	\$46.68	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Tugger Operator	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Vibrators, All	\$50.13	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Wagon Drills	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Water Pipe Liner	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Welder, Electrical, Manual Or Automatic (hdpe Or Similar Pipe And Liner)	\$50.44	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Well-point Person	\$49.52	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Wheelbarrow, Power Driven	\$49.83	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers	Window Washer, Cleaner	\$46.68	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers - Underground Sewer & Water	General Laborer & Topman	\$50.13	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Laborers - Underground Sewer & Water	Pipe Layer	\$50.13	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Landscape Construction	Landscape Laborer	\$46.68	<u>7B</u>	<u>1M</u>	<u>8Z</u>	View
Whitman	Landscape Construction	Landscape Operator	\$57.61	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Landscape Maintenance	Groundskeeper	\$16.28		<u>1</u>		View
Whitman	Lathers	Journey Level	\$56.68	<u>15Q</u>	<u>11S</u>		View
Whitman	Marble Setters	Journey Level	\$57.54	<u>5A</u>	<u>1M</u>		View

Whitman	Metal Fabrication (In Shop)	Fitter	\$16.28		<u>1</u>		View
Whitman	Metal Fabrication (In Shop)	Laborer	\$16.28		<u>1</u>		View
Whitman	Metal Fabrication (In Shop)	Machine Operator	\$16.28		<u>1</u>		View
Whitman	Metal Fabrication (In Shop)	Painter	\$16.28		<u>1</u>		View
Whitman	Metal Fabrication (In Shop)	Welder	\$16.28		<u>1</u>		View
Whitman	Millwright	Journey Level	\$76.28	<u>5A</u>	<u>1B</u>		View
Whitman	Modular Buildings	Journey Level	\$16.28		<u>1</u>		View
Whitman	Painters	Commercial Painter	\$45.51	<u>6Z</u>	<u>1W</u>		View
Whitman	Painters	Industrial Painter	\$52.42	<u>6Z</u>	<u>1W</u>	<u>9D</u>	View
Whitman	Pile Driver	Journey Level	\$61.94	<u>7E</u>	<u>4X</u>	<u>8N</u>	View
Whitman	Plasterers	Journey Level	\$54.62	<u>7K</u>	<u>1N</u>		View
Whitman	Playground & Park Equipment Installers	Journey Level	\$16.28		<u>1</u>		View
Whitman	Plumbers & Pipefitters	Journey Level	\$92.81	<u>6Z</u>	<u>1Q</u>		View
Whitman	Power Equipment Operators	A-frame Truck (2 Or More Drums)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	A-frame Truck (single Drum)	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	All Tower Cranes	\$61.92	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Asphalt Plant Operator	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Assistant Plant Operator, Fireman Or Pugmixer (asphalt)	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Assistant Refrigeration Plant & Chiller Operator (over 1000 Ton)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Assistant Refrigeration Plant (under 1000 Ton)	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Automatic Subgrader (ditches & Trimmers)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Backfillers (cleveland & Similar)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Backhoe & Hoe Ram (under 3/4 Yd.)	\$57.80	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Backhoe (45,000 Gw & Under)	\$57.80	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Backhoe (45,000 Gw To 110,000 Gw)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Backhoe (over 110,000 Gw)	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Backhoes & Hoe Ram (3 Yds & Over)	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Backhoes & Hoe Ram (3/4 Yd. To 3 Yd.)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Bagley Or Stationary Scraper	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Batch & Wet Mix Operator (multiple Units, 2 & Incl. 4)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Batch Plant & Wet Mix Operator, Single Unit (concrete)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Batch Plant (over 4 Units)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Belt Finishing Machine	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Belt Loader (kocal Or Similar)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View

Whitman	Power Equipment Operators	Belt-crete Conveyors With Power Pack Or Similar	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Bending Machine	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Bit Grinders	\$56.39	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Blade (finish & Bluetop), Automatic, Cmi, Abc, Finish Athey & Huber & Similar When Used As Automatic	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Blade Operator (motor Patrol & Attachments)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Blower Operator (cement)	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Boat Operator	\$56.39	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Bob Cat (skid Steer)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Bolt Threading Machine	\$56.39	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Boom Cats (side)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Boring Machine (earth)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Boring Machine (Rock Under 8 inch Bit - Quarry Master, Joy Or Similar)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Bump Cutter (wayne, Saginaw Or Similar)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Cableway Controller (dispatcher)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Cableway Operators	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Canal Lining Machine (concrete)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Carrydeck & Boom Truck (under 25 Tons)	\$57.80	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Cement Hog	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Chipper (Without Crane)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Clamshell, Dragline	\$60.22	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Cleaning & Doping Machine (Pipeline)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Compactor (self-propelled With Blade)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Compressor (2000 Cfm Or Over, 2 Or More, Gas Diesel Or Electric Power)	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Compressors (under 2000 Cfm, Gas, Diesel Or Electric Power)	\$56.39	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Concrete Cleaning / Decontamination Machine Operator	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Concrete Pump Boom Truck	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Concrete Pumps (squeeze-crete, Flow-crete, Whitman & Similar)	\$57.61	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Concrete Saw (multiple Cut)	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Concrete Slip Form Paver	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Conveyor Aggregate Delivery Systems (c.a.d.)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View

Whitman	Power Equipment Operators	Crane Oiler & Cable Tender, Mucking Machine	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators	Crane Oiler - Driver (cdl Required)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators	Cranes (100 to 299 Tons) All Attachments	\$61.12	7Z	4S	9A	View
Whitman	Power Equipment Operators	Cranes (25 Tons & Under), All Attachments Incl. Clamshell, Dragline	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators	Cranes (25 Tons To And Including 44 Tons), All Attachments Incl. Clamshell, Dragline	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Cranes (300 Tons and Over) All Attachments	\$61.92	7Z	4S	9A	View
Whitman	Power Equipment Operators	Cranes (45 Tons To 55 Tons), All Attachments Incl. Clamshell And Dragline	\$58.42	7Z	4S	9A	View
Whitman	Power Equipment Operators	Cranes (56 to 99 tons) and overhead, rail and Quick Tower. All attachment incl. Clamshell, Dragline	\$60.22	7Z	4S	9A	View
Whitman	Power Equipment Operators	Crusher Feeder	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators	Crusher, Grizzle & Screening Plant Operator	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Curb Extruder (asphalt Or Concrete)	\$57.61	7Z	4S	9A	View
Whitman	Power Equipment Operators	Deck Engineer	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators	Deck Hand	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators	Derricks & Stifflegs (65 Tons & Over)	\$58.42	7Z	4S	9A	View
Whitman	Power Equipment Operators	Derricks & Stifflegs (under 65 Tons)	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators	Distributor Leverman	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators	Ditch Witch Or Similar	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators	Dope Pots (power Agitated	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators	Dozer / Tractor (up To D-5 Or Equivalent) And Traxcavator	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators	Dozer / Tractors (d-6 & Equivalent & Over)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Dozer, 834 R/t & Similar	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Drill Doctor	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Driller Licensed	\$60.22	7Z	4S	9A	View
Whitman	Power Equipment Operators	Drillers Helper	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators	Drilling Equipment (8 inch Bit & Over - Robbins, Reverse Circulation & Similar)	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators	Drills (churn, Core, Calyx Or Diamond)	\$57.61	7Z	4S	9A	View
Whitman	Power Equipment Operators	Elevating Belt (holland Type)	\$58.42	7Z	4S	9A	View
Whitman	Power Equipment Operators	Elevating Belt-type Loader (euclid, Barber Green &	\$57.43	7Z	4S	9A	View

		Similar)					
Whitman	Power Equipment Operators	Elevating Grader-type Loader (dumorf, Adams Or Similar)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Elevator Hoisting Materials	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Equipment Serviceman, Greaser & Oiler	\$57.61	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Fireman & Heater Tender	\$56.39	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Fork Lift Or Lumber Stacker, Hydra-life & Similar	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Generator Plant Engineers (diesel Or Electric)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Gin Trucks (pipeline)	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Grade Checker	\$57.80	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Gunitite Combination Mixer & Compressor	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	H.d. Mechanic	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	H.d. Welder	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Heavy Equipment Robotics Operator	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Helicopter Pilot	\$60.22	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Helper, Mechanic Or Welder, H.D	\$56.39	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Hoe Ram	\$57.80	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Hoist (2 Or More Drums Or Tower Hoist)	\$57.61	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Hoist, Single Drum	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Hydraulic Platform Trailers (goldhofer, Shaurerly And Similar)	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Hydro-seeder, Mulcher, Nozzleman	\$56.39	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Lime Batch Tank Operator (recycle Train)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Lime Brain Operator (recycle Train)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Loader (360 Degrees Revolving Koehring Scooper Or Similar)	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Loader Operator (front-end & Overhead, 4 Yds. Incl. 8 Yds.)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Loaders (bucket Elevators And Conveyors)	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Loaders (overhead & Front-end, Over 8 Yds.)	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Loaders (overhead & Front-end, Under 4 Yds.. R/t)	\$57.61	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Loaders (overhead And Front-end, 10 Yds. & Over)	\$60.22	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Locomotive Engineer	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Longitudinal Float	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators	Master Environmental Maintenance Technician	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View

Whitman	Power Equipment Operators	Mixer (portable - Concrete)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators	Mixermobile	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators	Mobile Crusher Operator (recycle Train)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Mucking Machine	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators	Multiple Dozer Units With Single Blade	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Pavement Breaker, Hydra-hammer & Similar	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators	Paving (dual Drum)	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators	Paving Machine (asphalt And Concrete)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Piledriving Engineers	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators	Plant Oiler	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators	Posthole Auger Or Punch	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators	Power Broom	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators	Pump (grout Or Jet)	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators	Pumpman	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators	Quad-track Or Similar Equipment	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Railroad Ballast Regulation Operator (self-propelled)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators	Railroad Power Tamper Operator (self-propelled)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators	Railroad Tamper Jack Operator (self-propelled)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators	Railroad Track Liner Operator (self-propelled)	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators	Refrigeration Plant Engineer (1000 Tons & Over)	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators	Refrigeration Plant Engineer (under 1000 Ton)	\$57.61	7Z	4S	9A	View
Whitman	Power Equipment Operators	Rollerman (finishing Asphalt Pavement)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Rollers, All Types On Subgrade, Including Seal And Chip Coating (farm Type, Case, John Deere And Similar, or Compacting Vibrator), Except When Pulled B	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators	Roto Mill (pavement Grinder)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Rotomill Groundsman	\$57.61	7Z	4S	9A	View
Whitman	Power Equipment Operators	Rubber-tired Scrapers (multiple Engine With Three Or More Scrapers)	\$58.42	7Z	4S	9A	View
Whitman	Power Equipment Operators	Rubber-tired Skidders (r/t With Or Without Attachments)	\$57.61	7Z	4S	9A	View
Whitman	Power Equipment Operators	Scrapers, All, Rubber-tired	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Screed Operator	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators	Shovels (3 Yds. & Over)	\$58.42	7Z	4S	9A	View
Whitman	Power Equipment Operators	Shovels (under 3 Yds.)	\$58.11	7Z	4S	9A	View

Whitman	Power Equipment Operators	Signalman (whirleys, Highline, Hammerheads Or Similar)	\$57.80	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Soil Stabilizer (p & H Or Similar)	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Spray Curing Machine (concrete)	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Spreader Box (self-propelled)	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Spreader Machine	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Steam Cleaner	\$56.39	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Straddle Buggy (ross & Similar On Construction Job Only)	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Surface Heater & Planer Machine	\$57.61	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Tractor (farm Type R/t With Attachments, Except Backhoe)	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Traverse Finish Machine	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Trenching Machines (7 Ft. Depth & Over)	\$58.11	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Trenching Machines (under 7 Ft. Depth Capacity)	\$57.61	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Tug Boat Operator	\$58.11	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Tugger Operator	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Turnhead (with Re-screening)	\$57.61	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Turnhead Operator	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Ultra High Pressure Waterjet Cutting Tool System Operator, (30,000 Psi)	\$58.42	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Vactor Guzzler, Super Sucker	\$58.11	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Vacuum Blasting Machine Operator	\$58.42	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Vacuum Drill (reverse Circulation Drill Under 8 Inch Bit)	\$57.61	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Welding Machine	\$56.39	ZZ	4S	9A	View
Whitman	Power Equipment Operators	Whirleys & Hammerheads, All	\$58.42	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	A-frame Truck (2 Or More Drums)	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	A-frame Truck (single Drum)	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	All Tower Cranes	\$61.92	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Asphalt Plant Operator	\$58.11	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Assistant Plant Operator, Fireman Or Pugmixer (asphalt)	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Assistant Refrigeration Plant & Chiller Operator (over 1000 Ton)	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Assistant Refrigeration Plant (under 1000 Ton)	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators-	Automatic Subgrader (ditches	\$58.11	ZZ	4S	9A	View

	Underground Sewer & Water	& Trimmers)					
Whitman	Power Equipment Operators- Underground Sewer & Water	Backfillers (cleveland & Similar)	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Backhoe & Hoe Ram (under 3/4 Yd.)	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Backhoe (45,000 Gw & Under)	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Backhoe (45,000 Gw To 110,000 Gw)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Backhoe (over 110,000 Gw)	\$58.42	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Backhoes & Hoe Ram (3 Yds & Over)	\$58.42	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Backhoes & Hoe Ram (3/4 Yd. To 3 Yd.)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Bagley Or Stationary Scraper	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Batch & Wet Mix Operator (multiple Units, 2 & Incl. 4)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Batch Plant & Wet Mix Operator, Single Unit (concrete)	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Batch Plant (over 4 Units)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Belt Finishing Machine	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Belt Loader (kocal Or Similar)	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Belt-crete Conveyors With Power Pack Or Similar	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Bending Machine	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Bit Grinders	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Blade (finish & Bluetop), Automatic, Cmi, Abc, Finish Athey & Huber & Similar When Used As Automatic	\$58.42	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Blade Operator (motor Patrol & Attachments)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Blower Operator (cement)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Boat Operator	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Bob Cat (skid Steer)	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Bolt Threading Machine	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Boom Cats (side)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Boring Machine (earth)	\$57.43	7Z	4S	9A	View

Whitman	Power Equipment Operators-Underground Sewer & Water	Boring Machine (Rock Under 8 inch Bit - Quarry Master, Joy Or Similar)	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Bump Cutter (wayne, Saginaw Or Similar)	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Cableway Controller (dispatcher)	\$58.11	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Cableway Operators	\$58.42	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Canal Lining Machine (concrete)	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Carrydeck & Boom Truck (under 25 Tons)	\$57.80	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Cement Hog	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Chipper (Without Crane)	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Clamshell, Dragline	\$60.22	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Cleaning & Doping Machine (Pipeline)	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Compactor (self-propelled With Blade)	\$58.11	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Compressor (2000 Cfm Or Over, 2 Or More, Gas Diesel Or Electric Power)	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Compressors (under 2000 Cfm, Gas, Diesel Or Electric Power)	\$56.39	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Concrete Cleaning / Decontamination Machine Operator	\$58.42	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Concrete Pump Boom Truck	\$58.11	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Concrete Pumps (squeeze-crete, Flow-crete, Whitman & Similar)	\$57.61	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Concrete Saw (multiple Cut)	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Concrete Slip Form Paver	\$58.11	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Conveyor Aggregate Delivery Systems (c.a.d.)	\$58.11	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Crane Oiler & Cable Tender, Mucking Machine	\$56.39	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Crane Oiler - Driver (cdl Required)	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Cranes (100 to 299 Tons) All Attachments	\$61.12	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Cranes (25 Tons & Under), All Attachments Incl. Clamshell, Dragline	\$57.80	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Cranes (25 Tons To And Including 44 Tons), All	\$58.11	ZZ	4S	9A	View

		Attachments Incl. Clamshell, Dragline					
Whitman	Power Equipment Operators-Underground Sewer & Water	Cranes (300 Tons and Over) All Attachments	\$61.92	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Cranes (45 Tons To 55 Tons), All Attachments Incl. Clamshell And Dragline	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Cranes (56 to 99 tons) and overhead, rail and Quick Tower. All attachment incl. Clamshell, Dragline	\$60.22	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Crusher Feeder	\$56.39	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Crusher, Grizzle & Screening Plant Operator	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Curb Extruder (asphalt Or Concrete)	\$57.61	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Deck Engineer	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Deck Hand	\$56.39	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Derricks & Stifflegs (65 Tons & Over)	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Derricks & Stifflegs (under 65 Tons)	\$57.80	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Distributor Leverman	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Ditch Witch Or Similar	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Dope Pots (power Agitated	\$56.74	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Dozer / Tractor (up To D-5 Or Equivalent) And Traxcavator	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Dozer / Tractors (d-6 & Equivalent & Over)	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Dozer, 834 R/t & Similar	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Drill Doctor	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Driller Licensed	\$60.22	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Drillers Helper	\$56.39	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Drilling Equipment (8 inch Bit & Over - Robbins, Reverse Circulation & Similar)	\$57.80	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Drills (churn, Core, Calyx Or Diamond)	\$57.61	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Elevating Belt (holland Type)	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Elevating Belt-type Loader (euclid, Barber Green & Similar)	\$57.43	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View

Whitman	Power Equipment Operators-Underground Sewer & Water	Elevating Grader-type Loader (dumorf, Adams Or Similar)	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Elevator Hoisting Materials	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Equipment Serviceman, Greaser & Oilor	\$57.61	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Fireman & Heater Tender	\$56.39	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Fork Lift Or Lumber Stacker, Hydra-life & Similar	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Generator Plant Engineers (diesel Or Electric)	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Gin Trucks (pipeline)	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Grade Checker	\$57.80	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Gunitite Combination Mixer & Compressor	\$57.43	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	H.d. Mechanic	\$58.42	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	H.d. Welder	\$58.42	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Heavy Equipment Robotics Operator	\$58.42	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Helicopter Pilot	\$60.22	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Helper, Mechanic Or Welder, H.D	\$56.39	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Hoe Ram	\$57.80	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Hoist (2 Or More Drums Or Tower Hoist)	\$57.61	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Hoist, Single Drum	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Hydraulic Platform Trailers (goldhofer, Shaurerly And Similar)	\$58.42	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Hydro-seeder, Mulcher, Nozzleman	\$56.39	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Lime Batch Tank Operator (recycle Train)	\$58.11	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Lime Brain Operator (recycle Train)	\$58.11	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Loader (360 Degrees Revolving Koehring Scooper Or Similar)	\$58.42	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Loader Operator (front-end & Overhead, 4 Yds. Incl. 8 Yds.)	\$58.11	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Loaders (bucket Elevators And Conveyors)	\$56.74	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Loaders (overhead & Front-end, Over 8 Yds.)	\$58.42	ZZ	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Loaders (overhead & Front-end, Under 4 Yds.. R/t)	\$57.61	ZZ	4S	9A	View

Whitman	Power Equipment Operators-Underground Sewer & Water	Locomotive Engineer	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Longitudinal Float	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Master Environmental Maintenance Technician	\$58.42	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Mixer (portable - Concrete)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Mixermobile	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Mobile Crusher Operator (recycle Train)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Mucking Machine	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Multiple Dozer Units With Single Blade	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Pavement Breaker, Hydra-hammer & Similar	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Paving (dual Drum)	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Paving Machine (asphalt And Concrete)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Piledriving Engineers	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Plant Oiler	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Posthole Auger Or Punch	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Power Broom	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Pump (grout Or Jet)	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Pumpman	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Quad-track Or Similar Equipment	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Railroad Ballast Regulation Operator (self-propelled)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Railroad Power Tamper Operator (self-propelled)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Railroad Tamper Jack Operator (self-propelled)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Railroad Track Liner Operator (self-propelled)	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Refrigeration Plant Engineer (1000 Tons & Over)	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Refrigeration Plant Engineer (under 1000 Ton)	\$57.61	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Rollerman (finishing Asphalt Pavement)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Rollers, All Types On Subgrade, Including Seal And Chip Coating (farm Type, Case,	\$56.39	7Z	4S	9A	View

		John Deere And Similar,or Compacting Vibrator), Except When Pulled B					
Whitman	Power Equipment Operators- Underground Sewer & Water	Roto Mill (pavement Grinder)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Rotomill Groundsman	\$57.61	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Rubber-tired Scrapers (multiple Engine With Three Or More Scrapers)	\$58.42	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Rubber-tired Skidders (r/t With Or Without Attachments)	\$57.61	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Scrapers, All, Rubber-tired	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Screed Operator	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Shovels (3 Yds. & Over)	\$58.42	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Shovels (under 3 Yds.)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Signalman (whirleys, Highline, Hammerheads Or Similar)	\$57.80	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Soil Stabilizer (p & H Or Similar)	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Spray Curing Machine (concrete)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Spreader Box (self-propelled)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Spreader Machine	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Steam Cleaner	\$56.39	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Straddle Buggy (ross & Similar On Construction Job Only)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Surface Heater & Planer Machine	\$57.61	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Tractor (farm Type R/t With Attachments, Except Backhoe)	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Traverse Finish Machine	\$57.43	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Trenching Machines (7 Ft. Depth & Over)	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Trenching Machines (under 7 Ft. Depth Capacity)	\$57.61	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Tug Boat Operator	\$58.11	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Tugger Operator	\$56.74	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Turnhead (with Re-screening)	\$57.61	7Z	4S	9A	View
Whitman	Power Equipment Operators- Underground Sewer & Water	Turnhead Operator	\$57.43	7Z	4S	9A	View

Whitman	Power Equipment Operators-Underground Sewer & Water	Ultra High Pressure Waterjet Cutting Tool System Operator, (30,000 Psi)	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Vactor Guzzler, Super Sucker	\$58.11	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Vacuum Blasting Machine Operator	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Vacuum Drill (reverse Circulation Drill Under 8 Inch Bit)	\$57.61	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Welding Machine	\$56.39	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Equipment Operators-Underground Sewer & Water	Whirleys & Hammerheads, All	\$58.42	<u>7Z</u>	<u>4S</u>	<u>9A</u>	View
Whitman	Power Line Clearance Tree Trimmers	Journey Level In Charge	\$57.22	<u>5A</u>	<u>4A</u>		View
Whitman	Power Line Clearance Tree Trimmers	Spray Person	\$54.32	<u>5A</u>	<u>4A</u>		View
Whitman	Power Line Clearance Tree Trimmers	Tree Equipment Operator	\$57.22	<u>5A</u>	<u>4A</u>		View
Whitman	Power Line Clearance Tree Trimmers	Tree Trimmer	\$51.18	<u>5A</u>	<u>4A</u>		View
Whitman	Power Line Clearance Tree Trimmers	Tree Trimmer Groundperson	\$38.99	<u>5A</u>	<u>4A</u>		View
Whitman	Refrigeration & Air Conditioning Mechanics	Journey Level	\$92.81	<u>6Z</u>	<u>1Q</u>		View
Whitman	Residential Brick Mason	Journey Level	\$57.54	<u>5A</u>	<u>1M</u>		View
Whitman	Residential Carpenters	Journey Level	\$25.00		<u>1</u>		View
Whitman	Residential Cement Masons	Journey Level	\$16.28		<u>1</u>		View
Whitman	Residential Drywall Applicators	Journey Level	\$25.64		<u>1</u>		View
Whitman	Residential Drywall Tapers	Journey Level	\$51.18	<u>7E</u>	<u>1P</u>		View
Whitman	Residential Electricians	Journey Level	\$31.82		<u>1</u>		View
Whitman	Residential Glaziers	Journey Level	\$20.72		<u>1</u>		View
Whitman	Residential Insulation Applicators	Journey Level	\$16.28		<u>1</u>		View
Whitman	Residential Laborers	Journey Level	\$22.44		<u>1</u>		View
Whitman	Residential Marble Setters	Journey Level	\$57.54	<u>5A</u>	<u>1M</u>		View
Whitman	Residential Painters	Journey Level	\$25.08		<u>1</u>		View
Whitman	Residential Plumbers & Pipefitters	Journey Level	\$43.33		<u>1</u>		View
Whitman	Residential Refrigeration & Air Conditioning Mechanics	Journey Level	\$18.40		<u>1</u>		View
Whitman	Residential Sheet Metal Workers	Journey Level (Field or Shop)	\$69.36	<u>5I</u>	<u>1B</u>		View
Whitman	Residential Soft Floor Layers	Journey Level	\$17.62		<u>1</u>		View
Whitman	Residential Sprinkler Fitters (Fire Protection)	Journey Level	\$18.40		<u>1</u>		View
Whitman	Residential Stone Masons	Journey Level	\$57.54	<u>5A</u>	<u>1M</u>		View
Whitman	Residential Terrazzo Workers	Journey Level	\$20.61		<u>1</u>		View
Whitman	Residential Terrazzo/Tile Finishers	Journey Level	\$17.92		<u>1</u>		View
Whitman	Residential Tile Setters	Journey Level	\$20.61		<u>1</u>		View

Whitman	Roofers	Journey Level	\$46.79	5I	1R		View
Whitman	Roofers	Using Irritable Bituminous Materials	\$48.79	5I	1R		View
Whitman	Sheet Metal Workers	Journey Level (Field or Shop)	\$77.36	6Z	1B		View
Whitman	Sign Makers & Installers (Electrical)	Journey Level	\$16.28		1		View
Whitman	Sign Makers & Installers (Non-Electrical)	Journey Level	\$16.28		1		View
Whitman	Soft Floor Layers	Journey Level	\$57.11	5A	3J		View
Whitman	Solar Controls For Windows	Journey Level	\$16.28		1		View
Whitman	Sprinkler Fitters (Fire Protection)	Journey Level	\$67.41	7J	1R		View
Whitman	Stage Rigging Mechanics (Non Structural)	Journey Level	\$16.28		1		View
Whitman	Stone Masons	Journey Level	\$57.54	5A	1M		View
Whitman	Street And Parking Lot Sweeper Workers	Journey Level	\$16.28		1		View
Whitman	Surveyors	Chain Person	\$16.28	0	1	9H	View
Whitman	Surveyors	Instrument Person	\$16.28	0	1	9H	View
Whitman	Surveyors	Party Chief	\$16.28	0	1	9H	View
Whitman	Telecommunication Technicians	Journey Level	\$53.20	5I	1B		View
Whitman	Telephone Line Construction - Outside	Cable Splicer	\$40.36	5A	2B		View
Whitman	Telephone Line Construction - Outside	Hole Digger/Ground Person	\$26.92	5A	2B		View
Whitman	Telephone Line Construction - Outside	Telephone Equipment Operator (Light)	\$33.74	5A	2B		View
Whitman	Telephone Line Construction - Outside	Telephone Lineperson	\$38.15	5A	2B		View
Whitman	Terrazzo Workers	Journey Level	\$43.81	5A	1M		View
Whitman	Tile Setters	Journey Level	\$43.81	5A	1M		View
Whitman	Tile, Marble & Terrazzo Finishers	Journey Level	\$35.93	5A	1M		View
Whitman	Traffic Control Strippers	Journey Level	\$89.54	15L	1K		View
Whitman	Truck Drivers	Asphalt Mix Over 20 Yards	\$56.35	5D	1V	8M	View
Whitman	Truck Drivers	Asphalt Mix To 20 Yards	\$56.15	5D	1V	8M	View
Whitman	Truck Drivers	Dump Truck	\$56.15	5D	1V	8M	View
Whitman	Truck Drivers	Dump Truck & Trailer	\$56.35	5D	1V	8M	View
Whitman	Truck Drivers	Other Trucks	\$56.04	5D	1V	8M	View
Whitman	Truck Drivers - Ready Mix	Transit Mixers 20 yards and under	\$56.35	5D	1V	8M	View
Whitman	Truck Drivers - Ready Mix	Transit Mixers over 20 yards	\$56.69	5D	1V	8M	View
Whitman	Well Drillers & Irrigation Pump Installers	Irrigation Pump Installer	\$16.28		1		View
Whitman	Well Drillers & Irrigation Pump Installers	Oiler	\$16.28		1		View
Whitman	Well Drillers & Irrigation Pump Installers	Well Driller	\$18.00		1		View

Overtime Codes

Overtime calculations are based on the hourly rate actually paid to the worker. On public works projects, the hourly rate must be not less than the prevailing rate of wage minus the hourly rate of the cost of fringe benefits actually provided for the worker.

1. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.
 - B. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.
 - C. The first two (2) hours after eight (8) regular hours Monday through Friday and the first ten (10) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other overtime hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.
 - D. The first two (2) hours before or after a five-eight (8) hour workweek day or a four-ten (10) hour workweek day and the first eight (8) hours worked the next day after either workweek shall be paid at one and one-half times the hourly rate of wage. All additional hours worked and all worked on Sundays and holidays shall be paid at double the hourly rate of wage.
 - E. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.
 - F. The first two (2) hours after eight (8) regular hours Monday through Friday and the first ten (10) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other overtime hours worked, except Labor Day, shall be paid at double the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage.
 - G. The first ten (10) hours worked on Saturdays and the first ten (10) hours worked on a fifth calendar weekday in a four-ten hour schedule, shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of ten (10) hours per day Monday through Saturday and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.
 - H. All hours worked on Saturdays (except makeup days if work is lost due to inclement weather conditions or equipment breakdown) shall be paid at one and one-half times the hourly rate of wage. All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.
 - I. All hours worked on Sundays and holidays shall also be paid at double the hourly rate of wage.
 - J. The first two (2) hours after eight (8) regular hours Monday through Friday and the first ten (10) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked over ten (10) hours Monday through Saturday, Sundays and holidays shall be paid at double the hourly rate of wage.
 - K. All hours worked on Saturdays and Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.
 - M. All hours worked on Saturdays (except makeup days if work is lost due to inclement weather conditions) shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

Overtime Codes Continued

1. N. All hours worked on Saturdays (except makeup days) shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.
- O. The first ten (10) hours worked on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays, holidays and after twelve (12) hours, Monday through Friday and after ten (10) hours on Saturday shall be paid at double the hourly rate of wage.
- P. All hours worked on Saturdays (except makeup days if circumstances warrant) and Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.
- Q. The first two (2) hours after eight (8) regular hours Monday through Friday and up to ten (10) hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of ten (10) hours per day Monday through Saturday and all hours worked on Sundays and holidays (except Christmas day) shall be paid at double the hourly rate of wage. All hours worked on Christmas day shall be paid at two and one-half times the hourly rate of wage.
- R. All hours worked on Sundays and holidays shall be paid at two times the hourly rate of wage.
- U. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays (except Labor Day) shall be paid at two times the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage.
- V. All hours worked on Sundays and holidays (except Thanksgiving Day and Christmas day) shall be paid at one and one-half times the hourly rate of wage. All hours worked on Thanksgiving Day and Christmas day shall be paid at double the hourly rate of wage.
- W. All hours worked on Saturdays and Sundays (except make-up days due to conditions beyond the control of the employer)) shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.
- X. The first four (4) hours after eight (8) regular hours Monday through Friday and the first twelve (12) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked over twelve (12) hours Monday through Saturday, Sundays and holidays shall be paid at double the hourly rate of wage. When holiday falls on Saturday or Sunday, the day before Saturday, Friday, and the day after Sunday, Monday, shall be considered the holiday and all work performed shall be paid at double the hourly rate of wage.
- Y. All hours worked outside the hours of 5:00 am and 5:00 pm (or such other hours as may be agreed upon by any employer and the employee) and all hours worked in excess of eight (8) hours per day (10 hours per day for a 4 x 10 workweek) and on Saturdays and holidays (except labor day) shall be paid at one and one-half times the hourly rate of wage. (except for employees who are absent from work without prior approval on a scheduled workday during the workweek shall be paid at the straight-time rate until they have worked 8 hours in a day (10 in a 4 x 10 workweek) or 40 hours during that workweek.) All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and Labor Day shall be paid at double the hourly rate of wage.
- Z. All hours worked on Saturdays and Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid the straight time rate of pay in addition to holiday pay.

Overtime Codes Continued

2. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.
- B. All hours worked on holidays shall be paid at one and one-half times the hourly rate of wage.
- F. The first eight (8) hours worked on holidays shall be paid at the straight hourly rate of wage in addition to the holiday pay. All hours worked in excess of eight (8) hours on holidays shall be paid at double the hourly rate of wage.
- M. This code appears to be missing. All hours worked on Saturdays, Sundays and holidays shall be paid at double the hourly rate of wage.
- R. All hours worked on Sundays and holidays and all hours worked over sixty (60) in one week shall be paid at double the hourly rate of wage.
- U. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked over 12 hours in a day or on Sundays and holidays shall be paid at double the hourly rate of wage.
3. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.
- F. All hours worked on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sunday shall be paid at two times the hourly rate of wage. All hours worked on paid holidays shall be paid at two and one-half times the hourly rate of wage including holiday pay.
- H. All work performed on Sundays between March 16th and October 14th and all Holidays shall be compensated for at two (2) times the regular rate of pay. Work performed on Sundays between October 15th and March 15th shall be compensated at one and one half (1-1/2) times the regular rate of pay.
- J. All hours worked between the hours of 10:00 pm and 5:00 am, Monday through Friday, and all hours worked on Saturdays shall be paid at a one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.
- K. Work performed in excess of eight (8) hours of straight time per day, or ten (10) hours of straight time per day when four ten (10) hour shifts are established, or forty (40) hours of straight time per week, Monday through Friday, or outside the normal 5 am to 6pm shift, and all work on Saturdays shall be paid at one and one-half times the hourly rate of wage. All work performed after 6:00 pm Saturday to 5:00 am Monday and Holidays, and all hours worked in excess of twelve (12) hours in a single shift shall be paid at double the hourly rate of wage.
- After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more. When an employee returns to work without at least eight (8) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until he/she shall have the eight (8) hours rest period.

Overtime Codes Continued

4. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

- A. All hours worked in excess of eight (8) hours per day or forty (40) hours per week shall be paid at double the hourly rate of wage. All hours worked on Saturdays, Sundays and holidays shall be paid at double the hourly rate of wage
- C. On Monday through Friday, the first four (4) hours of overtime after eight (8) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay, unless a four (4) day ten (10) hour workweek has been established. On a four (4) day ten (10) hour workweek scheduled Monday through Thursday, or Tuesday through Friday, the first two (2) hours of overtime after ten (10) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay. On Saturday, the first twelve (12) hours of work shall be paid at one and one half (1-1/2) times the straight time rate of pay, except that if the job is down on Monday through Friday due to weather conditions or other conditions outside the control of the employer, the first ten (10) hours on Saturday may be worked at the straight time rate of pay. All hours worked over twelve (12) hours in a day and all hours worked on Sunday and Holidays shall be paid at two (2) times the straight time rate of pay.
- D. All hours worked in excess of eight (8) hours per day or forty (40) hours per week shall be paid at double the hourly rate of wage. All hours worked on Saturday, Sundays and holidays shall be paid at double the hourly rate of pay. Rates include all members of the assigned crew.

EXCEPTION:

On all multipole structures and steel transmission lines, switching stations, regulating, capacitor stations, generating plants, industrial plants, associated installations and substations, except those substations whose primary function is to feed a distribution system, will be paid overtime under the following rates:

The first two (2) hours after eight (8) regular hours Monday through Friday of overtime on a regular workday, shall be paid at one and one-half times the hourly rate of wage. All hours in excess of ten (10) hours will be at two (2) times the hourly rate of wage. The first eight (8) hours worked on Saturday will be paid at one and one-half (1-1/2) times the hourly rate of wage. All hours worked in excess of eight (8) hours on Saturday, and all hours worked on Sundays and holidays will be at the double the hourly rate of wage.

All overtime eligible hours performed on the above described work that is energized, shall be paid at the double the hourly rate of wage.

- E. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

On a four-day, ten-hour weekly schedule, either Monday thru Thursday or Tuesday thru Friday schedule, all hours worked after ten shall be paid at double the hourly rate of wage. The Monday or Friday not utilized in the normal four-day, ten hour work week, and Saturday shall be paid at one and one half (1½) times the regular shift rate for the first eight (8) hours. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.
- G. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.
- I. The First eight (8) hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of eight (8) per day on Saturdays shall be paid at double the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

Overtime Codes Continued

4. J. The first eight (8) hours worked on a Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of eight (8) hours on a Saturday shall be paid at double the hourly rate of wage. All hours worked over twelve (12) in a day, and all hours worked on Sundays and Holidays shall be paid at double the hourly rate of wage.
- K. All hours worked on a Saturday shall be paid at one and one-half times the hourly rate of wage, so long as Saturday is the sixth consecutive day worked. All hours worked over twelve (12) in a day Monday through Saturday, and all hours worked on Sundays and Holidays shall be paid at double the hourly rate of wage.
- L. The first twelve (12) hours worked on a Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked on a Saturday in excess of twelve (12) hours shall be paid at double the hourly rate of pay. All hours worked over twelve (12) in a day Monday through Friday, and all hours worked on Sundays shall be paid at double the hourly rate of wage. All hours worked on a holiday shall be paid at one and one-half times the hourly rate of wage, except that all hours worked on Labor Day shall be paid at double the hourly rate of pay.
- S. On a four (4) day ten (10) hour workweek scheduled Monday through Thursday, or Tuesday through Friday, work performed in excess of (10) hours shall be paid at one and one half (1-1/2) times the hourly rate of pay. On Monday through Friday, work performed outside the normal work hours of 6:00 a.m. and 6:00 p.m. shall be paid at one and one-half (1-1/2) times the straight time rate, (except for special shifts or multiple shift operations).
- All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All work performed on Sundays and holidays shall be paid at double the hourly rate of wage. When an employee returns to work without at least eight (8) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.
- Multiple Shift Operations: When the first shift of a multiple shift (a two or three shift) operation is started at the basic straight time rate or at a specific overtime rate, all shifts of that day's operation shall be completed at that rate. Special Shifts: The Special Shift Premium is the basic hourly rate of pay plus \$2.00 an hour. When due to conditions beyond the control of the employer or when an owner (not acting as the contractor), a government agency or the contract specifications require more than four (4) hours of a special shift can only be performed outside the normal 6am to 6pm shift then the special shift premium will be applied to the basic straight time for the entire shift. When an employee works on a special shift, they shall be paid the special shift premium for each hour worked unless they are in overtime or double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday).
- U. The first four (4) hours after eight (8) regular hours Monday through Friday and the first twelve (12) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. (Except on makeup days if work is lost due to inclement weather, then the first eight (8) hours on Saturday may be paid the regular rate.) All hours worked over twelve (12) hours Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

Overtime Codes Continued

4. V. Work performed in excess of ten (10) hours of straight time per day when four ten (10) hour shifts are established or outside the normal shift (5 am to 6pm), and all work on Saturdays, except for make-up days shall be paid at time and one-half (1 ½) the straight time rate.

In the event the job is down due to weather conditions, then Saturday may, be worked as a voluntary make-up day at the straight time rate. However, Saturday shall not be utilized as a make-up day when a holiday falls on Friday. All work performed on Sundays and holidays and work in excess of twelve (12) hours per day shall be paid at double (2x) the straight time rate of pay.

After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

When an employee returns to work without a break of eight (8) hours since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

- X. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage. Work performed outside the normal shift of 6 am to 6pm shall be paid at one and one-half the straight time rate, (except for special shifts or three shift operations). All work performed on Sundays and holidays shall be paid at double the hourly rate of wage. Shifts may be established when considered necessary by the Employer.

The Employer may establish shifts consisting of eight (8) or ten (10) hours of work (subject to WAC 296-127-022), that shall constitute a normal forty (40) hour work week. The Employer can change from a 5-eight to a 4-ten hour schedule or back to the other. All hours of work on these shifts shall be paid for at the straight time hourly rate. Work performed in excess of eight hours (or ten hours per day (subject to WAC 296-127-022) shall be paid at one and one-half the straight time rate.

When due to conditions beyond the control of the Employer, or when contract specifications require that work can only be performed outside the regular day shift, then by mutual agreement a special shift may be worked at the straight time rate, eight (8) hours work for eight (8) hours pay. The starting time shall be arranged to fit such conditions of work.

When an employee returns to work without at a break of eight (8) hours since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

11. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

- B After an employee has worked eight (8) hours, all additional hours worked shall be paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more.

- C The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other overtime hours worked, except Labor Day, and all hours on Sunday shall be paid at double the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage. All non-overtime and non-holiday hours worked between 4:00 pm and 5:00 am, Monday through Friday, shall be paid at a premium rate of 15% over the hourly rate of wage.

Overtime Codes Continued

11. D. All hours worked on Saturdays and holidays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays shall be paid at double the hourly rate of wage.
- After an employee has worked eight (8) hours, all additional hours worked shall be paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more.
- E. The first two (2) hours after eight (8) regular hours Monday through Friday, the first ten (10) hours on Saturday, and the first ten (10) hours worked on Holidays shall be paid at one and one-half times the hourly rate of wage. All hours worked over ten (10) hours Monday through Saturday, and Sundays shall be paid at double the hourly rate of wage.
- After an employee has worked eight (8) hours, all additional hours worked shall be paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more.
- F. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.
- On a four-day, ten-hour weekly schedule, either Monday thru Thursday or Tuesday thru Friday schedule, all hours worked after ten shall be paid at double the hourly rate of wage. The Monday or Friday not utilized in the normal four-day, ten hour work week, and Saturday shall be paid at one-half times the hourly rate of wage for the first eight (8) hours. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.
- G. Work performed in excess of eight (8) hours of straight time per day, or ten (10) hours of straight time per day when four ten (10) hour shifts are established, or forty (40) hours of straight time per week, Monday through Friday, or outside the normal 5 am to 6pm shift, and all work on Saturdays shall be paid at one and one-half times the hourly rate of wage.
- All work performed after 6:00 pm Saturday to 5:00 am Monday and Holidays, and all hours worked in excess of twelve (12) hours in a single shift shall be paid at double the hourly rate of wage.
- After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of nine (9) hours or more. When an employee returns to work without at least nine (9) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until he/she shall have the nine (9) hours rest period.
- H. Work performed in excess of eight (8) hours of straight time per day, or ten (10) hours of straight time per day when four ten (10) hour shifts are established, or forty (40) hours of straight time per week, Monday through Friday, or outside the normal 5 am to 6pm shift, and all work on Saturdays shall be paid at one and one-half times the hourly rate of wage.
- All work performed after 6:00 pm Saturday to 5:00 am Monday and Holidays, and all hours worked in excess of twelve (12) hours in a single shift shall be paid at double the hourly rate of wage.
- After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of ten (10) hours or more. When an employee returns to work without at least ten (10) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until he/she shall have the ten (10) hours rest period.

Overtime Codes Continued

11. J. All hours worked on holidays shall be paid at double the hourly rate of wage.
- K. On Monday through Friday hours worked outside 4:00 am and 5:00 pm, and the first two (2) hours after eight (8) hours worked shall be paid at one and one-half times the hourly rate. All hours worked over 10 hours per day Monday through Friday, and all hours worked on Saturdays, Sundays, and Holidays worked shall be paid at double the hourly rate of wage.
- L. An employee working outside 5:00 am and 5:00 pm shall receive an additional two dollar (\$2.00) per hour for all hours worked that shift. All hours worked on holidays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at one and one-half times the hourly rate of wage.
- M. On Monday through Friday, the first four (4) hours of overtime after eight (8) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay, unless a four (4) day ten (10) hour workweek has been established. On a four (4) day ten (10) hour workweek scheduled Monday through Thursday, or Tuesday through Friday, the first two (2) hours of overtime after ten (10) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay.
- Work performed outside the normal work hours of 5:00 a.m. and 6:00 p.m. shall be paid at one and one-half (1-1/2) times the straight time rate, (except for special shifts or multiple shift operations). When the first shift of a multiple shift (a two or three shift) operation is started at the basic straight time rate or at a specific overtime rate, all shifts of that day's operation shall be completed at that rate. When due to conditions beyond the control of the Employer or when contract specifications require that work can only be performed outside the regular day shift of 5:00 am to 6:00 pm, then a special shift may be worked at the straight time rate, plus the shift pay premium when applicable. The starting time of work will be arranged to fit such conditions of work. Such shift shall consist of eight (8) hours work for eight (8) hours pay or ten (10) hours work for ten (10) hours pay for four ten shifts.
- On Saturday, the first twelve (12) hours of work shall be paid at one and one half (1-1/2) times the straight time rate of pay. All work performed after 6:00 pm Saturday to 5:00 am Monday, all work performed over twelve (12) hours, and all work performed on holidays shall be paid at double the straight time rate of pay.
- Shift Pay Premium: In an addition to any overtime already required, all hours worked between the hours of 6:00 pm and 5:00 am shall receive an additional two dollars (\$2.00) per hour.
- N. All work performed over twelve hours in a shift and all work performed on Sundays and Holidays shall be paid at double the straight time rate.
- Any time worked over eight (8) hours on Saturday shall be paid double the straight time rate, except employees assigned to work six 10-hour shifts per week shall be paid double the straight time rate for any time worked on Saturday over 10 hours.
- O. All work performed on Saturdays, Sundays, and Holidays shall be paid at one and one half (1-1/2) times the straight time rate of pay.

Overtime Codes Continued

11. P. Work performed in excess of ten (10) hours of straight time per day when four ten (10) hour shifts are established and all work on Saturdays, except for make-up days shall be paid at time and one-half (1 ½) the straight time rate.
- Work performed outside the normal work hours of 5:00 a.m. and 6:00 p.m. shall be paid at one and one-half (1-1/2) times the straight time rate, (except for special shifts or multiple shift operations). When the first shift of multiple shift (a two or three shift) operation is started at the basic straight time rate or at a specific overtime rate, all shifts of that day's operation shall be completed at that rate. When due to conditions beyond the control of the Employer or when contract specifications require that work can only be performed outside the regular day shift of 5:00 a.m. to 6:00 p.m., then a special shift may be worked at the straight time rate, plus the shift pay premium when applicable. The starting time of work will be arranged to fit such conditions of work. Such shifts shall consist of eight (8) hours work for eight (8) hours pay or ten (10) hours work for ten (10) hours pay for four ten-hour shifts.
- In the event the job is down due to weather conditions, then Saturday may, be worked as a voluntary make-up day at the straight time rate. However, Saturday shall not be utilized as a make-up day when a holiday falls on Friday. All work performed on Sundays and holidays and work in excess of twelve (12) hours per day shall be paid at double (2x) the straight time rate of pay.
- After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.
- When an employee returns to work without a break of eight (8) hours since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.
- Q. All hours worked between the hours of 6:00 pm and 6:00 am, Monday through Saturday, shall be paid at a premium rate of 35% over the hourly rate of wage. Work performed on Sundays shall be paid at double time. All hours worked on holidays shall be paid at double the hourly rate of wage.
- R. On Monday through Saturday hours worked outside 6:00 am and 7:00 pm, and all hours after eight (8) hours worked shall be paid at one and one-half times the hourly rate. All hours worked on Sundays and Holidays shall be paid at double the hourly rate of wage.
- S. The first ten (10) hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. In the event the job is down due to weather conditions, or other conditions beyond the control of the Employer, then Saturday may be worked at the straight time rate, for the first eight (8) hours, or the first ten (10) hours when a four day ten hour workweek has been established.
- All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.
- When an employee returns to work without a break of eight (8) hours since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

Holiday Codes

5. A. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, and Christmas Day (7).
- B. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, the day before Christmas, and Christmas Day (8).
- C. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8).
- D. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8).
- H. Holidays: New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, the Day after Thanksgiving Day, And Christmas (6).
- I. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day (6).
- K. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday After Thanksgiving Day, The Day Before Christmas, And Christmas Day (9).
- L. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, And Christmas Day (8).
- N. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, The Friday After Thanksgiving Day, And Christmas Day (9).
- P. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday And Saturday After Thanksgiving Day, The Day Before Christmas, And Christmas Day (9). If A Holiday Falls On Sunday, The Following Monday Shall Be Considered As A Holiday.
- Q. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day (6).
- R. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Day After Thanksgiving Day, One-Half Day Before Christmas Day, And Christmas Day. (7 1/2).
- S. Paid Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, And Christmas Day (7).
- Z. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8).
- G. Paid Holidays: New Year's Day, Martin Luther King Jr. Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and Christmas Eve Day (11).
- H. Paid Holidays: New Year's Day, New Year's Eve Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday After Thanksgiving Day, Christmas Day, The Day After Christmas, And A Floating Holiday (10).

Holiday Codes Continued

7. T. Paid Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, The Last Working Day Before Christmas Day, And Christmas Day (9).
- Z. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, And Christmas Day (7). If a holiday falls on Saturday, the preceding Friday shall be considered as the holiday. If a holiday falls on Sunday, the following Monday shall be considered as the holiday.
- A. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any Holiday Which Falls On A Sunday Shall Be Observed As A Holiday On The Following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.
- B. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.
- C. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.
- D. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8). Unpaid Holidays: President's Day. Any paid holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any paid holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.
- E. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.
- F. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the last working day before Christmas day and Christmas day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.
- G. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day (6). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.
- H. Holidays: New Year's Day, Martin Luther King Jr. Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the Last Working Day before Christmas Day and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.
- I. Holidays: New Year's Day, President's Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, The Day Before Christmas Day And Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

Holiday Codes Continued

7. J. Holidays: New Year's Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day and Christmas Day (6). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.
- K. Holidays: New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.
- L. Holidays: New Year's Day, Memorial Day, Labor Day, Independence Day, Thanksgiving Day, the Last Work Day before Christmas Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.
- N. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. When Christmas falls on a Saturday, the preceding Friday shall be observed as a holiday.
- P. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.
- Q. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the Last Working Day before Christmas Day and Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.
- S. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, Christmas Day, the Day after Christmas, and A Floating Holiday (9). If any of the listed holidays falls on a Sunday, the day observed by the Nation shall be considered a holiday and compensated accordingly.
- V. Holidays: New Year's Day, President's Birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, the day before or after Christmas, and the day before or after New Year's Day. If any of the above listed holidays falls on a Sunday, the day observed by the Nation shall be considered a holiday and compensated accordingly.
- W. Holidays: New Year's Day, Day After New Year's, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Eve Day, Christmas Day, the day after Christmas, the day before New Year's Day, and a Floating Holiday.
- X. Holidays: New Year's Day, Day before or after New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and the day before or after Christmas day. If a holiday falls on a Saturday or on a Friday that is the normal day off, then the holiday will be taken on the last normal workday. If the holiday falls on a Monday that is the normal day off or on a Sunday, then the holiday will be taken on the next normal workday.
- Y. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day. (8) If the holiday falls on a Sunday, then the day observed by the federal government shall be considered a holiday and compensated accordingly.

Holiday Codes Continued

7. Z. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, Christmas Eve, and Christmas Day (9). Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday. Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.
15. G. New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, the last scheduled workday before Christmas, and Christmas Day (9). If any of the listed holidays falls on a Sunday, the day observed by the Nation shall be considered a holiday and compensated accordingly.
- H. Holidays: New Year's Day, Martin Luther King Jr. Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the Last Working Day before Christmas Day and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.
- I. Holidays: New Year's Day, President's Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, The Day Before Christmas Day And Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.
- J. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.
- K. Holidays: New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.
- L. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.
- M. Holidays: New Year's Day, Martin Luther King Jr. Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Eve Day and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.
- N. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.
- O. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, the day before Christmas day, and Christmas Day (10). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

Note Codes

8. D. Workers working with supplied air on hazmat projects receive an additional \$1.00 per hour.
- L. Workers on hazmat projects receive additional hourly premiums as follows -Level A: \$0.75, Level B: \$0.50, And Level C: \$0.25.
- M. Workers on hazmat projects receive additional hourly premiums as follows: Levels A & B: \$1.00, Levels C & D: \$0.50.
- N. Workers on hazmat projects receive additional hourly premiums as follows -Level A: \$1.00, Level B: \$0.75, Level C: \$0.50, And Level D: \$0.25.
- S. Effective August 31, 2012 – A Traffic Control Supervisor shall be present on the project whenever flagging or spotting or other traffic control labor is being utilized. Flaggers and Spotters shall be posted where shown on approved Traffic Control Plans or where directed by the Engineer. All flaggers and spotters shall possess a current flagging card issued by the State of Washington, Oregon, Montana, or Idaho. This classification is only effective on or after August 31, 2012.
- T. Effective August 31, 2012 – A Traffic Control Laborer performs the setup, maintenance and removal of all temporary traffic control devices and construction signs necessary to control vehicular, bicycle, and pedestrian traffic during construction operations. Flaggers and Spotters shall be posted where shown on approved Traffic Control Plans or where directed by the Engineer. All flaggers and spotters shall possess a current flagging card issued by the State of Washington, Oregon, Montana, or Idaho. This classification is only effective on or after August 31, 2012.
- U. Workers on hazmat projects receive additional hourly premiums as follows – Class A Suit: \$2.00, Class B Suit: \$1.50, And Class C Suit: \$1.00. Workers performing underground work receive an additional \$0.40 per hour for any and all work performed underground, including operating, servicing and repairing of equipment. The premium for underground work shall be paid for the entire shift worked. Workers who work suspended by a rope or cable receive an additional \$0.50 per hour. The premium for work suspended shall be paid for the entire shift worked. Workers who do “pioneer” work (break open a cut, build road, etc.) more than one hundred fifty (150) feet above grade elevation receive an additional \$0.50 per hour.
- V. In addition to the hourly wage and fringe benefits, the following depth and enclosure premiums shall be paid. The premiums are to be calculated for the maximum depth and distance into an enclosure that a diver reaches in a day. The premiums are to be paid one time for the day and are not used in calculating overtime pay.
- Depth premiums apply to depths of fifty feet or more. Over 50' to 100' - \$2.00 per foot for each foot over 50 feet. Over 101' to 150' - \$3.00 per foot for each foot over 101 feet. Over 151' to 220' - \$4.00 per foot for each foot over 220 feet. Over 221' - \$5.00 per foot for each foot over 221 feet.
- Enclosure premiums apply when divers enter enclosures (such as pipes or tunnels) where there is no vertical ascent and is measured by the distance travelled from the entrance. 25' to 300' - \$1.00 per foot from entrance. 300' to 600' - \$1.50 per foot beginning at 300'. Over 600' - \$2.00 per foot beginning at 600'.
- W. Meter Installers work on single phase 120/240V self-contained residential meters. The Lineman/Groundmen rates would apply to meters not fitting this description.

Note Codes Continued

- X. Workers on hazmat projects receive additional hourly premiums as follows - Class A Suit: \$2.00, Class B Suit: \$1.50, Class C Suit: \$1.00, and Class D Suit: \$0.50. Special Shift Premium: Basic hourly rate plus \$2.00 per hour.

When due to conditions beyond the control of the Employer or when an owner (not acting as the contractor), a government agency or the contract specifications requires that work can only be performed outside the normal 5 am to 6pm shift, then the special shift premium will be applied to the basic hourly rate. When an employee works on a special shift, they shall be paid a special shift premium for each hour worked unless they are in OT or Double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday.)

- Y. Tide Work: When employees are called out between the hours of 6:00 p.m. and 6:00 a.m. to work on tide work (work located in the tide plane) all time worked shall be at one and one-half times the hourly rate of pay.

Swinging Stage/Boatswains Chair: Employees working on a swinging state or boatswains chair or under conditions that require them to be tied off to allow their hands to be free shall receive seventy-five cents (\$0.75) per hour above the classification rate.

- Z. Workers working with supplied air on hazmat projects receive an additional \$1.00 per hour.

Special Shift Premium: Basic hourly rate plus \$2.00 per hour. When due to conditions beyond the control of the Employer or when an owner (not acting as a contractor), a government agency or the contract specifications require that more than (4) hours of a special shift can only be performed outside the normal 6 am to 6pm shift, then the special shift premium will be applied to the basic straight time for the entire shift. When an employee works on a special shift, they will be paid a special shift premium for each hour worked unless they are in overtime or double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday.)

9. A. Workers working with supplied air on hazmat projects receive an additional \$1.00 per hour.

Special Shift Premium: Basic hourly rate plus \$2.00 per hour. When due to conditions beyond the control of the Employer or when an owner (not acting as the contractor), a government agency or the contract specifications require that more than four (4) hours of a special shift can only be performed outside the normal 6 am to 6pm shift, then the special shift premium will be applied to the basic straight time for the entire shift. When an employee works on a special shift, they shall be paid a special shift premium for each hour worked unless they are in overtime or double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday.)

Certified Crane Operator Premium: Crane operators requiring certifications shall be paid \$0.50 per hour above their classification rate.

Boom Pay Premium: All cranes including tower shall be paid as follows based on boom length:

(A) – 130' to 199' – \$0.50 per hour over their classification rate.

(B) – 200' to 299' – \$0.80 per hour over their classification rate.

(C) – 300' and over – \$1.00 per hour over their classification rate.

Note Codes Continued

- B. The highest pressure registered on the gauge for an accumulated time of more than fifteen (15) minutes during the shift shall be used in determining the scale paid.

Tide Work: When employees are called out between the hours of 6:00 p.m. and 6:00 a.m. to work on tide work (work located in the tide plane) all time worked shall be at one and one-half times the hourly rate of pay. Swinging Stage/Boatswains Chair: Employees working on a swinging stage or boatswains chair or under conditions that require them to be tied off to allow their hands to be free shall receive seventy-five cents (\$0.75) per hour above the classification rate.

- C. Tide Work: When employees are called out between the hours of 6:00 p.m. and 6:00 a.m. to work on tide work (work located in the tide plane) all time worked shall be at one and one-half times the hourly rate of pay. Swinging Stage/Boatswains Chair: Employees working on a swinging stage or boatswains chair or under conditions that require them to be tied off to allow their hands to be free shall receive seventy-five cents (\$0.75) per hour above the classification rate.

Effective August 31, 2012 – A Traffic Control Supervisor shall be present on the project whenever flagging or spotting or other traffic control labor is being utilized. A Traffic Control Laborer performs the setup, maintenance and removal of all temporary traffic control devices and construction signs necessary to control vehicular, bicycle, and pedestrian traffic during construction operations. Flaggers and Spotters shall be posted where shown on approved Traffic Control Plans or where directed by the Engineer. All flaggers and spotters shall possess a current flagging card issued by the State of Washington, Oregon, Montana, or Idaho. These classifications are only effective on or after August 31, 2012.

- D. Industrial Painter wages are required for painting within industrial facilities such as treatment plants, pipelines, towers, dams, bridges, power generation facilities and manufacturing facilities such as chemical plants, etc., or anywhere abrasive blasting is necessary to prepare surfaces, or hazardous materials encapsulation is required.

9. E. Heavy Construction includes construction, repair, alteration or additions to the production, fabrication or manufacturing portions of industrial or manufacturing plants, hydroelectric or nuclear power plants and atomic reactor construction. Workers on hazmat projects receive additional hourly premiums as follows -Level A: \$1.00, Level B: \$0.75, Level C: \$0.50, And Level D: \$0.25.

- F. Industrial Painter wages are required for painting within industrial facilities such as treatment plants, pipelines, towers, dams, power generation facilities and manufacturing facilities such as chemical plants, etc., or anywhere abrasive blasting is necessary to prepare surfaces, or hazardous materials encapsulation is required.

- H. One (1) person crew shall consist of a Party Chief. (Total Station or similar one (1) person survey system). Two (2) person survey party shall consist of a least a Party Chief and a Chain Person. Three (3) person survey party shall consist of at least a Party Chief, an Instrument Person, and a Chain Person.

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Procedures for preparation and submittal of the Schedule of Values.

1.02 SUBMITTALS

- A.** Contractor shall submit an initial Schedule of Values per the Pre-Construction Submittal Requirements of Section 01 33 00.
- B.** Contractor shall submit supporting documentation justifying the amounts in the Schedule of Values if requested by Owner.

1.03 SCHEDULE OF VALUES

- A.** Contractor shall submit a typed schedule on Owner's form. Once approved, Contractor shall not revise the Schedule of Values without prior approval by Owner.
- B.** Format:
1. Separate each category of Work into a separate line item.
 2. List all major Work activities indicated on the Progress Schedule.
 3. Separate floors, phases, and other easily recognized building divisions when appropriate.
 4. Separate labor, materials and equipment for each item.
 5. Identify site mobilization, demobilization, bonds, and insurance as individual line items.
 6. Include a line item for close-out Work between Substantial Completion and Final Completion.
 7. If applicable, include a line item for allowances. For unit cost allowances, give quantities measured from the Contract Documents multiplied by the unit cost.
 8. When required by Owner, include separate line items for "separately funded Work."

END OF SECTION 01 29 73

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Preconstruction Meeting;
2. Progress Meetings; and
3. Other meetings, as requested by Owner.

1.02 PRECONSTRUCTION MEETING

A. Meeting Location: Owner will schedule a meeting prior to the start of construction. The purpose of this meeting is to review Contract administration requirements and mobilization procedures. Attendance is required for the following:

1. Architect/Engineer and design Subconsultants;
2. Contractor's Superintendent and Project Manager;
3. Representative of major Subcontractors, as appropriate;
4. Others, as appropriate.

B. Owner's Designated Representative shall:

1. Preside over and conduct meeting.
2. Record, reproduce, and distribute copies of minutes within 7 Days of the meeting to all meeting participants.

C. Agenda for the meeting will include at a minimum:

1. The Work;
2. Progress Schedule, including Work sequence, phasing, and occupancy requirements;
3. Communications chain and persons authorized to direct changes;
4. Use of the Project site;
5. Special Project procedures;
6. Procedures and processing:
 - a. Application for Payments and Schedule of Values;
 - b. Contract Change Proposals (CCP), Work Directive (WD);
 - c. Change Orders (CO);

- d. Requests for Information (RFI);
- e. Submittals; and
- f. Others as appropriate.
- 7. Project Record;
- 8. Construction facilities, controls, and construction aids;
- 9. Temporary utilities;
- 10. Security procedures;
- 11. Safety and first-aid procedures;
- 12. Environmental Health and Safety;
- 13. Housekeeping procedures;
- 14. AHJ representative(s) and inspection procedures;
- 15. Utility shutdowns;
- 16. Parking;
- 17. Existing conditions;
- 18. Subcontractor list;
- 19. Emergency phone and keys to site;
- 20. Progress meeting scheduling;
- 21. Shipment and deliveries; and
- 22. Other(s) as appropriate.

1.03 PROGRESS MEETINGS

- A. Progress meetings will occur weekly.
- B. Meeting Location: Contractor's Project field office, unless otherwise agreed.
- C. Attendance: Representatives attending meetings must be qualified and authorized to act on behalf of their firms. Attendance shall include:
 - 1. Architect/Engineer and Subconsultants, as appropriate;
 - 2. Owner's Designated Representatives;
 - 3. Contractor's Superintendent and Project Manager;
 - 4. Subcontractors, as appropriate;
 - 5. Suppliers, as appropriate; and
 - 6. Others, as appropriate.
- D. Owner's Designated Representative shall:

1. Administer progress and other specially scheduled meetings;
 2. Record, reproduce, and distribute copies of minutes within 6 Days of meeting to all meeting participants; and
- E. Contractor shall, at each meeting, provide each meeting attendant with:
1. Short-interval (look-ahead) schedule coordinated with the Progress Schedule;
 2. Updated Progress Schedule, if appropriate;
 3. Updated submittal log and schedules;
 4. Updated RFI log;
 5. Issues Log;
 6. Quality Control Log; and
 7. Any applicable tracking mechanisms.
- F. Agenda for these meetings will include at a minimum:
1. Project safety;
 2. Review and approval of minutes from previous meeting;
 3. Review Work progress since previous meeting;
 4. Review plans for progress for subsequent Work period and short-interval (look-ahead) schedule;
 5. Review Progress Schedule;
 6. Present corrective measures and procedures to regain Progress Schedule, as applicable;
 7. Present field observations, problems, and conflicts;
 8. Discuss RFIs;
 9. Review quality control;
 10. Review submittal log and schedules and present methods to expedite as required;
 11. Review off-site fabrication;
 12. Review delivery schedules;
 13. Review coordination issues;
 14. Review proposed changes for:
 - a. Effect on Progress Schedule and on completion date.
 - b. Effect on any other contracts of the Project.
 15. Review Issues Log;

16. Review draft Application for Payment (at end of month);
17. Review Project Record; and
18. Review any other issues.

1.04 OTHER MEETINGS

- A. Owner may call additional Project meetings as appropriate.
- B. Meetings as required by other sections.
- C. Format and agenda of these meetings will follow that of Progress Meetings unless Owner determines otherwise.

END OF SECTION 01 31 19

PART 1 GENERAL

1.01 GENERAL COMMUNICATION

- A. Subcontractors: Informal communication between Owner, Owner's consultants, and other Subcontractors is permitted. If written clarification or direction is required to resolve questions, transmit questions in writing using a Request for Information (RFI) through the Contractor to Owner.
- B. In case of an EMERGENCY, dial 9-1-1 if appropriate; otherwise, contact Owner's Designated Representative. If he or she is not available contact Facilities Services, Capital at 509-335-9000.

1.02 CORRESPONDENCE

- A. Address all correspondence to Owner's Designated Representative.
- B. Contractor shall copy Architect/Engineer on all correspondence to and from Owner.
- C. Include Project title and Owner Project number on all correspondence.

1.03 REQUEST FOR INFORMATION

- A. When field conditions or Contract Document require clarification, a written Request for Information (RFI) must be submitted per the following:
 - 1. Identify the nature and location of each clarification/verification using a RFI form and provide at least the following information:
 - a. Project name and number;
 - b. Date;
 - c. Date response requested;
 - d. RFI number;
 - e. Subject;
 - f. Initiator of the question;
 - g. Indication of costs;
 - h. Indication of schedule impact;
 - i. Location on site;
 - j. Contract Drawing reference;
 - k. Contract Specification section and paragraph reference;
 - l. Descriptive text;
 - m. Recommended solution(s); and

n. Space for reply on same page as questions.

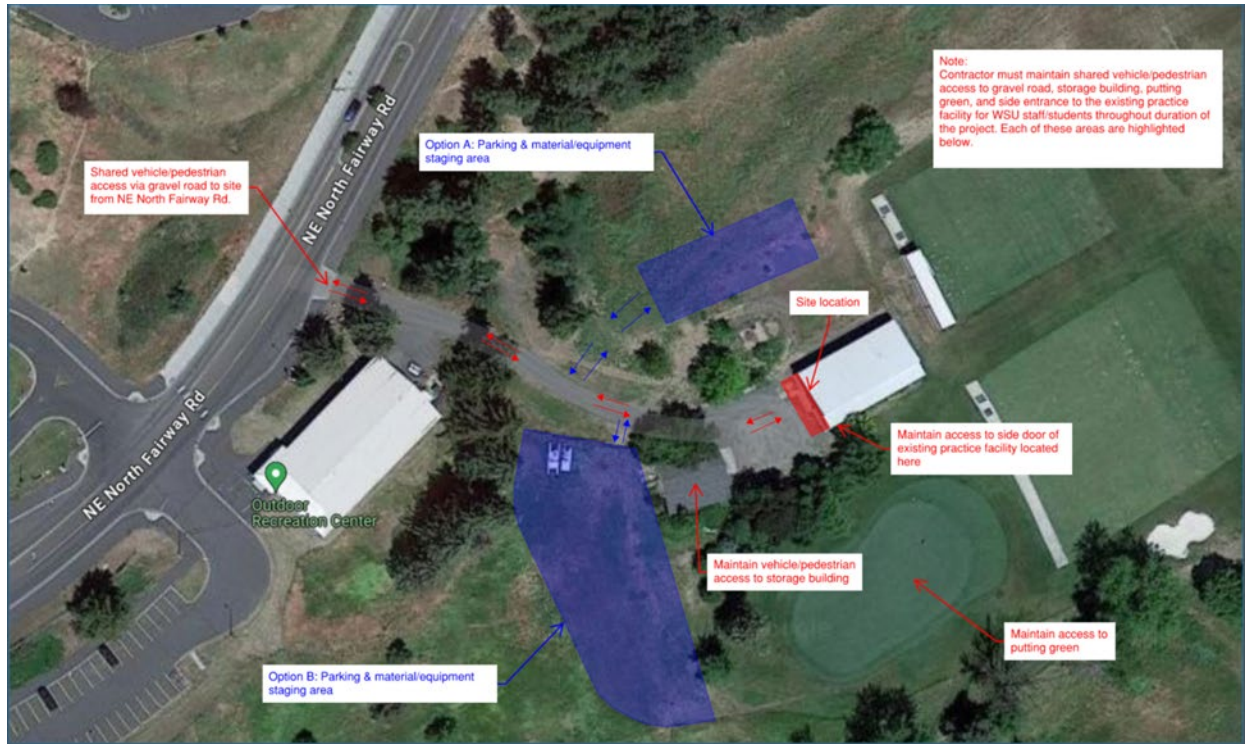
- B. Each RFI must be limited to a single issue, but shall reference other related RFI's.
- C. Route and copy RFIs in same manner as correspondence.
- D. Allow a minimum of 14 Days for Owner response to RFI.

1.04 NONCONFORMANCE REPORT

- A. Reference Document: Owner Nonconformance Report (NCR).
- B. Procedure: If Contractor proceeds to install deficient Work or fails to correct Work that in the opinion of Owner fails to conform to the Contract Documents, an NCR may be issued. Upon receipt of a NCR, Contractor shall take immediate action to correct nonconforming Work. Correction of nonconforming Work will be reviewed at progress meetings.

1.05 COORDINATION

- A. Special Coordination: Contractor shall:
 - 1. Contractor will need to submit a site logistics plans for approval to work within the constraints detailed below.



B. General Coordination: Contractor shall:

1. Coordinate with Work of other sections to ensure that all fixtures, devices, switches, outlets, ducts, pipes, and similar items can be installed as shown without modifications to framing. Provide all blockouts, raceways and similar framing, as required;
2. Coordinate the Work and not delegate responsibility for coordination to any Subcontractor. Contractor must make available to each Subcontractor, prior to the execution of each Subcontract, copies of the Contract Documents to which the Subcontractor will be bound. Subcontractor will similarly make copies of the Contract Documents available to their respective lower-tier Subcontractors. Contractor must provide Owner copies of the written agreements between Contractor and any Subcontractor upon request;
3. Anticipate interrelationship of all Subcontractors and their relationship with the total Work;
4. Resolve differences or disputes between Subcontractors and materials suppliers concerning coordination, interference, or extent of Work between sections;
5. Be in charge of and responsible for the Work and the Project site, including directing and scheduling all Work; and
6. Cooperate with Separate Contractors. Work by others may be occurring within the building or at locations adjacent or near to the Project site. Contractor must cooperate with all such work.

C. Mechanical and Electrical Coordination: Contractor shall:

1. Resolve all "tight", restricted, or inaccessible areas involving Work of various disciplines in advance of installation.
2. If necessary, and before Work proceeds in these areas, prepare coordination drawings for review showing all Work in "tight", restricted, or inaccessible areas.
3. Provide coordination drawings necessary to resolve "tight", restricted, or inaccessible areas, at no increase in Contract Sum.

D. Job Site Field Measurements and Templates: Contractor shall:

1. Obtain field measurements required for accurate fabrication and installation of Work. Exact measurements are Contractor's responsibility.
2. Furnish or obtain templates, patterns, and setting instructions as required for installation of all Work. Contractor shall verify in field, as needed.

END OF SECTION 01 31 23

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the administrative and procedural requirements to comply with the requirements of the General Conditions regarding preparation of Contractor's Progress Schedules, monthly update to the Progress Schedules, and other schedules as specified herein. The purposes of these schedules and reports are to:
 - 1. Ensure adequate planning and execution of the Work by Contractor;
 - 2. Establish a standard against which progress of the Work can be tracked;
 - 3. Assist in monitoring progress;
 - 4. Evaluate the impact of any changes to the Contract; and
 - 5. Support the basis for progress payments.
- B. All schedule submittals including updated Progress Schedules will be reviewed by Owner for compliance with Contract terms and the needs of the University. Review of any schedule does not constitute approval or acceptance of Contractor's construction means, methods, or sequencing, or an assessment by Owner of Contractor's ability to complete the Work within the Contract Time.

1.02 WORK INCLUDED

- A. Contractor shall submit a preliminary Progress Schedule, as required by the Pre-Construction Submittal Requirements of Section 01 33 00.
- B. Contractor shall prepare and submit Progress Schedules and reports as required by this Section. NOTE: Processing and payment of the second Application for Payment is contingent upon receipt, review, and subsequent acceptance of the updated Progress Schedule.
- C. Contractor shall participate in monthly scheduling meetings and provide updated Progress Schedules as required by this Section.
- D. Contractor shall perform Contemporaneous Period Analysis (CPA) of any delays associated with the critical path schedule as required by this Section.
- E. Contractor shall provide weekly Short-Interval (look-ahead) schedules as required by this Section.
- F. Contractor shall submit a Submittal Schedule as required by this Section.

1.03 PRELIMINARY PROGRESS SCHEDULE

- A. Contractor shall submit a preliminary Progress Schedule as part of the Pre-

Construction Submittal Requirements in Section 01 33 00 - Submittals. The schedule shall include activity description, activity start and end dates. The schedule shall emphasize milestone dates and date of Substantial Completion. Schedule shall clearly identify the critical path schedule elements.

- B. Progress Schedule shall be in Bar Chart format.
- C. Schedule activities longer than 14 days shall be sufficiently detailed.

1.04 CONTRACTOR'S PROGRESS SCHEDULE

- A. Within three calendar days of receiving WSU comments on the preliminary Progress (Bar Chart) Schedule, the Contractor shall prepare and submit a detailed Progress (Bar Chart) Schedule. This schedule shall be the Contractor's as-planned schedule and shall be used to plan, organize, and execute the Work, record and report actual performance and progress through updates, as well as show how the Contractor plans to complete all remaining Work. The accepted Contractor's Progress (Bar Chart) Schedule and subsequent updates shall be the basis for consideration and analysis of requests for time extensions.
- B. Updates:
 - 1. The Contractor is required to prepare and submit an updated Progress (Bar Chart) Schedule as agreed upon at the Pre-construction Meeting.
 - 2. The Contractor and Owner's Designated Representative will review the updated schedule and will discuss any differences or issues raised. Decisions made and agreed to by all parties are binding. However, no contracted completion dates will be modified except by an approved Contract Change Proposal and subsequent Change Order.
 - 3. Timely submission of updates is of significant and crucial importance to the management of this Project. Lack of or late receipt of updates diminishes their value to the Project. Therefore, at the Owner's Designated Representative discretion, partial payment may be withheld for a late update as may be determined by the Owner's Designated Representative in consideration of the value of the update at the time of receipt, the circumstances of the late submittal, and the level of progress achieved on the Project.
- C. The Contractor shall submit the Progress Schedule, consisting of the reports and diagrams as specified by this subsection, in the following formats quantities:
 - 1. Electronic PDF file of all reports, schedules, etc.
 - 2. Native electronic copy of the CPM Progress Schedule.
- D. Float: Contractor is not entitled to any adjustment in the Contract Time or the Contract Sum, or to any additional payment or equitable adjustment of any sort, by reason of the loss or the use of any float time, including time between Contractor's anticipated completion date and the end of the Contract Time, whether or not the float time is described as such on the Progress Schedule.

- E. Qualifications: Contractor shall submit the resume(s) of the person(s) designated as responsible for schedules and reports (the Contractor's scheduler) Prior to commencing construction activities. Contractor's scheduler shall have demonstrable capability to plan, coordinate, execute, and monitor a CPM schedule as required for this Project. Owner's Designated Representative will approve or disapprove the Contractor's proposed scheduler. In the event of disapproval, a new scheduler shall be proposed within 7 Days and be subject to the same consideration criteria as noted above.

1.05 MONTHLY UPDATES

- A. Contractor shall prepare and submit updated Progress Schedules and participate in schedule update meetings with the Owner each month. Participation in the meeting and submission of the monthly update is a condition precedent for payment of the line item value for scheduling Work.
 - 1. Updated monthly schedule submittals:
 - a. A PDF electronic version of complete Project schedule showing the critical path accompanied by a narrative of any deviations from the previous month.
 - b. Electronic schedule file in native format.
 - c. Short-interval schedules or look-ahead schedules shall not be an acceptable submittal.
- B. Contractor shall prepare an update of the current Progress Schedule each month to reflect Work progress achieved since the previous update. Progress updating shall be performed without changes to the schedule logic or the original duration of activities. Monthly progress updating is required and necessary prior to performing a Contemporaneous Period Analysis of any change to the calculated completion date from the prior update.
- C. Contractor may, in a second report, incorporate any logic and duration changes that represent revised planning. All such changes must be clearly identified and submitted for acceptance.
- D. The Progress Schedule must clearly identify the current Substantial and Final Completion dates.
- E. Contractor shall account for all adverse weather days and similar excusable noncompensable delays. By whatever method Contractor chooses to account for such delays and events, a narrative description and CPA of the accounting shall be included with the narrative report.
- F. Monthly schedule update meetings:
 - 1. Monthly schedule update meetings shall be held at Contractor's Project field office one week prior to the due date of Contractor's monthly Application for Payment, unless otherwise agreed.

2. The Contractor shall provide updated Project schedule submittals.
 3. The Contractor shall also provide a narrative report including:
 - a. A description of the Work accomplished during the preceding period;
 - b. A discussion of the Work that had been scheduled to be performed during the previous period but was not, and explain why it was not performed; and
 - c. A discussion of the Work scheduled for the upcoming period noting any issues or events that could impact this Work. If Contractor intends to make logic or original activity duration changes, the report must specifically identify such changes.
 4. Contractor, Owner, and Architect/Engineer will review these reports and will discuss any differences or issues raised. No contractual completion dates will be modified except by approved Change Order.
- G. Timely submission of updates is of significant and crucial importance to the Project. Owner may withhold payment as per Section 01 29 00 Applications for Payment.

1.06 THE CONTEMPORANEOUS PERIOD ANALYSIS

- A. It is Owner's intent to resolve all issues affecting the Contract completion date in a timely, efficient and effective manner. To achieve this goal, and in addition to contractor's obligation to follow the contractual dispute resolution procedure, Contractor shall analyze any delays to the critical path or completion date by application of the Contemporaneous Period Analysis method. A CPA shall normally coincide with the monthly schedule update meetings.
- B. Assessment of impacts due to changes or other events, in accordance with the CPA method, must be based on the most recent accepted updated Progress Schedule. No logic or duration changes shall be made to updates until progress related data has been incorporated into the Progress Schedule and the Progress Schedule is updated to reflect actual progress for the period. All data shall be provided to Owner.
- C. Submission of an accurate and properly updated Progress Schedule and completion of the Contemporaneous Period Analysis are conditions precedent to the review and approval of any request for an extension in the Contract Time. Owner may assess liquidated damages, if any, regardless of the status of any requests for time extensions pending, until any such requests are resolved.
- D. The process for preparing and submitting a CPA is as follows:
 1. Contractor will notify Owner in writing of event(s) or occurrence(s) which constitute a delay of the critical path or completion date affecting progress of the Work.
 2. Contractor shall evaluate the event(s) or occurrence(s) and produce a

- narrative of the resulting delay describing the effect upon concurrent or logically connected subsequent activities.
3. Consistent with the narrative, Contractor shall produce a subnet to graphically describe the event(s) or occurrence(s) and the effect upon the Progress Schedule.
 4. Contractor will recalculate the Progress Schedule and provide an updated PDF and Native Progress Schedule.
- E. The CPA will be reviewed at the monthly schedule update meeting or at a special meeting scheduled with Owner. At the CPA review meeting, Contractor shall present the CPA and respond to questions.
- F. Until and unless substantiated delay is accepted by Owner, the time effect shall not be incorporated into any monthly update. If accepted after a monthly update in which the event(s) or occurrence(s) took place, that monthly update may be recalculated, resubmitted and shall be included in an approved Change Order.

1.07 SHORT-INTERVAL SCHEDULE

- A. Prepare a weekly Short-Interval (look-ahead) Schedule based upon the Contractor's Work plan and the updated Progress Schedule.
- B. Format for the Short-Interval (look-ahead) Schedule shall be acceptable to Owner. The format shall include comment annotation as necessary.
- C. Content of the Short-Interval (look-ahead) Schedule shall include the Work planned for the next 3-week period and the Work that was performed in the previous week.
- D. Copies of the Short-Interval (look-ahead) Schedule shall be provided at the weekly progress meetings to be used as a basis for discussion of progress and of planned Work.

1.08 SUBMITTAL SCHEDULE

- A. Provide a Submittal Schedule within 10 Days of Owner's Acceptance of the Project Schedule per Section 01 33 00 - Submittals.

PART 2 PRODUCTS

2.01 SCHEDULING SOFTWARE

- A. Contractor shall utilize Microsoft Project or Primavera P6 unless otherwise agreed to by Owner.
- B. Contractor shall provide a licensed and royalty pre-paid copy of the mutually agreed upon scheduling software. The selected software must be capable of performing target-to-current schedule comparisons, cost and resource loading functions and have the option of executing calculations in retained logic.

Activities must be able to process lead and lag time relationships, start-to-finish or finish-to-finish relationships, and be capable of being hammocked, if required. The software must be registered with Owner and be provided in a format compatible with Owner's systems.

END OF SECTION 01 32 13

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction photography.
- B. Construction photography of Work-in-progress.

1.02 GENERAL

- A. Contractor shall provide photographs taken from locations coordinated with Owner.
- B. Photographer: Experienced in taking construction photography.
- C. Equipment: All photos shall be in digital format.
- D. Video images may be acceptable for certain operations. Confirm with Owner.

PART 2 PRODUCTS

2.01 PRECONSTRUCTION PHOTOGRAPHS

- A. Contractor shall provide electronic files containing photographs of the existing conditions at the site, surroundings, and haul routes per the Pre-Construction Submittal Requirements of Section 01 33 00. Coordinate with Owner the extent of the preconstruction photographic record that is required.

2.02 CONSTRUCTION PHOTOGRAPHS

- A. Contractor shall provide electronic files containing photographs of construction progress on a monthly basis.

2.03 PHOTOGRAPHIC SUBMITTALS

- A. Photographs shall be submitted each month during the Contract Time, or as otherwise agreed upon by Owner. The number of photographs shall be sufficient to document the site to the satisfaction of the Owner and Contractor.
- B. Photographs shall be representative of Project progress, showing all major Work and any critical concealed conditions.
- C. The files in each monthly photograph submittal must each be labeled with the Project name, Project number, and submittal date. Additionally, each photograph shall be dated, labeled, and accompanied by a brief description identifying the location and direction the photo was taken. Date stamp using month/date/year format.

PART 3 EXECUTION

3.01 PRECONSTRUCTION PHOTOGRAPHS

- A. Coordinate the scope of preconstruction photographic record survey with Owner.
- B. Take preconstruction photographs to identify and establish a baseline record of existing conditions.
- C. A preconstruction photographic record survey shall include, but not be limited to, all areas that may be impacted or damaged by construction phase activities.
- D. The extent or nature of the existing site and adjacent surroundings shall be thoroughly documented.

3.02 CONSTRUCTION PHOTOGRAPHS

- A. Contractor shall take construction photographs each month during construction of the Project.
- B. Contractor shall document concealed conditions (once exposed) that differ from expectations.
 - 1. It is critical that Contractor photographically document concealed conditions that may benefit Owner's future maintenance and operations activities. Take photographs (with a reference point) prior to cover or concealment. For example:
 - a. Underground pipe arrangements/valves/structures.
 - b. Under-slab utility rough-in.
 - c. Wall cavity utility routing.
 - d. Above-ceiling installation after ceiling support system installed, but prior to cover.
 - 2. The photograph record described above shall be considered minimum and shall not be deemed to limit the quantity or quality of the photographic record.

END OF SECTION 01 32 33

PART 1 GENERAL

1.01 SUMMARY

- A. This section includes administrative and procedural requirements for submittals required for performance of the Work, including:
 - 1. Pre-Construction Submittal Requirements;
 - 2. Shop Drawings;
 - 3. Product data;
 - 4. Samples; and
 - 5. Mock-ups.

1.02 SUBMITTAL PROCEDURES

- A. Provide submittal schedule as required by Section 01 32 13 – Progress Schedule. The Submittal Schedule shall meet all of the requirements below.
- B. Coordination: Review of the submittals by Owner is not for the purpose of determining their accuracy and/or completeness, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of Contractor as required by the Contract Documents.
 - 1. Owner reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are provided.
 - 2. Allow at least 14 Days for review of each submittal by Owner. Complex or interrelated submittals, or the submission of multiple submittals at or near the same time, will require additional time. Provide a "priority list" when submitting multiple submittals at or near the same time. Submittal sequencing should coincide with the submittal schedule (see Section 01 32 13 – Progress Schedule).
- C. Submittal Preparation: Place a permanent label or title block on each submittal for identification.
 - 1. Include the following information on the label or title block:
 - a. Project name, Project number, and date;
 - b. Name and address of Owner;
 - c. Name and address of Contractor and submitting Subcontractor, if applicable;
 - d. Name and address of supplier and manufacturer, if applicable;
 - e. Number and title of appropriate Specification section; and
 - f. Drawing number and detail references, as appropriate.

2. Provide adequate space for action stamps to record review.
- D. Submittal Transmittal: Package submittals in manageable quantities and transmit to Owner and Architect/Engineer, if applicable, simultaneously. Submittals received from sources other than Contractor will be returned without action. By submitting submittals, Contractor represents to Owner that Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements, and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within each submittal with the requirements of the Work and of the Contract Documents.
1. Address one topic or related set of topics in each transmittal based upon Specification sections (i.e., mechanical items should not be submitted under same transmittal with electrical items).
 2. Clearly call out relevant information, deviations, and requests for data, including minor variations from the Contract Documents on both the transmittal and all copies of a submittal.
 3. Shop drawings, product data, samples, and mock-ups shall be submitted to Owner's Designated Representative for review/approval. The minimum number of submittals to be provided are:
 - a. Pre-Construction, Shop Drawings, Product Data: Electronic copies.
 - b. Samples: As required by the technical Specification section.
 - c. Mock-ups: As required by the technical Specification section.
 - d. Demonstrations: As required to facilitate installation and inspection.
 - e. Reference technical Specifications for additional submittal requirements.
 4. Owner may modify the required submittal quantities.
- E. Material and Color Submittal: Submit samples of actual colors and/or materials.
- F. Number submittals by Specification section number and revision letter.
- G. In the event of the need to "revise and resubmit" a submittal, resubmit same in acceptable form/content, clearly identifying deviations from the previous rejected submittal. Contractor shall also keep accurate records of the receipt, review, and delivery of all submittals and shall submit to Owner, as requested, status reports.
- H. Provide a final electronic copy of all approved submittals.

1.03 PRE-CONSTRUCTION SUBMITTAL REQUIREMENTS

- A. All Pre-Construction Submittals are required before onsite construction activities may commence. Contractor shall submit the following Pre-

Construction Submittals **within 30 days** of Notice to Proceed. Submittal review for these items only shall be supplied **within 30 days** of receipt by Owner.

1. Indoor Air Quality Management Plan
2. Site Safety and Health Plan (for information only)
3. Quality Control / Quality Assurance Plan
4. Waste Management Plan
5. Progress Schedule
6. Schedule of Values
7. Pre-Construction Photographs
8. Emergency Points of Contact
9. List of Subs and Suppliers
10. Demolition Plan
11. List of Long Lead Items
12. Site Logistics Plan

1.04 SHOP DRAWINGS

- A. Submit Shop Drawings drawn to accurate scale. Do not reproduce Contract Documents or copy standard information for use as Shop Drawings. Standard information prepared without specific references to the Project will not be accepted as a Shop Drawing.
- B. Shop Drawings Include: fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
 1. Dimensions;
 2. Products and materials;
 3. Compliance with specified standards;
 4. Coordination requirements;
 5. Notation of dimensions established by field measurements;
 6. Any deviation from Drawings or Specifications; and
 7. Date when review is requested to maintain Progress Schedule.

1.05 PRODUCT DATA

- A. Product data includes: Manufacturer's printed installation instructions, catalog cuts, standard color charts, rough-in diagrams and templates, standard wiring diagrams, and performance curves.
 1. Where product data must be specially prepared because standard printed data is not suitable, the submittal must be provided as a Shop Drawing.
- B. Requirements: Mark each copy to show applicable options. Include the

following information:

1. Manufacturer's printed recommendations;
2. Compliance with recognized trade-association standards;
3. Compliance with recognized testing-agency standards;
4. Application of testing-agency labels and seals;
5. Notation of dimensions verified by field measurement;
6. Notation of coordination requirements;
7. Any deviation from Drawings or Specifications; and
8. Date when review requested to maintain Progress Schedule.

1.06 SAMPLES AND MOCK-UPS

- A. Submit samples and mock-ups that are identical to the material or product proposed. Samples include partial sections of components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.
 1. Package samples to facilitate review. Include the following:
 - a. Generic description of the sample;
 - b. Source;
 - c. Product name or name of manufacturer;
 - d. Compliance with recognized standards;
 - e. Availability and delivery time; and
 - f. Specification section.
- B. Requirements: Submit samples and mock-ups for review of kind, color, pattern, and texture for a comparison of these characteristics before actual installation.
 1. Where variation in color, pattern, texture or other characteristics are inherent in the material, submit not less than four units to show limits of variation.
- C. Submittals: Where samples are for selection of appearance from a range of standard choices, submit a full set of choices for the material or products.
- D. Maintain sets of approved samples and mock-ups at the Project site for quality comparisons throughout the course of construction.
- E. Demolish and remove all samples and mock-ups prior to Substantial Completion but not sooner than directed by Owner.

1.07 OWNER's ACTION

- A. Review: Except for submittals for information or a similar purpose, Owner will review each submittal, mark to indicate action taken, and return promptly.

- B. Owner approval of submittals does not supersede or alter Contract Document requirements.

END OF SECTION 01 33 00

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the administrative and procedural requirements for any general alterations to be performed during the Project, including but not limited to products, transition and adjustments, cutting, patching, and repair and cleaning.

1.02 SUBMITTALS

- A. Contractor shall submit a written request in advance of cutting or alteration that impacts:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather-exposed or moisture-resistant elements.
 - 3. Efficiency, maintenance, or safety of any operational elements.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or a separate contractor.
- B. Contractor must include in its written request, when required:
 - 1. Identification of Project.
 - 2. Location and description of affected Work.
 - 3. Necessity for cutting or alteration.
 - 4. Description of proposed Work and products to be used.
 - 5. Alternatives to cutting and patching.
 - 6. Effect on Work of Owner or separate contractor.
 - 7. Written permission of affected separate contractor.
 - 8. Date and time Work will be executed.

1.03 QUALITY ASSURANCE

- A. Limits of Work:
 - 1. Contractor shall maintain existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not indicated to be removed; do not cut such existing conditions beyond indicated limits.
 - 2. Contractor shall maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not indicated to be removed; do not cut such existing conditions beyond indicated limits.
 - 3. Contractor shall maintain existing nonshell, nonstructural components (walls, flooring, and ceilings) not indicated to be removed; do not cut such existing conditions beyond indicated limits.

- B. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- C. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
 - 1. Primary operational systems and equipment.
 - 2. Air or smoke barriers.
 - 3. Fire-suppression systems.
 - 4. Mechanical systems piping and ducts.
 - 5. Control systems.
 - 6. Communication systems.
 - 7. Conveying systems.
 - 8. Electrical wiring systems.
 - 9. All low voltage systems.
 - 10. Operating systems of special construction in Division 13.
 - 11. Other operating systems as appropriate.
- D. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended that result in increased maintenance or decreased operational life or void of warranty, or could adversely affect safety. Miscellaneous elements include the following:
 - 1. Water, moisture, or vapor barriers.
 - 2. Firestopping or fire barriers.
 - 3. Membranes and flashings.
 - 4. Exterior curtain-wall construction.
 - 5. Equipment supports.
 - 6. Piping, ductwork, vessels, and equipment.
 - 7. Noise and vibration-control elements and systems.
 - 8. Other miscellaneous systems as appropriate.
- E. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exterior conditions or in occupied spaces in a manner that would, in Owner's opinion, reduce the building's aesthetic qualities. Contractor shall remove and replace conditions that have been cut and patched in a visually unsatisfactory manner.

PART 2 PRODUCTS

2.01 PRODUCTS FOR PATCHING AND EXTENDING WORK

- A. New Materials: Match existing products and Work when patching and extending Work.

- B. Type and Quality of Existing Products: Determine by inspection and testing products where necessary; refer to existing Work as a standard.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents related to that portion of the Work, as well as other information available to Contractor, take field measurements, and inspect any existing conditions, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing Work, inspect conditions affecting performance of Work.
- C. By beginning any cutting or patching, Contractor represents and warrants its acceptance of existing conditions.
- D. Contractor shall verify that demolition is complete and areas are ready for installation of new Work.

3.02 PREPARATION

- A. Contractor shall cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- B. Contractor shall remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, deteriorated masonry, concrete, and disturbed subgrade material. Replace materials as specified for finished Work.
- C. Contractor shall remove debris and abandoned items from area and from concealed spaces.
- D. Contractor shall prepare surface and remove surface finishes to provide for proper installation of new Work and finishes.
- E. Contractor shall close openings in exterior surfaces to protect existing Work. Contractor shall insulate ductwork and piping to prevent moisture and condensation in exposed areas.
- F. Contractor shall provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect Work from damage.

3.03 PERFORMANCE

- A. Contractor shall coordinate alterations and renovations to expedite completion of the Work.

- B. Remove, cut, and patch Work in a manner to minimize damage. Provide a means of restoring products and finishes to their original or specified condition.
- C. Refinish remaining existing surfaces in renovated rooms and spaces, to specified condition for each material, with a neat and clean transition to adjacent finishes.
- D. In addition to specified replacement of equipment and fixtures, restore existing plumbing, heating, ventilation, air conditioning, and electrical systems to full original operational condition.
- E. Install products as specified in individual sections.
- F. Remove samples of installed Work for testing when requested.
- G. Provide openings in the Work for penetration of mechanical and electrical Work.
- H. Cut rigid materials using the appropriate equipment and tool. Pneumatic tools not allowed without prior approval.
 - 1. Concrete Walls: Saw-cut walls using accurately located straight lines, unless directed otherwise. Minimize overcuts.
 - 2. Masonry Walls: Saw-cut along mortar joints, cutting block uniformly in accurately located straight lines, unless otherwise directed. Remove all mortar adhering to edges. Overcuts not allowed.
 - 3. Wood Framed Walls: Demolish plaster or gypsum wallboard, removing wall framing only as required. Cut wall finish materials in straight uniform lines.
 - 4. Concrete Floors: Saw-cut floors and remove. Core drill as required.
- I. Restore Work with new products in accordance with requirements of Contract Documents.
- J. Fit Work to existing pipes, sleeves, ducts, conduit, and other penetrations through surfaces, while maintaining assemblies.
- K. At penetrations of fire rated walls, partitions, ceilings, or floors, completely seal voids with firestopping material to full thickness of the penetrated element, while maintaining assemblies.
- L. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 35 16

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements pertaining to regulatory requirements.
- B. List of regulatory requirements.

1.02 CONTRACTOR RESPONSIBILITY

- A. Contractor is solely responsible for compliance with all codes, laws, or regulatory requirements.
- B. Inspections performed or not performed by the City of Pullman, Labor and Industries, Owner, Owner Designated Representative, or others who are under contract to Owner do not waive or change Contractor's obligations, nor do such inspections constitute approval or acceptance of portions of the Work.

1.03 CONTRACTOR REQUIREMENTS

- A. Contractor shall perform the Work in accordance with the requirements of governing agencies and applicable regulatory requirements, including those included in this Section and elsewhere in the Contract Documents. Contractor must comply with all applicable laws, building codes, regulations, and rules, including, when applicable, the Washington State University campus code.
- B. Contractor shall schedule and coordinate inspections and gain approvals required by the City of Pullman and other governing agencies in a timely manner and as required for Owner occupancy of the Project within the Contract Time.
- C. Contractor shall inform the City of Pullman Building and Fire Departments, Labor and Industries, and other governing agencies of changes in the Work affecting regulatory requirements in a timely manner.
- D. Contractor shall promptly forward to Owner all inspection reports, orders, permits, and other directives and correspondence received from the City of Pullman inspectors or other governing agencies having jurisdiction over the Work.
- E. Contractor shall promptly notify Owner when the Contract Documents appear to be in conflict with Regulatory Requirements.
- F. Contractor shall, at all times, use its best efforts and exercise its judgment as an experienced contractor to adopt and implement policies and practices designed to avoid work stoppages, slowdowns, disputes, or strikes where reasonably possible and practical under the circumstances, and shall, at all times, maintain Project-wide labor harmony.

1.04 REGULATORY REQUIREMENTS

- A. Authority Having Jurisdiction (AHJ) shall be the organization, office, or individual responsible for enforcing the requirements of the applicable code(s) or standard(s), and or for approving equipment, materials, installation(s), or procedure(s).
- B. Regulatory authorities establish minimum requirement levels. Where provisions of the Contract Documents and regulatory requirements differ or conflict, the more stringent requirement governs.
- C. Regulatory requirements added by other sections of the Contract Documents or otherwise applicable are binding upon the Work in accordance with the provisions of this Section. The regulatory-requirements list provided below is intended to assist Contractor in determining the regulatory requirements for the Project, but neither the inclusion nor omission of any item from the list shall be construed to relieve Contractor of obligations that otherwise exist under the law or the Contract.

1.05 LIST OF REGULATORY REQUIREMENTS

- A. International Building Code (IBC), current adopted edition.
- B. International Fire Code (IFC), current adopted edition.
- C. National Fire Protection Association (NFPA) Codes.
- D. American Society of Mechanical Engineers (ASME), ASME A17.1 Safety Code for Elevators and Escalators, current adopted edition.
- E. American Society of Mechanical Engineers (ASME), ASME A18.1 Safety Standard for Platform Lifts and Stairway Chairlifts, current adopted edition.
- F. State of Washington, WAC-51-50-1101, Accessibility, as adopted by the State of Washington.
- G. International Code Council (ICC)/American National Standards Institute (ANSI) A117.1 Accessible and Usable Buildings and Facilities, current adopted edition.
- H. State of Washington, WAC Chapters 173, 246, and 296, as applicable.
- I. U.S. Environmental Protection Agency 40 CFR, as applicable.
- J. U.S. Transportation Department Title 49, Parts Pertaining to Transportation of Hazardous Materials.
- K. U.S. Nuclear Regulatory Commission Title 10, Parts Pertaining To Radioactive Materials Management.
- L. Washington State Ventilation and Indoor Air Quality Code, WAC 51-13.

- M. Washington State Energy Code, WAC 51-11C. Shortened
- N. Mechanical Work: International Mechanical Code (IMC), current adopted edition.
- O. Plumbing Work: Uniform Plumbing Code (UPC) as amended and adopted by the State of Washington, in the Washington Administrative Code (WAC).
- P. Federal Emergency Management Agency (FEMA) requirements for floodway/floodplain development.
- Q. Electrical Work:
 - 1. NFPA 70, National Electrical Code (NEC), most recent adopted edition.
 - 2. Underwriters' Laboratories (UL).
 - 3. National Electrical Manufacturer's Association (NEMA).
 - 4. National Electric Safety Code (NESC).

1.06 PERMITS REQUIRED

- A. Contractor shall obtain and pay for all required building permits, including any renewals. Contractor shall identify costs for permits on the Schedule of Values for permits obtained.
- B. All trade permits (e.g. electrical, pressure vessel, elevator, etc.) must be included in each Subcontractor bid.
- C. Owner obtains permits for the following facilities and activities.
 - 1. U.S. Army Corps of Engineers:
 - a. Wetlands (404).
 - 2. Permits and/or Approvals from the DOE or local environmental authority:
 - a. Stormwater from Construction Sites (Notice of Intent).
 - b. Wastewater Discharge Facilities.
 - c. Well Construction (including Well Abandonment).
 - d. Water Rights.
 - e. Notice of Construction (Air Pollution Sources).
 - f. SEPA.
 - g. Floodway/Floodplain development.

1.07 APPRENTICESHIP REQUIREMENTS – NOT USED

END OF SECTION 01 41 00

PART 1 GENERAL

1.01 SUMMARY

- A. Conduct portions of the Work requiring special procedures due to hazardous materials and conditions in accordance with regulatory standards and guidance provided in this Section.

1.02 SUBMITTALS

- A. Contractor shall deliver a current copy of its site specific Health and Safety Plan to the Owner per the Pre-Construction Submittal Requirements of Section 01 33 00. The submittal must include each Subcontractor's site specific Health and Safety Plan. Submittal to Owner is for information only, not for review, acceptance, or approval of the Health and Safety Plan, nor for analysis of content or completeness.

1.03 QUALIFICATIONS OF HEALTH AND SAFETY PERSONNEL

- A. Contractor shall employ a competent person for each hazardous construction task in accordance with the requirements of WAC 296-155.
- B. Contractor shall submit to Owner the names of its employees performing duties as competent persons, as well as the names of Subcontractor employees performing duties as competent persons.

1.04 HAZARDOUS MATERIALS MANAGEMENT

- A. Dangerous Waste Management:
 - 1. Contractor agrees and acknowledges that:
 - a. Contractor has direct and exclusive control over the Work and operations at the Project site and is responsible for any Contractor generated, created, or disturbed Washington State dangerous waste and its collection, labeling, accumulation, transportation, and disposal. Owner's EH&S department will provide assistance to Contractor upon request, and will coordinate transportation and disposal of Project-generated Washington State dangerous waste.
 - b. Contractor must provide Owner immediate notification of any pre-existing unanticipated Washington State dangerous waste or site contamination.
 - 2. Contractor is responsible for securing its own waste generator identification number, and Contractor shall sign all manifests associated with the Contractor-generated waste.
 - a. Contractor shall obtain an EPA/State ID number in accordance with WAC 173-303-360 before conducting activities generating chemical waste designated as Washington State dangerous waste.

- b. Contractor shall cancel the EPA/State ID number when:
 - 1) All activities generating or managing waste have ceased;
 - 2) All regulated wastes have been removed from the Project site under proper manifests, and all site contamination is remediated; and
 - 3) All annual dangerous-waste reporting requirements are complete.
 - c. Contractor may call the Washington State Department of Ecology (DOE) to request a reporting package for early submittal.
 - d. Contractor shall furnish to Owner's EH&S Department, Pullman, WA, within 3 Days from submittal or receipt, copies of the following documents:
 - 1) Form 2 Notification of Dangerous Waste Activities;
 - 2) All signed Uniform Hazardous Waste Manifests (original copy when shipping wastes and copy returned from the treatment, storage, disposal, or recycling facility), Land Disposal Restriction Notification forms, Certificates of Recycling/Disposal/Destruction, and Exception Reports;
 - 3) All Annual Reports; and
 - 4) All correspondence from the DOE.
- 3. Owner remains responsible for Washington State dangerous waste and site contamination: (1) pre-existing Contractor's activities at the site, (2) not listed in the Contract Documents, and (3) not disturbed by Contractor through improper construction activities.
- 4. For waste identified in contract document and for unanticipated Washington State dangerous waste or site contamination discovered during the course of the Work on the site, Contractor shall:
 - a. Collect, containerize, and accumulate all Washington State dangerous waste or site contamination in accordance with applicable Federal, State, and local regulations.
 - b. Coordinate all transportation and disposal activities through Owner's EH&S department, who will utilize the Washington State Hazardous Waste Disposal Services contract or equivalent pre-approved contractor. Owner's disposal contractor shall complete all applicable dangerous waste shipping papers including all Uniform Hazardous Waste Manifests, Land Disposal Restriction Notification forms, profiles and barrel packing lists.
- B. Hazardous Materials Spills and Releases:
 - 1. Contractor and Subcontractor(s) shall immediately report all hazardous materials spills at the Project site to Owner. If a hazardous material spill occurs at a Project site in Whitman County, and if any individual may be affected by the spill, Contractor and/or Subcontractor(s) must immediately

report the spill to Whitcom (emergency dispatch). In other counties, Contractor and Subcontractor(s) must report spills to the appropriate emergency response agency in that area.

2. Contractor shall be responsible for spill containment, cleanup, decontamination, post-cleanup monitoring, disposal of any wastes generated from cleanup activities, and generation of any reports required by regulatory agencies and/or regulations including, but not limited to, WAC 173-303 and WAC 173-340.

C. Spill Prevention Control and Countermeasures:

1. Owner's EH&S department is responsible for Owner's SPCC Plan. Any of Contractor's on-site activities involving the handling and/or storage of materials meeting the definition of oil per 40 CFR 112 in containers and/or equipment with a capacity greater than 42 gallons must be included in the Owner's SPCC Plan. Contractor shall provide Owner's EH&S department with an inventory of this equipment or containers at least 14 Days prior to the equipment or containers being brought to the Project site.
2. Contractor shall provide and utilize secondary containment for containers and tanks of oil with a capacity greater than 42 gallons. Owner may waive this requirement in its sole discretion upon Contractor's request after Owner reviews Contractor's written explanation as to why secondary containment is unnecessary for a particular container or tank.

D. Asbestos:

1. All Contractor employees involved in excavation or demolition shall be asbestos awareness trained. Contractor shall submit to Owner the name of Contractor's competent trainer, the names of each of Contractor's trained personnel, and the date of each training. Contractor's submittal must also state that the training was conducted for asbestos awareness for the Work.
2. All asbestos abatement Work shall be performed by persons trained in Washington State-approved courses and certified by the State of Washington.
3. All asbestos abatement Work performed shall be overseen by a consultant hired by the Owner to ensure the Work meets regulatory standards and Owner requirements.
4. All asbestos cement pipe Work shall be performed by persons trained in an asbestos cement pipe procedures course whose content is reviewed and approved by the Washington State Department of Labor and Industries, per WAC 296-62-07722(3)(ii)(C).
5. If suspected asbestos-containing material is discovered during Contractor's execution of the Work, and abatement of the material is not a requirement of the Contract, Contractor shall suspend any Work that affects the material and immediately notify Owner. Contractor shall safeguard the area to prevent entry until certified personnel determine

whether the material is non-asbestos containing or the material is abated, at which time the Work in that area may resume.

E. Lead:

1. Owner shall inform Contractor of lead-containing coatings and materials that the Contractor may encounter while performing the Work. These materials or coatings may release lead into the air, soil, or water, or may be a source of contamination due to skin contact. Owner shall provide general data about the percentage of lead content of each suspected lead-containing material or coating and/or provide Contractor with data showing the amount of lead per surface area.
2. Contractor is responsible for protecting its employees from lead exposure, as required by Washington law.
3. Contractor shall manage all paint chips, building components, soil, and/or other material considered by Owner to be dangerous waste according to the Dangerous Waste Management paragraph.

F. Polychlorinated Biphenyls:

1. Owner may survey oil-filled equipment prior to commencement of construction. This equipment includes, but is not limited to, transformers, electrical switches, hydraulic elevators, emergency generators, capacitors and light ballasts. Owner's survey shall usually determine if the equipment is filled with oil containing polychlorinated biphenyl (PCB). Owner shall remove, or arrange for the removal of, any equipment that contains oil in concentrations qualifying the equipment as dangerous waste per WAC 173-303.
2. If oil-filled equipment is discovered during Contractor's execution of the Work, Contractor shall suspend any Work that may affect the equipment and immediately notify Owner. Owner shall test the equipment and determine the appropriate management method for the equipment and the oil it contains.

G. Mercury:

1. Owner may survey all equipment suspected of containing mercury prior to commencement of construction. This equipment includes, but is not limited to, switches and thermostats. Owner's survey shall determine if the equipment contains mercury. Owner shall remove, or arrange for the removal of, any such equipment.
2. If mercury-containing equipment is discovered during Contractor's execution of the Work, Contractor shall suspend any Work that may affect the equipment and immediately notify Owner. Owner shall test the equipment and determine the appropriate management method for the equipment and the mercury it contains.

H. Hazardous Materials or Equipment:

1. Fixed equipment such as fume hoods, safety cabinets, and vacuum systems, and related ductwork, fans, and appurtenances, may contain or be contaminated with hazardous materials. Owner may test this equipment to determine what, if any, hazards are present. If equipment contains a hazard, or if the equipment itself is a dangerous waste, Owner shall inform Contractor of the nature of the hazard including any information necessary for Contractor to protect its workers. If the equipment is a dangerous waste, Contractor shall dispose of, or make arrangements for the disposal of, the equipment per the above Dangerous Waste Management paragraph.

I. Underground Storage Tanks (USTs):

1. Removal of USTs shall be performed in accordance with DOE regulations. Removal of existing USTs shall be performed by a DOE-certified UST removal company following the submittal of required forms. Copies of forms must be provided to Owner's EH&S department at the same time they are submitted to DOE.
2. Installation of any UST must be done by DOE-certified UST installers. The installation shall be permitted by DOE following the submittal of completed UST installation forms. Copies of forms must be provided to Owner at the same time they are submitted to DOE.
3. Retrofits and upgrades of existing USTs must be completed by DOE certified companies. Records of the retrofit or upgrade must be submitted to DOE following the retrofit or upgrade. Copies of such records must be provided to Owner at the same time they are submitted to DOE.
4. If a UST is discovered during Contractor's execution of the Work, Contractor shall suspend any Work that may affect the UST and immediately notify Owner. Owner will determine if UST must be sampled and/or removed. If necessary, Owner shall engage a certified company to remove UST.

J. Department of Homeland Security (DHS) Chemicals of Interest (COI)

1. Contractor and Subcontractors shall report any COI to Owner as required by the DHS. Contractor may contact Owner's Representative in conjunction with the University's EH&S Department for the specific means of reporting.

1.05 WATER AND STORMWATER POLLUTION PREVENTION:

A. Water Pollution:

1. Discharge of any pollutants (including sewage and chlorinated water from water line disinfection) into surface or ground waters of the State

(including storm drains, ditches and any other water conveyances) is prohibited.

2. Contractor removal of snow, ice, soil, and mud from roadways and sidewalks shall be accomplished without polluting storm drains or surface waters. Mud and soil removal shall be undertaken on a full-time basis, not just once or twice a day. Soil or mud that is dropped onto streets and sidewalks by vehicles at the Project site shall immediately be cleaned by Contractor. Contractor may not use water to clean streets and sidewalks. Under no circumstances may dust mitigation cause soil erosion or pollution of surface waters.
3. If a discharge to surface or ground waters does occur, Contractor shall immediately notify Owner.

B. Stormwater Pollution Prevention Plan (SWPPP):

1. For projects that disturb a soil surface area of one acre or greater:
 - a. Contractor shall prepare a written SWPPP that meets DOE regulations and the requirements of Owner's Municipal Stormwater Permit.
 - b. Owner shall apply for a DOE NPDES Construction Stormwater General Permit for stormwater discharge, and then transfer the permit to Contractor. Contractor shall comply with all provisions of the permit.
 - c. Contractor shall maintain a copy of the NPDES permit and the SWPPP on-site at all times.
 - d. Contractor shall maintain on-site or on call, at all times, a Certified Erosion and Sediment Control Lead (CESCL).
 - e. Contractor's SWPPP shall identify all management practices used to prevent stormwater pollution and the location(s) at which each practice will be utilized on the Project site.
 - f. Contractor shall obtain approval from Owner of the SWPPP prior to groundbreaking. Contractor shall construct approved BMP's and the site inspected and approved, per permit requirements, prior to groundbreaking.
 - g. Contractor shall use best management practices (BMPs) and shall inspect BMPs at least once a week. In addition, Contractor shall inspect BMPs immediately following each rainfall event of 0.1 inches or greater.
 - h. Contractor shall maintain a written log detailing the results of inspections beginning with the first day of construction. Contractor's written log shall describe all erosion control activities resulting from inspections. In addition, the following dates and events shall be included in the written log:
 - 1) The beginning and completion of major grading activities.

- 2) Rainfall events of 0.1 inches or greater.
 - 3) When construction activities temporarily or permanently cease on-site, or on a portion of the site.
 - 4) When stabilization measures are initiated for portions of the site.
 - 5) Stormwater sampling results.
- i. Contractor shall maintain and/or repair all BMPs as necessary to ensure continued performance of their intended function. Contractor's maintenance and repair activities shall include, but are not limited to:
- 1) Removal of sediment from silt fences before it reaches approximately one third the height of the fence, especially if heavy rains are expected; and
 - 2) Cleaning or removal and replacement of drain inlet protection devices at least once every 7 Days, and once daily during storm events or before 6 inches of sediment can accumulate.
- j. Contractor shall remove all temporary erosion and sedimentation control measure from the Project site within 30 Days after final site stabilization is achieved, or after the temporary BMPs are no longer necessary. Contractor shall remove any trapped sediment from the Project site. Contractor shall permanently stabilize any areas of soil disturbed by sediment removal.
- k. In addition to sediment control, Contractor shall prevent other pollutant discharges from contaminating stormwater, groundwater, or soils.
- 1) Any maintenance or repair of heavy equipment and vehicles involving oil changes, hydraulic system draining and removal, solvent and degreasing cleaning operations, fuel tank draining and removal, and other activities that may result in discharge or spillage of pollutants to the ground or into stormwater runoff must be conducted using spill prevention measures, such as drip pans. Contractor shall immediately clean any contaminated surfaces following any discharge or spill incident. Emergency repairs may be performed on-site using temporary plastic placed beneath and, if raining, over the vehicle.
 - 2) Wheel wash or tire bath wastewater shall be discharged to a separate on-site treatment system.
 - 3) Application of agricultural chemicals including fertilizers and pesticides shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' recommendations for application rates and procedures shall be followed.

- 4) Use of lime, flyash, or other soil amendments that could alter the pH of discharge waters is prohibited.
 - 5) Highly turbid or contaminated dewatering water from construction equipment operation shall be handled separately from stormwater. Management options include infiltration, transportation off-site for legal disposal, or use of a sedimentation bag with outfall to a ditch or swale for small volumes of localized dewatering.
 - I. Contractor shall provide to Owner all notifications/reports required by permit to DOE.
 - 1) If stormwater sampling results show turbidity greater than or equal to 250 NTU, Contractor shall immediately report to DOE and shall notify Owner of the report.
 - 2) Contractor shall file monthly Discharge Monitoring Reports (DMR's) with DOE as required. Contractor shall provide copies of all DMR's to Owner.
 2. For projects that disturb a soil surface area of 5,000 square feet or greater, but less than one acre, provisions shall be made to meet applicable local regulations, as necessary.
 - a. Contractor shall make provisions for inspection and approval by the local authority prior to groundbreaking.
 3. For projects that create additional impervious surfaces, provisions shall be made to meet stormwater flow control and treatment requirements, as applicable.
- C. Wetlands:
 1. Contractor must follow all Federal, State and local regulations including but not limited to WAC 173-201 regarding protection of wetlands.

1.06 AIR POLLUTION

- A. Contractor shall comply with all provisions of the Owner's Air Operating Permit, WAC 173-400 and WAC 173-401 requirements as applicable.
- B. Contractor shall control pollutants, such as diesel emissions, chemical emissions, and dust generated by the Project, so that pollutants do not adversely impact the Project site or the surrounding-area air quality.
- C. Contractor shall submit to Owner within 30 Days of the Notice to Proceed a list of any stationary air emission-generating equipment included in the Work, such as: fuel-powered electrical generators, internal combustion engines, boilers, paint booths, CFC-containing equipment, or other regulated emission sources. Contractor shall assist Owner in the preparation of necessary permit applications, and Owner shall obtain necessary permits. Contractor shall abide by any conditions or requirements of permits.

- D. Per WAC 173-400, Contractor shall mitigate all fugitive emissions (such as dust, vehicle exhausts, and other emissions that do not pass through a stack, chimney, or vent) generated by the Work. Contractor shall mitigate dust at the Project site throughout the entire duration of the Work. Dust mitigation may include application of specific chemical compounds approved by Owner, or may be accomplished with intermittent watering and sprinkling at such a frequency as will satisfactorily settle dust (excluding paved surfaces). Paved surfaces shall be cleaned mechanically without the discharge of water or chemicals to storm drains and/or surface waters. Under no circumstances shall Contractor permit dust mitigation cause soil erosion or pollution of surface waters.
- E. No materials shall be burned without required permits. If permitted burning is done, odors shall be minimized in accordance with the Owner's Air Operating Permit.
- F. CFCs (chlorofluorocarbons) or HCFCs (hydrochlorofluorocarbons) are not permitted as refrigerants in new or renovation projects. New permanently installed refrigeration equipment, such as chillers, temperature controlled chambers, air conditioning equipment, compressors, etc., must contain HFC (hydrofluorocarbon) refrigerants only (i.e., R-134A, R-404A, or R-507). At the completion of the Project, Contractor must provide detailed documentation to Owner about the refrigeration equipment installed, including identifying markings, capacity, and type of refrigerant. Refrigerant must be installed only by persons certified to do so.
- G. Indoor Air Quality:
 - 1. Owner shall notify Contractor of the location of fresh air supply intakes for buildings in the immediate area of the Work, and of fresh air supply intakes for buildings that may be affected by emissions from Contractor operations.
 - 2. Contractor shall notify Owner 3 Days prior to commencing Work in which Contractor must operate vehicles or equipment in areas where fresh air supply intakes are located.
 - 3. Contractor shall notify Owner 3 Days prior to commencing Work in which Contractor will be using solvents or other volatile chemicals, or processes which emit fumes, smoke, or strong odors that may affect fresh air supply intakes, or may enter Owner's buildings through doorways or windows.
 - 4. Contractor shall not allow its activities that emit vapors, fumes, smoke or strong odors to negatively affect fresh air supply intakes.
 - 5. If air releases of hazardous chemicals must occur, Contractor shall submit no later than 30 Days after the Notice to Proceed a chemical release plan detailing how such incidents may adversely affect Owner. Such a plan shall also specify protection to be provided to the employees of Owner and Contractor actions required to minimize chemical overexposure.
 - 6. During welding activity, Contractor shall confine fumes to the Project site, and the fumes must not adversely affect Owner's employees or students.

1.07 PUBLIC HEALTH

A. Solid Waste Disposal:

1. Contractor shall legally dispose of or recycle all solid waste at an off-site location. Contractor shall not burn, dump, or bury waste materials, debris, or rubbish on Owner property. Contractor shall clean the Project site at the end of each work shift. Contractor is liable for any and all damage resulting from improper waste handling and disposal (see Section 07 74 19 - Construction Waste Management).

B. Environmental Noise:

1. Per WAC 173-60, and applicable local requirements, Contractor shall not exceed maximum permissible environmental noise levels for the duration of the Work.

C. General Sanitation:

1. Per WAC 246-203, Contractor shall supply adequate water for drinking and hand washing purposes. The use of common drinking cups or towels is prohibited. For hand washing purposes, Contractor shall supply hot running water, soap, disposable towels, and a waste receptacle.

D. Drinking Water Protection:

1. Per WAC 246-290 and 246-291, Contractor shall protect all public water supplies. No portion of a public water system containing potable water shall be put into service nor shall service be resumed until the facility has been effectively disinfected and a satisfactory bacteriological sample has been obtained from a DOE-certified laboratory. Results of sampling shall be sent to Owner. The procedure used for disinfection shall conform to current standards of the American Water Works Association.
2. A minimum sanitary control area around all wells shall be maintained at all times. The sanitary control area shall extend at least 100 feet from any well. No source of contamination may be constructed, stored, disposed or applied within the sanitary control area.
3. If wells are being constructed or abandoned, Owner shall procure the appropriate water rights and construction permits per WAC 173-160. Owner shall provide copies of these documents to Contractor. Wells shall be constructed/abandoned properly by a licensed well driller. Contractor shall submit a plan to Owner detailing how all disinfection shall be accomplished.
4. Backflow Prevention:
 - a. Any connection made by Contractor to Owner's drinking water system, including connection to a fire hydrant, must be made

through a backflow prevention assembly approved by a Washington State certified cross connection control specialist (CCS) engaged by Owner and inspected and tested by a Washington State certified backflow assembly tester (BAT).

- b. Contractor shall label all non-potable water outlets, in a manner acceptable to the Owner, "Non-potable Water / Do Not Drink".

E. Vector Control:

- 1. Buildings shall be constructed so as to minimize the attraction and/or harborage of pests and vectors such as birds and rodents. Minimize bird roosting areas by not constructing exposed pipes, beams, or flat ledges on openings, especially underneath covered areas directly accessible to the outside. Openings 1/4-inch or larger shall be sealed. Leave a minimum of a 3-foot swath around the building that is bare. Do not plant trees, shrubs and grass immediately adjacent to building.
- 2. The presence of standing water shall be minimized or eliminated to prevent mosquito breeding.

F. On-Site Sewage Disposal:

- 1. Contractor is responsible for fully complying with WAC 246-272. A construction permit application shall be submitted to the appropriate jurisdictional authority for approval. The jurisdictional authority shall issue a construction permit prior to the commencement of construction and shall perform pre-opening inspections. Contractor shall ensure that the appropriate authority inspects and approves the site prior to construction and when the project is substantially complete.

G. Water Recreation Facilities:

- 1. Contractor is responsible for fully complying with WAC 246-260. A construction permit application shall be submitted to the appropriate jurisdictional authority for approval prior to the commencement of construction. WSU EH&S shall be consulted prior to the development of a construction permit application. Contractor shall ensure that the appropriate regulatory authority inspects and approves the site prior to operation.

H. Food Service Facilities:

- 1. Contractor is responsible for fully complying with WAC 246-215. A construction permit application shall be submitted to the appropriate jurisdictional authority for approval prior to the commencement of construction. WSU EH&S shall be consulted prior to the development of a construction permit application. Contractor shall ensure that the appropriate regulatory authority inspects and approves the food service prior to operation.

1.08 OCCUPATIONAL HAZARD MANAGEMENT

A. Chemical Hazard Communication:

1. If any hazardous chemicals will be used in the Work or present at the Project site, copies of applicable Material Safety Data Sheets (MSDS) shall be made immediately available to Owner prior to use by Contractor and during any use of the hazardous chemicals in the Work.
2. If the use or presence of hazardous chemicals at the Project site may affect the health of individuals outside the Project site, Contractor shall submit a written plan to Owner at least 30 Days prior to such use or presence detailing how Owner can avoid exposure to the products. Contractor shall submit MSDS / SDS to Owner for any hazardous chemical to which persons outside the project site may be exposed. The exposure avoidance plan shall also specify actions that should be taken if inadvertent exposure occurs. Owner shall provide Contractor with a written plan detailing how Contractor employees can avoid exposure to hazardous chemicals used by Owner that may impact the Project site, and shall specify actions which should be taken if inadvertent exposure occurs. Owner shall submit MSDS / SDS to Contractor for any hazardous chemical to which persons inside the project site may be exposed.

B. Lock-Out/Tag-Out:

1. When Owner and Contractor are to be engaged in coordinated activities requiring the control of hazardous energy, Owner and Contractor shall inform each other of their respective lock-out or tag-out procedures.

C. Confined Space:

1. When Contractor employees are to enter permit-required confined spaces, Owner shall:
 - a. Inform Contractor that the Project site contains permit required spaces and that permit-space entry is allowed only through compliance with a confined-space program meeting WAC 296-809.
 - b. Inform Contractor of hazards that have been identified.
 - c. Coordinate entry operations with Contractor when both Owner and Contractor personnel will be working in or near permit spaces.
 - d. Debrief Contractor at the conclusion of the entry operations regarding any hazards confronted or created in permit spaces during entry operations.

END OF SECTION 01 41 19

PART 1 GENERAL

1.01 SUMMARY

- A. Contractor shall perform all Work in a skillful and workmanlike manner. Materials and equipment furnished by Contract and any Subcontractor(s) must be of good quality and new unless the Contract Documents require or permit otherwise. Materials shall conform to the manufacturer's standards in effect at the date of execution of the Contractor and shall be installed in accordance with the manufacturer's instructions, specifications, and directions. Contractor shall, if requested by Owner, furnish satisfactory evidence regarding the kind and quality of any materials identifying thereon the source, and warranting their quality and compliance with the Contract Documents.
- B. Section includes:
 - 1. Contractor's Quality Control Program;
 - 2. Field samples;
 - 3. Mock-ups;
 - 4. Manufacturer's instructions;
 - 5. Manufacturer's field services;
 - 6. Testing laboratory services; and
 - 7. Contractor tests and inspections.

1.02 QUALITY CONTROL PROGRAM SUBMITTALS

- A. Contractor shall submit a written Quality Control Program for the Project per the Pre-Construction Submittal Requirements of Section 01 33 00. This submittal shall include but not be limited to the following:
 - 1. An overview of Contractor's Quality Control Program.
 - 2. Identification and resume of Contractor's on-site Quality Control Manager (QCM) .
 - 3. A description of the activities, record keeping, and correspondence that the QCM will perform and be accountable for throughout the duration of the Project.
 - 4. A description of the quality control meetings to be conducted, sample inspection check lists (i.e., samples of actual inspection check list forms that will be submitted to Owner when scheduling inspections), and Subcontractors' quality control representatives. All forms that Contractor intends to use in its Quality Control Program shall be part of the submittal.
 - 5. A description of the QCM activities when inspections fail to verify compliance with the Contract Documents.
 - a. These activities are to include, as a minimum, follow-up with

- applicable Subcontractors, correction and/or completion of Work required for re-inspection, and the re-inspection.
- b. Contractor shall submit its weekly Non-Compliance Logs at least 2 Days prior to each Progress Meeting.
- 6. A description of the QCM activities to provide the required notifications for inspections.
 - 7. A description of record keeping and information turn-over to Owner as a component of the Operating and Maintenance data (i.e. factory representative's start-up reports and permission to energize, verification of correct voltage and phasing to motors, etc.).
 - 8. Contractor will submit a daily report within 3-business days for any day work is performed. The daily report should include the following information; the list may be adjusted or relaxed with Owners Representative approval depending on size and scope of the project requirements:
 - a. progress photo's,
 - b. list of contractor's and work-force #'s for each contractor,
 - c. RFI's or questions,
 - d. equipment quantities in use or idle,
 - e. weather (if work is being performed outside),
 - f. construction delays or likely delays,
 - g. 3rd part inspections or city visits,
 - h. safety issues,
 - i. meetings conducted,
 - j. substantive material deliveries, and
 - k. any other relevant facts occurring on the site.

1.03 CONTRACTOR'S QUALITY CONTROL PROGRAM

- A. Contractor shall establish and maintain a written Quality Control Program which shall be issued by Contractor to Subcontractors performing Work on the Project and utilized to verify that the execution of the Work is consistent with the requirements of the Contract Documents.
- B. The Quality Control Program shall include, but not be limited to the following:
 - 1. Preparatory Phase:
 - a. Prior to beginning Work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. Contractor shall:
 - b. Review of each paragraph of applicable specifications, reference codes, and standards. Make a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field at the preparatory inspection. Maintain these copies in the field, available for use by Owner's Designated Representative until final acceptance of the work.

- c. Review the Drawings.
 - d. Check to assure that all materials and/or equipment have been tested, submitted, and approved.
 - e. Review provisions that have been made to provide required control inspection and testing.
 - f. Examine the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
 - g. Perform a physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
 - h. Review appropriate accident safety procedures.
 - i. Discuss procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
 - j. Check to ensure that the portion of the plan for the work to be performed has been accepted by the Owner's Designated Representative.
 - k. Schedule, manage and record the minutes of each preparatory meeting.
 - l. Review all RFIs associated with the Work.
2. Initial Phase:
- a. At the beginning of the Work, Contractor shall:
 - b. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
 - c. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing. Resolve all differences and deficiencies.
 - d. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
 - e. Check safety to include compliance with and upgrading of the Safety Plan. Review with each worker. Particular attention should be given to high hazard work.
 - f. Prepare and attach to the daily CQC report separate minutes of this phase.
 - g. Repeat the initial phase any time acceptable specified quality standards are not being met.
3. Follow Up Phase:
- a. Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract

requirements, until completion of the Work. The checks shall be made a matter of record in the QC documentation. Conduct final follow-up checks and correct deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work.

- C. Contractor's Quality Control Program shall be independent of any inspections and testing performed by Owner or by any independent testing and inspection agencies hired by Owner.
- D. Within the Quality Control Program, Contractor shall have available on the jobsite at all times a written report of quality control activities. At a minimum, the report shall note Project site quality control inspections, performance of scheduled tests and follow-up testing, other required inspections, deficiency log, and examinations of workmanship and quality.
- E. Test results shall identify applicable Contract (including Specification) requirements, the test or analysis procedures used, and the actual test results. A statement shall be included that the item tested or analyzed conforms or fails to conform to the Contract Documents. Each report shall be conspicuously stamped on the cover sheet "CONFORMS" or "DOES NOT CONFORM" as the case may be. All test reports shall be signed by a testing laboratory representative authorized to sign certified test reports. Copies of all test reports shall be available on the jobsite at all times.
- F. If the Quality Control Program is found to be defective and Contractor does not promptly correct the deficiency, Owner may:
 - 1. Withhold payment until satisfactory corrective action has been taken, or
 - 2. Issue a stop work order until satisfactory corrective action has been taken.
- G. Pre-Inspections: Contractor shall pre-inspect Work that requires normal, special, and additional inspections as indicated in the Contract Documents.

1.04 FIELD SAMPLES

- A. Field samples are defined as the partial installation of selected materials at the Project site for Owner's review and acceptance of visual features and workmanship. Generally, accepted field samples are incorporated into the Work.
- B. Contractor shall provide field samples as required by the Contract Documents at location acceptable to Owner.
- C. Perform Work in accordance with the Contract Documents.
- D. Approved samples will serve as an acceptable standard of quality and workmanship.
- E. Maintain samples until completion of relevant Work.

- F. Upon completion of relevant Work or when directed by Owner, demolish and remove samples from Project site unless sample is accepted as part of completed Work.

1.05 MOCK-UPS

- A. Contractor shall provide mock-ups as required by the Contract Documents. Provide additional mock-ups, as required by Owner, until approval is obtained.
- B. Do not proceed with subsequent Work until approval of the mock-up is obtained.
- C. The approved mock-up shall be the standard of workmanship and materials for the Work that is represented by the mock-up.
- D. Maintain mock-up in approved condition, until directed otherwise by Owner.
- E. Unless specified otherwise, remove mock-up at completion of the Work or when directed by Owner.
- F. Unless specified or approved otherwise, mock-ups shall be completed and approved prior to the pre-installation meeting at which the Work represented by the mock-up will be discussed.
- G. Notify Owner a minimum of 7 Days prior to requesting mock-up approval.

1.06 MANUFACTURERS' INSTRUCTIONS

- A. Contractor shall comply with manufacturers' instructions in full detail, including each step in sequence. Do not omit preparatory steps or installation procedures unless specifically modified or exempted by Contract Documents.
- B. Should instructions conflict with Contract Documents, Contractor shall request clarification before proceeding.

1.07 MANUFACTURERS' FIELD SERVICES

- A. When specified, Contractor must require product manufacturer to furnish a qualified representative to observe field conditions and quality of workmanship, and to provide recommendations, certifications, and other specified services.
- B. Representative shall submit written report to Owner listing observations and recommendations.

1.08 TESTING LABORATORY SERVICES

- A. Owner will arrange for services of an independent Testing Laboratory to inspect and test the Work to verify compliance with Contract Documents.
- B. Contractor's Responsibilities:

1. Cooperate with Testing Laboratory personnel, and furnish access, tools, samples, certifications, test reports, design mixes, equipment, storage, and assistance as requested by the Testing Laboratory.
2. Notify Owner and Testing Laboratory a minimum of 7 Days in advance of all required tests and 48 hours in advance of all required inspections. When tests or inspections cannot be performed, through fault of Contractor, Contractor shall reimburse Owner for costs incurred by Owner.
3. Contractor shall remove and replace Work found to not comply with Contract Documents.
4. If initial tests and inspections indicate deficient work, Contractor shall reimburse Owner for costs of all subsequent tests and inspections related to such deficiency.
5. All damage to Work as a result of normal testing operations shall be repaired by Contractor to match surrounding surfaces.
6. Schedule testing and inspection so that work of testing and inspection personnel will be as continuous and brief as possible.
7. Contractor shall reimburse Owner for travel and lodging expenses incurred for testing and inspection services performed outside a radius of 100 miles of the Project site.

1.09 CONTRACTOR TESTS AND INSPECTIONS

- A. Inspection and testing performed exclusively for Contractor's convenience shall be the Contractor's sole responsibility.
- B. Earthwork Compaction Testing Requirements:
 1. Owner will engage the services of a Testing Laboratory to perform all soil and structural fill compaction testing. Compactions of any fill material shall be equal to or exceed the specified percentage of maximum dry density as defined by ASTM test procedure D1557 (modified proctor). Obtaining such specified compaction performance is the sole responsibility of Contractor.
 2. During any of Contractor's operations, Owner reserves the right to perform compaction tests for its own information only. At Owner's discretion, copies of such tests may be made available to Contractor. The taking of any such tests by Owner in no way relieves Contractor from testing to assure itself of compliance with the Contract Documents.
- C. Approved Structural Steel Fabricators:
 1. Contractor shall pay for any required structural steel fabrication special inspections.
- D. Cast-in-Place Concrete Strength Testing Requirements:

1. Concrete test cylinders will be made by Owner or Owner's Testing Laboratory. Contractor shall be responsible for proper care of cast cylinders while on the Project site (with respect to temperature, humidity and protection).
2. Contractor is also responsible for timely transportation to the laboratory in Spokane (or closer) on a schedule that will permit adequate laboratory curing before testing.
3. Contractor shall notify the Owner at least 48 hours before any concrete pour to allow time for observation.
4. Frequency and location of tests are to be determined. As a minimum, four test cylinders will be made for each day's pour or for every hundred cubic yards, whichever is greater.
5. The results of Owner's tests will be made available to Contractor.
6. The quality of all concrete is to be the sole responsibility of Contractor. If Contractor feels that additional testing is required to assure continued quality control, the frequency, testing, and payment therefore is Contractor's responsibility.

E. All Other Work Inspection and Testing Requirements:

1. Contractor shall, at no additional cost to Owner, provide all inspections and tests required to assure full compliance with the Contract Documents. Unless specifically required, Contractor is not required to submit copies of such test results to Owner. Contractor, however, shall maintain copies of all testing and inspection reports at the Project site for inspection and copying by Owner.
2. The performance of testing or inspection by Owner or Owner's Testing Laboratory does not relieve Contractor from responsibility for meeting all requirements of the Contract Documents.

END OF SECTION 01 45 00

PART 1 GENERAL

1.01 SUMMARY

- A. General: Owner will select and employ an independent testing agency, engineering service, or a special inspector to conduct the tests and inspections to be provided by Owner. Inspections that are normally associated with obtaining State approval (e.g., electrical work as specified in Division 26, etc.) shall be provided and paid for by Contractor. Contractor shall comply with all applicable building codes and provide all testing services required by the Contract Documents unless specifically identified as Owner's responsibility.
- B. Owner's testing agency shall prepare test reports, logs and certificates applicable to the Work for which Owner will provide testing and shall deliver the specified number of copies to the designated parties. If any inspection or testing 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 Owner's services and expenses, shall be at Contractor's expense.

1.02 DESCRIPTION

- A. Definition: For the purpose of this Section, all references made herein to testing laboratory, testing agency, or special inspector shall refer to as the tests or inspections conducted by a special inspector provided by Owner.

1.03 QUALITY ASSURANCE

- A. Qualifications: Contractor's inspection personnel must be approved by Owner and possess certain qualifications as stated in this Section. The testing agency shall comply with all requirements of ASTM E329.
 - 1. The inspector for waterproofing and roofing shall have specialized technical knowledge and experience specific to waterproofing and roofing.
 - 2. The testing agency for concrete testing and inspection services should be an agency other than the agency employed by Contractor for the purpose of establishing concrete mix designs, etc.
 - 3. Geotechnical inspection will be performed by a licensed geotechnical consulting firm.

1.04 DUTIES OF OWNER'S TESTING AGENCY

- A. General: Testing agencies shall conduct testing and inspection services, interpret them, evaluate the results for compliance with the Contract Documents, and report the findings to the Owner, Contractor, and local building authority, as applicable. Testing and inspection services shall be performed in accordance with applicable ASTM standard methods or other specified procedures.

- B. Testing: Materials to be tested are those so specified and others as Owner or authorities having jurisdiction over the Project may direct.
- C. Inspection: Inspections, continuous and special, shall be performed by the inspectors as required by the Contract Documents and authorities having jurisdiction.
- D. Rejected Work: Inspectors shall have the right to recommend rejection of materials and workmanship that is defective. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the Project site without charge to Owner. If Contractor does not correct rejected work within a reasonable time, Owner may elect to correct the work and charge the expense to Contractor.
- E. Inspectors are not authorized to do the following:
 - 1. Release, revoke, waive, alter, or enlarge on requirements of the Contract Documents;
 - 2. Approve or accept any portion of the Work, except as specified for soil conditions (i.e. bearing capacities, etc.);
 - 3. Perform any duties of Contractor; or
 - 4. Stop Work.
- F. Should the Owner elect at any time before Final Acceptance to make an examination of Work already completed by removing or tearing out the same, Contractor shall on request promptly furnish all necessary facilities, labor, and material. If such Work is found to be defective in any respect, Contractor shall be responsible for the cost of such examinations and of satisfactory reconstruction. If such Work is found to meet the requirements of the Contract, however, Owner shall be responsible for the cost of such examinations and of satisfactory reconstruction.

1.05 PAYMENTS

- A. Owner shall pay for the cost of initial testing and inspection, except as otherwise specified in the Contract Documents. Initial tests and inspections are defined as the first tests and inspections as hereinafter specified.
- B. In the event any test or inspection reveals Work not in compliance with the Contract Documents, Contractor shall pay for or be backcharged for all costs of re-testing and/or re-inspection.
- C. Additional tests and inspections not herein specified but requested by Owner shall be paid for by Owner, unless the results of such tests or inspections reveal Work not in compliance with the Contract Documents, in which case Contractor shall pay for or be backcharged for all costs of testing, re-testing, re-inspection, and any related Owner costs.

- D. Costs for additional tests or inspections required because of any change in materials or change in the source of supply from that specified shall be paid by or backcharged to Contractor.
- E. Contractor is responsible for all work required to correct any deficiencies.
- F. Contractor is responsible for the cost of any testing required for the convenience of Contractor in the scheduling and performance of the Work.
- G. Contractor is responsible for the cost to verify testing done without prior notice, with improper supervision, or contrary to construction practice, and for testing of materials for which mill reports are required but not furnished.
- H. Contractor is responsible for the cost of any testing that is required to be performed by Contractor by the Contract Documents.

1.06 TESTS AND INSPECTION REPORTS

- A. Copies of Test and Inspection Reports: Copies of test and inspection reports will be distributed at weekly intervals. Such reports shall include all tests performed, regardless of whether such tests indicate that material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations shall also be reported. Test and inspection reports shall be distributed electronically as requested by Owner.
- B. Test and inspection reports shall be distributed as follows:
 - 1. Architect/Engineer;
 - 2. Structural Engineer;
 - 3. Geotechnical Engineer or Soil Consultant;
 - 4. Owner; and
 - 5. Contractor.

1.07 CONTRACTOR'S RESPONSIBILITIES

- A. Coordination: Contractor shall initiate and coordinate all required tests and inspections, including conforming with requirements of applicable public agencies and authorities. Inspection of the Work does not relieve Contractor of any obligation under the Contract. The Owner's Designated Representative shall have authority to reject Work that is not in compliance with the Contract Documents.
- B. Access: Inspectors shall at all times have free access to the Work, wherever the Work is in preparation. Contractor shall at all times provide and maintain proper facilities and safe access for such inspection. Contractor shall also cooperate with testing personnel and furnish access, tools, samples, certifications, test reports, design mixes, equipment, storage, and requested assistance.

- C. Storage Facilities: Contractor shall furnish adequate storage facilities for the sole use of the testing laboratory for safe storage of specimens that must remain on the site.
- D. Data: Furnish records, drawings, certificates and similar data, including Shop Drawings and Change Orders, as may be required by the testing and inspection personnel to confirm compliance with the Contract Documents.
- E. Notice: Contractor shall furnish notice to Owner and inspector at least 48 hours in advance of all required tests and inspections, unless otherwise specified.
- F. Defective Work: Contractor shall remove and replace any Work found defective by Owner or not complying with the Contract Documents at no additional cost or Contract Time. Where testing personnel take cores or cut-outs to verify compliance, repair prior to acceptance. Where defective Work requires redesign, any redesign costs shall be paid for by Contractor.
- G. Cancellations: Contractor shall give sufficient advance notice to the inspector to allow in the event of any cancellation or rescheduling of a previously scheduled test or inspection. Any charges due to insufficient advance notice of cancellations or delay shall be paid by or backcharged to Contractor.

1.08 TEST FAILURES

- A. Where a sample fails to pass a required test, Owner may permit re-testing of the sampled material. In such cases, two samples shall be tested and the material shall be rejected if either of the two subsequent samples fail.

1.09 REPORTING TEST FAILURES

- A. Immediately upon inspector's determination of a test failure, inspector shall notify Owner. On the same day, inspector shall send written test results to those named on the distribution list above.

1.10 REMOVAL OF MATERIALS

- A. Unless otherwise directed, materials not conforming to the requirements of the Contract Documents shall be promptly removed from the Project site and properly disposed of without additional expense to Owner.

END OF SECTION 01 45 23

PART 1 GENERAL

1.01 SUMMARY

- A. Contractor shall be evaluated on performance throughout the course of the contract to provide past performance documentation for future projects.
- B. Section includes:
 - 1. Program Objectives;
 - 2. Performance Categories and Assessment;
 - 3. Evaluation Reports;
 - 4. Notice, Review and Appeal.

1.02 PROGRAM OBJECTIVES

- A. The Contract Performance Evaluation Program is intended to improve contractor selection given the following primary objectives:
 - 1. Assist the Owner in evaluating the contractor's qualifications and proven ability to successfully perform future contracts when past performance has been previously documented;
 - 2. Provide the University objective data relating to Contractor responsibility;
 - 3. Provide contractors with a means of enhancing their qualifications and reputation by receiving recognition for exceptional performance;
 - 4. Encourage better working relationships between the University and the Contractor and to provide feedback to the contractor during and after the contract period;

1.03 PERFORMANCE CATEGORIES AND ASSESSMENT

- A. Contractor shall be evaluated based upon the following categories:
 - 1. Schedule and Time Management;
 - 2. Quality Management;
 - 3. Communication Effectiveness;
 - 4. Management Approach;
 - 5. Code and Compliance; and
 - 6. Cost.
- B. Each of the above categories will be assessed by multiple key project stakeholders and provided one of the following performance levels based upon objective and cumulative data:

1. Outstanding (5): Contractor has exceeded the majority of all of the significant contract criteria and has met or exceeded the Schedule, Quality, Communications, Management, Code Compliance and Cost requirements of the contract. The contractor was extremely or completely knowledgeable of the contract requirements and applicable laws and regulations. A very consistent high level of cooperation, project management, and job site control appreciably contributed to an unusually good result.
2. Very Good (4): Contractor has exceeded many of the significant contract criteria and has met or exceeded some of the Schedule, Quality, Communications, Management, Code Compliance, and Cost requirements of the contract. The contractor was knowledgeable of the contract requirements and applicable laws and regulations. Was generally cooperative and performed their work with minimal prompting. Their performance results were very good.
3. Satisfactory (3): Contractor has satisfactorily met the overall contract criteria and has met the overall Schedule, Quality, Communications, Code Compliance and Cost requirement of the contract. The contractor occasionally had to be prompted or reminded of the contract requirements, but overall the project was acceptable, producing an acceptable result.
4. Marginal (2): Contractor may have met many, but not all, of the contract criteria and failed to meet one or more of the Schedule, Quality, Communications, Code Compliance or Cost performance requirements of the contract. Even though the project may have been accepted, the contractor's performance, as evaluated, was marginal overall. The contractor frequently had to be prompted or reminded of the contract requirements; overall the project was less than satisfactory.
5. Unsatisfactory (1): Contractor failed to meet many or most of the contract criteria and failed to meet the overall Schedule, Quality, Communications, Code Compliance and Cost performance requirements of the contract. While the project may have been accepted by the owner, the effort expended in prompting the contractor to perform was excessive. The contractor's poor or uncooperative performance created serious unnecessary and avoidable difficulties in achieving contract completion.

1.04 EVALUATION REPORTS

- A. At the midpoint of project completion, Owner shall provide contractor with a draft Contract Evaluation Report based upon the current performance during the contract. This shall provide the Contractor an opportunity improve performance levels during the contract, and provide an opportunity for Contractor-Owner communication and working relationship.
- B. A final Contract Performance Evaluation Report will be completed upon contract completion and shall become the official report of record.

1. A Summary Contract Performance Evaluation will be provided to the Contractor within 30 calendar days after Final Completion.
 2. Final Contract Performance Evaluation Reports will remain on record for a minimum of 5 years from date issued.
- C. Upon receipt of the Summary Contract Performance Evaluation, Contractor shall review the report and may request a debrief conference within 21 calendar days of receipt.
- D. If after the debrief, Contractor would like to dispute the evaluation findings the Contractor shall submit in writing, the specific reasons for disagreement and include the basis for their appeal within 14 calendar days following the debrief.
1. Upon receipt of appeal, Owner shall convene a review with the Assistant Vice President, Facilities Services, Capital to consider the objectivity, accuracy, completeness and fairness of the Contract Performance Evaluation.
 2. The Contractor shall be notified and issued a final determination within 30 calendar days of receipt of the appeal.

END OF SECTION 01 45 34

PART 1 GENERAL

1.01 TEMPORARY UTILITIES

- A. Owner may furnish to Contractor temporary Owner-owned utilities when available and upon Owner written approval. Owner reserves the right to restrict the use of its utilities if, in its opinion, Contractor fails to adequately conserve utilities or to use utilities appropriately. When using Owner-owned utilities, Contractor is to make metered connections to the nearest available service and disconnect same when no longer needed.
- B. If Owner-owned utilities are not available at the Project site, or if Owner restricts use of Owner-owned utilities, Contractor shall obtain required services from commercial sources or public utilities, and Contractor is responsible to pay for all utility costs.
- C. Contractor shall field verify the availability of utility services provided by Owner and coordinate the Work accordingly.
- D. In remodeling projects where portions of the building are to remain in service, Contractor shall be responsible for coordinating the Work to maintain utility services to the occupied portions of the building.

1.02 TEMPORARY ELECTRICAL SERVICE

- A. Contractor shall provide all services required for construction operations and may connect to existing services when available upon Owner approval. .
- B. Contractor shall provide lighting for construction operations.
- C. Contractor may use existing lighting when available and adequate.
- D. Contractor shall maintain site lighting throughout the duration of the Work.

1.03 HEAT AND VENTILATION

- A. Contractor shall provide heat and ventilation as required to maintain specified conditions for construction operations and to protect materials and finishes from damage due to temperature or humidity.
- B. After a building is substantially enclosed, the permanent heating system or a temporary hook-up of equipment from the permanent system may be used for temporary heat provided that the equipment is properly installed by the responsible electrical and mechanical Subcontractors and available for supplying temporary heat. Owner shall be the sole judge of the adequacy of the building enclosure for temporary heating or cooling purposes.
- C. Contractor shall arrange with the electrical and mechanical Subcontractors installing said systems and equipment for the use, operation, and maintenance of

the systems. Contractor shall pay for all connections and attendants for temporary heating, including necessary accessories such as temporary (construction) air filters to protect the air distribution systems from contamination.

- D. Contractor shall provide a dust free air distribution system and correct all damage to this system caused by the Work.
- E. In existing facilities, Contractor shall coordinate use of the existing systems with Owner. Contractor shall extend and supplement with temporary units as required to maintain specified conditions for construction operations.
- F. Use of electric resistance type heating systems for temporary heat is prohibited.
- G. The warranty period for any permanent equipment used during construction will not commence until Contractor achieves Substantial Completion.

1.04 TEMPORARY WATER SERVICE

- A. Unless available from an Owner-owned utility, Contractor shall provide service required for construction operations. At all times, Contractor shall utilize backflow/cross-connection devices, certified by Owner, to safeguard water supply.
- B. For Work in existing facilities, Contractor shall connect to existing services when approved by Owner and extend branch piping with outlets so that water is available for use by all persons associated with the Work.
- C. Provide drinking water from a safe source for all those associated with the Work.

1.05 SANITARY FACILITIES

- A. Contractor shall provide temporary restroom facilities. Facilities shall not directly or indirectly drain or discharge onto Owner property or any waters of the State. Place where directed at the time Work begins; maintain in sanitary condition. Remove upon completion of the Work and disinfect the premises.
- B. Use of permanent and/or existing Owner's facilities is not allowed.

1.06 BARRIERS

- A. Contractor shall provide barriers as required to prevent public entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. When temporary fencing is indicated by the Drawings, or if fencing is provided at Contractor's option, enclosures shall be constructed of 6 feet high commercial grade chain link with vehicular and personnel gates, as required.

1.07 ENCLOSURES

- A. Contractor shall provide temporary weather-tight closures of openings to provide acceptable working conditions, protect materials, facilitate temporary heating, and prevent entry of unauthorized persons. Provide doors with self-closing hardware and locks.
- B. Contractor shall provide temporary roofing when so indicated by the Drawings or when made necessary by the Project requirements.
- C. Contractor shall provide temporary dust-proof partitions when required to confine dust and moisture to the immediate Work area.
- D. Contractor shall provide temporary noise-proof partitions when required to confine noise to the immediate Work area.

1.08 PROTECTION OF EXISTING FACILITIES

- A. Utility Tunnel Protection: Contractor shall provide adequate planking across any tunnels to distribute loads and prevent damage. If necessary, Contractor shall provide temporary shoring inside tunnel areas.
- B. Low Overhead Clearance: Contractor shall be fully responsible for addressing all vehicular limitations caused by low overhead restrictions throughout campus. Route all traffic to avoid damage to overhead structures. Review proposed routing with Owner prior to commencement of construction.
- C. Tree and Plant Protection: Contractor shall protect trees and other plants not scheduled for removal; maintain protection until Project completion.
 - 1. In the event that a tree or plant is damaged as a result of the Work that, in the opinion of Owner, requires replacement, Contractor shall be responsible for such replacement.
 - 2. If at any time Contractor judges that the protection of plant materials designated to be saved is incompatible with Work required, or if operations necessarily threaten the health of any plant material, Contractor shall immediately notify Owner and cease Work affecting the area until a written agreement is reached concerning acceptable procedure.

1.09 SECURITY

- A. Contractor shall provide security to protect the Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, and theft. Coordinate with Owner's security program.
- B. During construction, all openings to Owner's utility tunnel system must be protected against unauthorized entry. Contractor shall provide closures, approved by Owner, including locked doors or hatches at any openings created by the Work.

1.10 PROTECTION OF INSTALLED WORK

- A. Contractor shall provide temporary protection for installed products. Control traffic in immediate area to minimize damage.
- B. Contractor shall provide protective coverings for walls, projections elevator cabs, jambs, sills, and soffits of openings. Protect finished floors and stairs from traffic, movement of heavy objects, and storage.
- C. Contractor shall prohibit traffic and storage on waterproofed and roofed surfaces and on lawns and landscaped areas.

1.11 CLEANING DURING CONSTRUCTION

- A. Contractor shall clean the site each day during construction and shall prevent the accumulation of waste materials and rubbish.
- B. Contractor shall clean interior areas prior to the start of finish Work and maintain areas free of dust and other contaminants during finishing operations.

1.12 OFF-SITE CLEAN UP

- A. Contractor shall continuously keep sidewalks, lawns, parking areas, and streets clear of construction materials, debris, gravel, rock, and dirt related to the Project.

1.13 LIFTING DEVICES AND HOISTING FACILITIES

- A. Contractor shall provide cranes, hoists, towers, and other lifting devices necessary for the proper and efficient movement of materials.

1.14 MECHANICAL AND ELECTRICAL SYSTEM SHUT-DOWNS

- A. Any shut-down of mechanical or electrical systems affecting Owner's operations shall be scheduled by Contractor during off-hours. Contractor shall submit a written shut-down request providing at least 14 Days advance notice. Any shut-down must be coordinated with and approved by Owner.

1.15 CONSTRUCTION PARKING

- A. Contractor's employees may park only in accordance with campus traffic and parking regulations and pay all required fees.
- B. When working in Pullman's central campus, Contractor's vehicular use will be limited to the following:
 - 1. Delivery of materials to and from Project site;
 - 2. Single vehicle for use by Project supervisor of each major Contractor (four total vehicles maximum); and

3. Workers' vehicles shall not be allowed to park in the central mall.

1.16 NOISE CONTROL

- A. Any construction related noise that interferes or is likely to interfere with normal use of adjacent space(s) shall be scheduled and approved by Owner.
- B. Contractor shall restrict any construction related noise to the hours approved by Owner and in accordance with the state and local noise ordinance.
- C. Owner may approve Contractor working extended hours. Request any extended hours of operation with Owner.

1.17 TRAFFIC OBSTRUCTIONS

- A. Contractor shall submit a written traffic control plan for all traffic obstructions, either pedestrian or vehicular, for approval by Owner, per the Pre-Construction Submittal Requirements of Section 01 33 00.
- B. In some cases, it may be necessary to develop special routes for large or unwieldy deliveries that could interfere with pedestrian movement, especially at peak times.
- C. Contractor shall avoid deliveries or equipment operations that block street traffic during peak times.
- D. Pedestrian Obstructions: Any equipment on sidewalks or other pedestrian ways shall be barricaded. Barricades shall include a horizontal member at a maximum of two feet above the walking surface.

1.18 REMOVAL OF TEMPORARY FACILITIES

- A. Contractor shall remove temporary materials, equipment, services, and construction facilities prior to Substantial Completion inspection.
- B. Contractor shall clean and repair damage caused by installation or use of temporary facilities.
- C. Contractor shall restore existing facilities used during construction to specified or original condition.

END OF SECTION 01 50 00

PART 1 GENERAL

1.01 PRODUCTS

- A. Products include material, equipment, and systems.
- B. Comply with Specifications and referenced standards as minimum requirements.
- C. Components required to be supplied in quantity within a specification section shall be the same, and shall be interchangeable.
- D. All materials shall be new unless specifically noted otherwise.

1.02 TRANSPORTATION AND HANDLING

- A. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry.
- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.
- C. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

1.03 STORAGE AND PROTECTION

- A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.
- B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
- C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.
- D. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

1.04 VARIATION FROM SPECIFIED PRODUCTS

- A. Subsequent to Bid Opening/Proposal - Approved Equivalents:
 - 1. Requests for approved equivalents will only be considered when approved equivalent statements, used in reference to product

specifications, are specifically provided for within individual Specification sections.

2. The terms "or an approved equivalent", "approved equivalent", or similar statements, when used herein in connection with manufacturers' products, shall be understood to mean products that are equally effective and suitable for their intended use; based on the judgment of the Owner, whose decision shall be final.
3. Written requests for consideration by the Owner of approved equivalents may be submitted throughout the Project.
4. Time extensions and additional costs resulting from use of approved equivalent products will not be considered.

B. No Substitutions:

1. The terms "No Substitutions", "Alternative Products not Acceptable", or similar statements used in reference to product specifications, shall mean that only the specified product will meet the needs of the University and that no other products will be considered at any time before or during the Project.

C. Requirements and Procedures for Product Variations:

1. The Contract is based on the standards of quality established in the Contract Documents.
2. Substitution or approved equivalent revisions shall be made only with the prior written acceptance of the Owner.
3. All requests for substitutions or approved equivalents must be on the proposer's letterhead and shall be accompanied by complete specifications, samples, records of performance, certified copies of tests by impartial and recognized laboratories, and such other information as the Owner may request to prove the merit of the proposed revisions.
4. The Contractor assumes the responsibility for capacity, dimensions, clearance, etc., of the named manufacturer's particular item to assure that the revision meets the requirements.
5. The Contractor shall assume the cost of any redesign, in the form of changes to the Drawings, or for the Work of any other trades, or any other costs required to properly incorporate any revision associated with substitutions or use of approved equivalent products.
6. Final decisions as to the quality and suitability of proposed revisions will rest solely with the Owner and will be based on proof submitted.
7. When the Owner approves a substitution or approved equivalent proposed by the Contractor, it is with the understanding that the Contractor certifies that the article or material is equivalent to or better than that specified.

END OF SECTION 01 60 00

PART 1 GENERAL

1.01 PURPOSE

- A. Provide for an orderly, timely, and efficient completion of the Work for Owner.

1.02 SUBSTANTIAL COMPLETION

- A. Requirements for Substantial Completion: Contractor shall comply with all requirements for Substantial Completion identified in the General Conditions and other Contract Documents. Prior to Substantial Completion, Contractor must have constructed the Work in substantial accordance with the Contract Documents, and:
1. Certificate of Occupancy received from the AHJ.
 2. All elements of the Work must be operational and in good working order and condition, except for incidental punchlist Work;
 3. The fire and life safety systems, if any, must be tested and accepted;
 4. Any elevators must be operational, functioning, and in good working order and condition, and be fully approved for use;
 5. All mechanical, electrical, plumbing, telecommunications, security, and access control systems must operate and function in good working order and condition, including commissioning;
 6. The finish portion of the Work must be complete including but not limited to paint, trim, doors, partitions, cabinetry, floor coverings, ceilings, wall finish, and other finish surfaces, except for incidental punchlist Work;
 7. All roadway improvements, paving, sidewalks, parking areas, other street improvements, lighting, landscaping and irrigation must be complete;
 8. Utilities must be complete, connected, and operating normally;
 9. Contractor must have removed all construction facilities, temporary controls, and construction debris;
 10. Contractor must have completed training Owner's personnel on all operating instructions and submitted training DVDs; and
 11. Final cleaning.
- B. Prior to Substantial Completion Contractor shall request in writing that Owner grant Substantial Completion. Accompanying the request Contractor submit the following:
1. A list of all items remaining to be completed or corrected;
 2. Signed originals from authorities having jurisdiction of all certificates of compliance and final approval, as applicable;
 3. All system software files required by the Contract Documents, including

- but not limited to lighting and environmental controls;
 - 4. Revised Draft Operation & Maintenance manuals; and
 - 5. Draft Project Record.
- C. Upon satisfactory completion of the requirements for Substantial Completion, Owner shall prepare and forward to Contractor a letter of Substantial Completion. The letter will identify the date of Substantial Completion and include a punch list identifying all remaining incomplete Work. Contract warranties shall begin as of the date of Substantial Completion.

1.03 FINAL COMPLETION

- A. Requirements for Final Completion: Upon receipt of Contractor's written Notice that Contractor has inspected and completed punch list items and that the Work is ready for final inspection and acceptance, Owner will promptly make such inspection accompanied by Contractor. If Owner determines that some or all of the punch list items are not complete, Contractor shall be responsible to Owner for all costs, including re-inspection fees, for any subsequent inspection to determine completion of the punch list. When Owner finds all punch list items complete and the Work and Contract fully performed, Owner shall establish the date of Final Completion. Owner is not required to establish Final Completion until the following are complete:
- 1. Complete all requirements listed in the Contract Documents for Substantial Completion of the Work;
 - 2. Complete all remaining punch list items and remaining Work, and obtain approval by Owner that all Work is complete;
 - 3. Obtain permanent occupancy permits (if only a temporary occupancy permit was issued at Substantial Completion);
 - 4. Submit Project Record, any final property survey, and final Operation and Maintenance manuals (if not previously submitted) required by the Contract Documents;
 - 5. Deliver any required tools, spare parts, extra stock of material and similar physical items to Owner as required by the Contract Documents;
 - 6. Complete cleaning after completion of punch list;
 - 7. Submit executed warranties;
 - 8. Complete any required sustainability documentation for which Contractor is responsible;
 - 9. Submit a final comprehensive list of all Subcontractors of all tiers and suppliers for the Project; and
 - 10. Submit certification that materials used in the Work are "asbestos-free" and that all requirements of governing jurisdictions related to the Project have been addressed.

11. Final Project Record.

- B. Upon satisfactory completion of the requirements for Final Completion, Contractor shall submit a final Application for Payment.

1.04 FINAL ACCEPTANCE

- A. Requirements for Final Acceptance: Final Acceptance shall be established by Owner in writing. Owner shall not be obligated to accept the Project as complete before Final Completion has occurred and Contractor has submitted the following:
1. An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which Owner or Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, except for any claims that are specifically identified on the affidavit (Affidavit of Payment of Debts and Claims, AIA form G706 or equivalent).
 2. A certificate or written statement 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 30 Days' prior written Notice has been given to Owner.
 3. Receipt of consent of surety, if any, to final payment (AIA form G707 or equivalent).
 4. If required by 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. If a Subcontractor refuses to furnish a release or waiver required by Owner, Contractor may furnish a bond satisfactory to Owner to indemnify Owner against such lien. If such lien remains unsatisfied after payments are made, Contractor shall refund to Owner all money that Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.
 5. Provide copy to Owner of all "Affidavits of Wages Paid". Pursuant to RCW 39.12.040, an "Affidavit of Wages Paid" from Contractor and from each Subcontractor certified by the Industrial Statistician of the Washington State Department of Labor and Industries, with the fees paid by Contractor or Subcontractor.
- B. Contingent upon completion of all Affidavits of Wages Paid, the "Notice of Completion of Public Works Contract" form may be completed by Owner.

1.05 RETAINAGE

- A. Retainage must be held at least 45 Days following Final Acceptance. If there are either unpaid taxes or fees, or unsatisfied claims of lien against the retained percentage, disbursement of retainage funds will be made in accordance with Washington law.

- B. The retainage will be held and applied by Owner as a trust fund in the manner required by RCW 60.28. Release of the retainage will be processed in the ordinary course of business following Final Acceptance of the Work by Owner, provided no notice of lien has been given as provided in RCW 60.28, no claims have been brought to the attention of Owner, Owner has no claims under the Contract, and the requirements below have been met.
- C. Owner shall not release retainage until the following requirements have been satisfied.
 - 1. "Certificate of Payment of State Excise Taxes by Public Works Contractor": Following receipt of Owner's notice of completion and after determining that all taxes, increase and penalties due from Contractor have been paid, the Department of Revenue will issue this certificate to Owner.
 - 2. "Certificate of Payment of Contributions, Penalties and Interest on Public work Contract": Upon receiving a copy of Owner's notice of completion and after determining that Contractor is in compliance with the provisions of the Employment Security Act, the Employment Security Department will issue this certificate to Owner.
 - 3. "Certificate of Release": Upon receipt of Contractor's request for release and verification from its records that required premiums have been paid by Contractor and each Subcontractor, the Department of Labor and Industries will issue a statement to that effect.

END OF SECTION 01 70 00

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for field engineering services, including but not limited to the following:
 - 1. Land survey Work; and
 - 2. Establishment of coordinated reference points for general building layout and location.

1.02 SUBMITTALS

- A. Project Record: Contractor shall submit a record of Work performed and record survey data as required by the Contract Documents.

1.03 QUALITY ASSURANCE

- A. Surveyor: Contractor shall engage a registered Professional Land Surveyor registered in the State of Washington to perform the required land-surveying services.
- B. Owner may furnish surveys describing physical characteristics, legal limitations, utility locations, and a legal description for the Project site. Contractor may rely on the information furnished by Owner but must exercise proper precautions to ensure the safe performance of the Work. Contractor shall assume that the locations of any underground or hidden utilities, underground tanks, plumbing, or electrical runs indicated in the surveys or Contract Documents are shown in approximate locations, but Contractor is responsible for verifying the location of all utilities impacted by the Work. Additionally, Owner may make available to Contractor the results of investigations of hidden or subsurface conditions for the convenience of Contractor. While Contractor may rely upon such investigation results, there is no guarantee, express or implied, that the conditions indicated are representative of those existing throughout the Project site, or that unforeseen developments may not occur. Contractor is solely responsible for interpreting the information and extrapolating beyond the location, including each individual boring, test pit, or other locations.

1.04 EXAMINATION

- A. Identification: Contractor shall verify the location of benchmarks and control points provided by Owner.
- B. Contractor shall verify layout information on Drawings in relation to the property survey and existing benchmarks before proceeding to layout the Work.

Contractor shall also locate and protect existing benchmarks and control points and preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without prior written approval of Owner. Promptly report lost or destroyed reference points and requests to relocate reference points because of changes in grades or locations.
 2. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.
- C. Contractor shall establish and maintain a minimum of two permanent benchmarks at the Project site.
1. Record benchmark locations, with horizontal and vertical data, on Project Record.
- D. Existing utilities and equipment: The existence and location of underground and other utilities are not guaranteed. Before beginning the Work, Contractor shall investigate and verify the existence and location of underground and other utilities (including irrigation and snow melt systems).
1. Prior to construction, verify the locations and invert elevation at points of connection sanitary sewer, storm sewer, and water service piping.

1.05 PERFORMANCE

- A. Contractor shall work from lines and levels established by the property survey; establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to locate each element of the Project; and calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
1. Advise entities engaged in Work activities of marked lines and levels provided for their use.
 2. As construction proceeds, check every major element for line, level, and plumb.
- B. Surveyor's Log: Contractor shall maintain a surveyor's log of control points and other survey Work. Make this log available to Owner for reference.
1. Record deviations from required lines and levels and advise Owner when deviations that exceed indicated or recognized tolerances are detected. On Project Record, record deviations that are accepted and not corrected.
 2. Following completion of foundation walls, major site improvements, and other Work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site Work.

- C. Site Improvements: Contractor shall locate and lay out site improvements, including pavement, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Existing Utilities: Contractor shall furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances affected by construction. Contractor shall coordinate with local authorities having jurisdiction.
- E. Contractor shall record accurately on the Project Record the principal metes, bounds, lines, and levels of the Project.

END OF SECTION 01 71 23

PART 1 GENERAL

1.01 SUMMARY

- A. This Section describes the waste management and recycle management criteria for debris and solid waste generated as part of the Work.
- B. Contractor shall be responsible for sorting, segregating, and placing designated waste materials into containers provided by Owner. Contractor shall be responsible for segregating and disposing all unacceptable and dangerous wastes as defined below.
- C. Owner shall be responsible for furnishing waste collection containers, servicing those containers, and disposing solid waste from the Project, with the exception of unacceptable and dangerous waste.
- D. Waste that is disposed of by Contractor shall be in accordance with all applicable local, state, and federal regulations, including WAC 173-350, Solid Waste Handling Standards, and WAC 173-303, Dangerous Waste Regulations.

1.02 DEFINITIONS

- A. Construction Waste: Waste resulting from the Work.
- B. Dangerous Waste: Solid waste designated in WAC 173-303 and/or 40 CFR. As used in this Section, the words "dangerous waste" will refer to the full universe of wastes regulated by WAC 173-303 and 40 CFR.
- C. Demolition Waste: Largely inert waste, resulting from the selective demolition of buildings, roads and other man-made structures such as cured concrete, asphaltic compounds, brick and masonry, ceramic, glass, steel, and aluminum, and non-inert materials such as clean wood, composition roofing and roofing paper, and minor amounts of metal. Plaster (i.e., sheetrock or plaster board) or any other material, other than clean wood, that is likely to produce gases or leachate during its decomposition process and asbestos waste are not considered to be demolition waste.
- D. Land Clearing Waste: Natural vegetation and clean soils from clearing and grubbing land for development such as stumps, brush, weeds, tree branches, tree bark, mud, dirt, sod and rocks.
- E. Recycle/Recycling: The process of separating waste materials for remanufacturing or reprocessing into usable or marketable materials. Examples of recycling include separating wood off-cuts for recycling by a wood processor into paper pulp, or separating cardboard, plastic, beverage containers, or miscellaneous metals for recycling.
- F. Reuse: To use a construction waste material again in roughly its same form. Materials can be reused on-site or on other projects off-site. Examples of reuse

include removing a hardwood floor and reinstalling it in a new project, or using soil from one site as fill on another site.

- G. Salvage: To remove a construction waste material or equipment from an existing building for reuse on-site or reuse on other projects off-site. Items to be salvaged shall be designated by Owner for removal and delivery to Owner.
- H. Unacceptable Waste: All waste not authorized for disposal by Owner. This includes any waste that is now or hereafter defined by federal law or by the governing jurisdiction as radioactive, dangerous, hazardous or extremely hazardous waste, unsanitary waste, and vehicle tires in excess or those permitted to be disposed of by the laws of the governing jurisdiction. It does not include any waste destined for salvage, recycling, or general demolition.
- I. Waste: All solid waste generated within the limits of the Project, or extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable and recyclable materials, masonry, and concrete.
- J. Waste Management Plan: A Project-specific plan for the salvage, collection, transportation, recycling, and disposal of the waste generated at the Project site. A waste management plan includes procedures for separating, storing, and transporting waste and includes methods to assure proper implementation of the plan.

1.03 WASTE MANAGEMENT PLAN

- A. Draft Waste Management Plan: Per the Pre-Construction Submittal Requirements of Section 01 33 00, Contractor shall submit to Owner a Draft Waste Management Plan. The Draft Plan shall contain the following:
 - 1. List of materials to be salvaged, materials to be recycled, and materials to be disposed of as solid waste, and dangerous waste.
 - 2. General material handling methods, including segregation and sorting, and placing solid waste into designated containers, on-site storage, and any special procedures for removing and protecting materials.
 - 3. Plan for communicating salvage and recycling requirements on the Project.
 - 4. Dangerous waste identification, accumulation, and disposal management procedures.
 - 5. Materials to be sorted, salvaged, and recycled:
 - a. At a minimum, the following types of materials in reusable condition shall be salvaged and sorted. Contractor shall remove and deliver to the Owner at designated location on the Pullman campus.
 - 1) Surplus building materials (new, leftover, unwanted). Review with Owner for clarification.

- b. At a minimum, the following types of materials shall be sorted and included for recycling:
 - 1) All metals (from banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze);
 - 2) Beverage containers;
 - 3) Cardboard (from supplies and packaging);
 - 4) Clean wood (all unpainted, untreated wood scrap including pallets and engineered wood);
 - 5) Mixed office paper (including blue prints);
 - 6) Film plastic (from shrink wrap and other packaging, and sheeting used as protection or erosion control); and
 - 7) Plate glass.
 - c. With the exception of unacceptable waste, all materials not designated for salvage or recycle per Paragraph 1.03(A)(5) above, may be co-mingled and disposed of as waste.
- B. Dangerous Waste Management:**
- 1. Contractor is responsible for all dangerous waste generated during the Project shall be identified, accumulated and disposed in accordance with WAC 173-303. Contractor generated dangerous waste must be shipped for disposal within 90 Days of generation.
 - 2. Contractor may accumulate dangerous waste in accordance with WAC 173-303 and Washington Department of Ecology Technical Information Memorandum 94-120, Satellite Accumulation. If Contractor accumulates dangerous waste in volume greater than 55 gallons or acutely hazardous waste in a volume greater than one quart, Contractor shall establish and operate a "90-Day" accumulation area in accordance with WAC 173-303.
 - 3. Contractor shall dispose dangerous waste only through vendor(s) approved by Owner. Contractor shall arrange all dangerous waste shipments. Utilization of the vendor and facilities included in the State of Washington Hazardous Waste Disposal contract is authorized. Any other proposed vendor(s) and/or facilities are subject to audit by Owner, prior to utilization. Contractor shall pay for said audits. Contractor shall coordinate with Owner's Environmental Health & Safety (EH&S) Department for transportation and disposal of all Project generated dangerous waste. EH&S will sign all Uniform Hazardous Waste Manifests.
- C. Final Waste Management Plan:** Once Owner has reviewed the draft Waste Management Plan and responded with comments or corrections, Contractor shall submit a final plan within 14 Days.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 WASTE CONTAINMENT

- A. Owner will provide and service containers for all wastes, with the exception of unacceptable waste. This service is at no cost to Contractor.
- B. Contractor shall provide separate waste containers for and properly dispose of all unacceptable waste, including dangerous waste, in accordance with applicable law.

3.02 CONTAMINATION OF WASTE

- A. Contractor shall take extraordinary care to ensure construction wastes are properly sorted, segregated, and placed within the correct containers.
- B. Should any waste containers designated for salvage, recycle, or general disposal be cross-contaminated with dangerous or unacceptable waste, Contractor shall pay all costs of legally disposing the contaminated waste.
- C. Co-mingling of waste:
 - 1. Should designated recycle or salvage containers become cross contaminated with other than unacceptable wastes, the Contract Sum shall be reduced at a rate of \$500.00 per cubic yard size of container. (i.e. a partially full, co-mingled 3 yard container would result in a charge to Contractor of \$1,500.00).
- D. Project progress meetings shall include review of construction waste management as an agenda item.

END OF SECTION 01 74 19

PART 1 GENERAL

1.01 PURPOSE

- A. Contractor shall submit advance/draft electronic of Operation & Maintenance manuals (O&Ms) at or immediately following the 80% Application for Payment. Subsequent Applications for Payment will not be processed until an advance/draft copy of the O&Ms has been submitted for review.
- B. Contractor shall submit a final draft of O&Ms on or before Substantial Completion and provide training of Owner's staff in the operation and maintenance of the facility.

1.02 PROCEDURES

- A. Together with a request for Substantial Completion, Contractor shall provide one revised draft electronic version of O&Ms.
- B. To achieve Final Completion, Contractor shall submit :
 - 1. Two final copies of O&Ms;
 - 2. A text-searchable PDF electronic file of the O&Ms;
 - 3. Separate Test & Balance Reports and Telecommunications Test Reports in an independent three ring binder;
 - 4. A text-searchable PDF electronic file of the Test & Balance Reports and Telecommunications Test Reports.

PART 2 PRODUCTS

2.01 O&M MANUAL MATERIALS

- A. O&M Manuals shall be bound into 3-ring binders (three sets) with the cover and spine to be composed and laid out per the cover page template on the last page of this Section.
- B. The maximum thickness for each manual shall be 3". Multiple manual sets shall be organized by:
 - 1. General,
 - 2. Vertical Transportation,
 - 3. Mechanical,
 - 4. Electrical, and
 - 5. Other (Laboratory Equipment, Special Equipment, etc.).

- C. Paper shall be 8 1/2" x 11", 20 lb. white paper. Divisions within volumes are to be accomplished and annotated with permanently imprinted tabs (insertable indexes are not permitted) which indicate Specification Section numbers only.
- D. Copies must be legible. Facsimile transmission copies are not acceptable. Original equipment manufacturer (OEM) printed material is preferred.

PART 3 EXECUTION

3.01 PRODUCTION

- A. O&Ms are to be as follows:
 - 1. Table of Contents – a listing of the contents of all volumes. This table of contents shall be inserted at the beginning of each volume in the set.
 - a. Identify Contractor, include name, address, phone and fax number, and provide a contact name.
 - 2. Subcontractor List – a list or spreadsheet, organized by Specification Section, of all suppliers and Subcontractors of all tiers who performed Work on the Project. Include the name, address, phone and fax number of Subcontractor or supplier, the Specification Section, and the description of the Work. When Subcontractors perform Work of more than one Specification Section, provide a separate listing of each Specification Section. This listing shall be at the beginning of volume #1 only.
 - a. Written certification from Contractor attesting that no asbestos containing products have been incorporated into the Work.
 - 3. Warranty List – a list or spreadsheet containing Contractor's one-year correction period obligation and all extended (greater than one-year) warranties, organized by Specification Section that indicates:
 - a. Item Description (include here special warranty numbers or codes),
 - b. Length of warranty,
 - c. Specification Section, and
 - d. Contractor's contact information, followed by physical copies of the Contractor's one-year correction period obligation and all extended warranties. Note that 1-year warranties from Subcontractors are not to be bound into each volume of the O&Ms. This warranty list and attendant warranties shall be at the beginning of volume #1 only, immediately following the asbestos certification.
 - 4. Provide data as outlined in each specification section.
- B. Original equipment manufacturer (OEM) information is required to be a part of all equipment information within the O&Ms.

- C. Shop Drawings and product data initially submitted for acceptance are generally not acceptable for O&M use (one notable exception is snow melting cable layout drawing – a manufacturer detailed item). Routine Project components such as asphalt, concrete, pipe, fittings, conduit, etc., are not to be included in O&Ms.

END OF SECTION 01 78 23
(O&M cover and spine data on next page)

Facility #365W, Golf Indoor Practice Facility

WSU Golf Team Clubhouse Upgrade Exterior & Addition 2024

General O&M Manual

Vol. X of Y

(Spine and Cover)

PART 1 GENERAL

1.01 PURPOSE AND PROCEDURE

- A. Contractor shall submit draft Project Record drawings on or before Substantial Completion. Requests for Substantial Completion will not be considered if submission of Project Record drawings has not occurred.
- B. Contractor shall submit final Project Record drawings before Final Completion may be achieved.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Project Record drawings are to be red-line markings on original Drawings which clearly indicate the as-built dimensions (both horizontally and vertically) for all installed Work.
- B. Identify on Project Record drawings all underground utilities encountered during the Work. Locate these utilities both horizontally and vertically and tie the dimension string(s) back to permanent and visible structures.
- C. Clearly label each sheet with the words "PROJECT RECORD DRAWINGS."
- D. Do not affix requests for information (RFIs), change proposals (CCPs) or architectural supplemental instructions (ASIs) to the Project Record drawings. If all or part of a Drawing has been modified, it is acceptable to affix the revised layout over top of the original. However, all dimensions that have been modified are to be red-lined or yellow highlighted.
- E. Copies must be legible.

PART 3 EXECUTION

3.01 PRODUCTION

- A. During construction, Project Record information will be reviewed not less than monthly concurrent with the monthly review of the draft Application for Payment.

END OF SECTION 01 78 39

PART 1 GENERAL

1.01 DESCRIPTION

- A. Owner has set the following indoor air quality requirements for site operations on the Project, within the limits of the Progress Schedule, Contract Sum, and available materials, equipment, products, and services. These include:
 - 1. Protect workers on the site from air quality problems during construction.
 - 2. Prevent indoor air quality problems in the completed facility.
 - 3. Prevent indoor air quality problems in adjacent facilities.
- B. To achieve these requirements, Contractor shall develop an "Indoor Air Quality (IAQ) Management Plan" for this Project.
- C. Comply with current LEED Reference Guide.

1.02 IAQ MANAGEMENT PLAN MANAGER

- A. Contractor shall identify an IAQ Management Plan Manager who will be responsible to monitor construction activities to ensure that the requirements of the IAQ Management Plan are met. The IAQ Manager may also be the Contractor's Quality Control Manager. The IAQ Manager will be responsible for the following:
 - 1. Draft and submit the IAQ Management Plan to Owner for acceptance.
 - 2. Document IAQ Management Plan progress on a weekly basis.
 - 3. Conduct meetings as required with all participants in the construction process to communicate the IAQ procedures and understand the importance of the requirements of the IAQ Management Plan. If necessary, post signs to ensure workers' safety.
 - 4. Identify IAQ problems and institute remedial action as necessary.
 - 5. Be present at regular Progress Meetings, as appropriate, and be responsible for providing a monthly written status report as it relates to IAQ for the Project and be prepared to discuss construction related IAQ procedures currently in effect.

1.03 IAQ MANAGEMENT PLAN

- A. Draft IAQ Management Plan: Submit a Draft IAQ Management Plan within 14 Days after Notice to Proceed, which contains preliminary descriptions of the following procedures for which Contractor is responsible (initial installation, verification that element(s) are in place, daily inspection and upkeep, and removal):

1. List of indoor air quality protective measures to be instituted at Project site, including HVAC system protection during construction and any other control measure applicable to the Project;
 2. A plan and schedule for inspection and maintenance of indoor air quality measures;
 3. Installation sequencing for porous materials, including paint;
 4. Measures to be employed to protect ducts and stored on-site or installed absorptive materials from moisture damage;
 5. Type of filtration media used during construction
 6. Cleanup of contaminated components after construction
- B. The Draft IAQ Management Plan shall meet or exceed the minimum requirements of the current Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines.
- C. Final IAQ Management Plan: After review and comment on the "Draft IAQ Management Plan," Contractor shall submit a "Final IAQ Management Plan" that includes the finalized written procedures for above noted elements. This final plan shall address all review comments noted on the draft submittal and be submitted prior to the commencement of construction.

1.04 BUILDING FLUSH-OUT SCHEDULE – NOT USED

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 IAQ MANAGEMENT PLAN IMPLEMENTATION

- A. Contractor shall implement and maintain the approved IAQ Management Plan for the duration of the Project and update procedures at any time due to unanticipated building conditions. Contractor shall:
1. Use temporary filtration media during construction to protect HVAC at each return air grille; filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ASHRAE 52.2 - 1999. Isolate the return side of the HVAC system from the surrounding environment as much as possible. Return side shall have the heaviest Work areas dampered off and all return system openings sealed with plastic. Return side shall be shut down and sealed whenever possible.
 2. Avoid the use of products, materials and operations that would cause IAQ problems or concerns.
 3. Protect the ventilation system components (equipment and ductwork) from contamination, and provide cleaning of the ventilation components, including ductwork exposed to contamination during construction. Protect during transit and installation.

4. Provide ventilation as may be necessary to protect workers' health and avoid the accumulation of volatile compounds, dust and other harmful airborne contamination.
 5. Provide weekly reports and photographs of construction IAQ management measures such as protection of ducts and stored or installed absorptive materials. In each report, describe and illustrate IAQ measures (installation, effectiveness, upkeep, etc.) during construction along with a description of the SMACNA approach employed.
 6. Provide data sheets of filtration media used during construction and installed prior to building occupancy.
 7. During installation of carpet, resilient flooring, paints, furnishings, and other VOC emitting products, provide supplemental (spot) ventilation for at least 72 hours after Work is completed and describe these activities in the weekly reports.
- B. Contractor shall conduct regular inspection and maintenance of indoor air quality measures, including ventilation system protection and ventilation rate.
- C. Contractor shall use low-toxic cleaning supplies for surfaces and equipment.
- D. When dry sanding for gypsum board assemblies, Contractor shall provide the following protection:
1. Isolate the space;
 2. Provide plastic sheet separation during sanding;
 3. Close and seal all air system devices and ductwork; and
 4. Sequence the Work to avoid contamination of other spaces with gypsum dust.

3.02 VENTILATION OF CONSTRUCTION FUMES

- A. When hazardous chemicals, mineral-spirit based paints, adhesives, or other similar materials are used, the Contractor shall exhaust toxic, noxious, or odor producing fumes from the building in a manner approved by Owner. Contractor's method of exhaust shall ensure the safety of building occupants and pedestrians in and around the Project site. All supply and return air ductwork within the construction area shall be capped air-tight to prevent distribution of fumes.

3.03 BUILDING FLUSH-OUT – NOT USED

3.04 COMPLETION PROCEDURES

- A. Remove all IAQ measures as well as signs, framing, and supports at completion of Project.

END OF SECTION 01 81 19

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and Owner's operational needs. This begins in the design phase and continues through construction. The commissioning process incorporates the traditionally separate functions of system documentation, equipment startup, control system calibrations, testing and balancing, performance testing, and training. Commissioning during the construction phase is intended to achieve the following specific objectives:
 - 1. Verify that applicable equipment and systems are installed according to the Contract, manufacturer's recommendations, and industry accepted standards and that they receive adequate operational checkout by installing contractors.
 - 2. Verify and document proper functional performance of equipment and systems.
 - 3. Document all non-performing equipment and systems and track corrective actions through to final resolution.
 - 4. Ensure compliance with State Energy Code Requirements (WA NREC Latest Revision).
- B. Work includes the completion of formal commissioning procedures on selected equipment and systems. Commissioning procedures will be designed and coordinated under the direction of a Commissioning Agent (CA). Contractor is not responsible for hiring the CA. The CA will work directly for Owner. Contractor is responsible for coordinating and cooperating with the CA as necessary to complete the training and commissioning processes.

1.02 DEFINITION OF TERMS

- A. Commissioning Agent (CA): Is an independent third-party consultant under contract with Owner. CA responsibilities are listed in Subsection 1.03 for information, reference, and clarification.
- B. Installation Verification Audit: Includes the on-site inspection and review of related system components for conformance to the Contract. The CA will check for proper systems installation and verify systems readiness for function testing. Noted deficiencies will be documented and must be satisfactorily resolved prior to continuing with commissioning on the affected component or system.
- C. Commissioning Plan: Outlines the commissioning process. Provides a brief overview of each start-up and functional test to be performed and identifies the responsible Contractor and/or supplier. It also outlines the responsibilities of all personnel to the commissioning process, estimates the commissioning schedule and provides sample Installation Verification, Start-Up, and Functional Performance Test Procedures and related documentation for information.

- D. Start-Up Testing: Initial test checkout of component or systems completed prior to functional performance testing. The start-up tests verify that the equipment is installed and operating properly per the Contact.
- E. Testing, Adjusting and Balancing (TAB): Testing, adjusting and balancing is a process where heating and air conditioning systems are tested against design standards, adjusted for maximum efficiency, and balanced to provide optimum performance. The Work typically covers balancing and adjusting air and water distribution in areas of the building served by an HVAC system, and verification and adjustment of heating and cooling loads to insure proper indoor environmental conditions. Areas that do not meet the design standards are referred to the appropriate party for correction. Reports are prepared documenting performance and compliance with design standards.
- F. Function Performance Testing: Includes the documented testing of individual components and equipment under actual operating conditions. Final performance commissioning of systems will begin only after Contractor certifies that system components are 100% complete, start-up test results have been accepted, and the CA agrees that systems are ready for functional testing.
- G. Commissioning Issues Log: Generated by the CA, includes deficiencies discovered during the commissioning process. The log identifies the responsible contractor, current disposition of issues, and the date of final resolution as confirmed by the CA. Deficiencies are defined as those issues where products, execution or performance do not satisfy the Contract, the design intent or Owner's need.
- H. Final Commissioning Report: Includes the overall final commissioning document, prepared by the CA, which details the actual commissioning procedures performed, inspection and testing results, and the final version of the Commissioning Issues Log indicating that all issues discovered through the commissioning process have been verified as resolved.

1.03 COMMISSIONING AGENT'S DUTIES AND RESPONSIBILITIES

- A. Meet and communicate with the Owner's Designated Representative, Contractor, equipment representatives, and others as necessary to facilitate the commissioning process.
- B. Write the commissioning plan.
- C. Review commissioning-related Specifications, submittals, and Contract Documents. Communicate noted deficiencies and concerns to Owner.
- D. Review the Owner Project requirements and Basis of Design documents to insure Owner's intent and design requirements are met.
- E. Chair controls integration meetings to ensure acceptance of control strategies and determine methods to achieve the required sequence of operation.

- F. Develop installation and start-up checklists from:
 - 1. Information in the Contract Documents; and
 - 2. Information from equipment manufacturers as provided by Contractor.
- G. Coordinate functional testing procedures with Contractor and integrate into Progress Schedule.
- H. Develop detailed and specific inspection and functional testing procedures for equipment and systems to be commissioned.
- I. Confirm completion of all static piping and duct tests and flushing and cleaning as performed by Contractor.
- J. Complete a detailed physical inspection and visual checkout of commissioning related equipment and components. Document specific deficiencies for resolution.
- K. Confirm completion of equipment and systems start-up procedures as performed by Contractor and equipment representatives. Verify appropriate documentation is completed and provided for inclusion in the final commissioning report. Record noted deficiencies.
- L. Schedule and coordinate the final on-site functional testing process. Complete a documented checkout of every specified operating parameter and mode. Document deficiencies and resolutions.
- M. Review Contractor-provided O&Ms. Ensure the manuals provide in-depth, Project-specific information. Provide formal comment.
- N. Work with Owner, Architect/Engineer, if any, and Contractor to satisfactorily resolve outstanding issues.
- O. Provide Owner with final, complete, and documented verification to ensure commissioned systems are 100% operational per Contract, prior to Owner's acceptance. Exceptions may be made for seasonal commissioning.
- P. Perform seasonal commissioning as required to verify proper system operation during peak heating and cooling seasons.
- Q. Complete all other items noted in Contract as Commissioning Agent responsibilities.
- R. Provide a final Commissioning Report to Owner.

1.04 DUTIES AND RESPONSIBILITIES FOR COMMISSIONING

- A. The commissioning process will require the active participation of persons qualified to represent the following interests:

1. Owner,
 2. Contractor,
 3. Equipment manufacturer's representatives,
 4. Mechanical Subcontractor,
 5. HVAC Subcontractor,
 6. Controls Subcontractor,
 7. TAB Subcontractor,
 8. Electrical Subcontractor, and
 9. Others as appropriate.
- B. The CA will coordinate, schedule, and oversee the final functional performance commissioning process. Participants shall include in their contracts all costs necessary to participate in and complete the commissioning process.
- C. Contractor will assure the participation and cooperation of Subcontractors and coordinate with Owner and Architect/Engineer, as required for the commissioning process.

Owner will assure the participation of its chosen representatives.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES FOR COMMISSIONING

- A. Contractor shall provide material, equipment, and tools to facilitate completing the functional performance testing process. The CA will provide specialized and calibrated test equipment to perform the calibration and functional performance testing.
- B. Contractor shall budget and provide sufficient time and qualified personnel to participate on-site in this process until the process is successfully completed and all deficiencies have been corrected or otherwise resolved.
- C. Contractor shall provide training to Owner. Specified training on related systems and equipment operation and maintenance shall only commence after final performance commissioning is successfully completed, and systems are verified by the CA to be 100% complete and functional.
- D. Contractor shall reimburse the CA for repeated test failures. After a second failed start-up or functional performance test, the CA and Owner shall be entitled to additional compensation for time and expenses involved with re-testing. The compensation shall be at published company billing rates.
- E. Owner will not accept equipment and systems, and Owner will generally not make final payment, until all equipment and systems have been successfully

commissioned and all specified requirements have been satisfied.

- F. Include a line item for commissioning in the Schedule of Values. Ensure sufficient costs are included for Contractor's expenses related to all commissioning tasks.

END OF SECTION 01 91 00

SECTION 02 41 19 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. The contractor is responsible for ascertaining the existing conditions and the work required to complete the work of this section satisfactorily.
 - 2. This Section requires the selective removal and salvage or subsequent off-site disposal of the following
 - a. Portions of existing building structure and finishes indicated on drawings and as required to accommodate new work
 - b. Removal of designated building equipment and fixtures
 - c. Removal and salvage of designated construction and site improvements
 - d. Identification of utilities
 - e. Removal and protection of existing fixtures, materials, and equipment items indicated "salvage."
 - 3. The Owner will remove some loose equipment and stored material in the project area, prior to the contractor taking possession of the site. All substrates and building conditions will be maintained in the condition as visible during the bid period; the contractor shall include all necessary costs to improve or modify the substrates to achieve the work shown in the construction documents. Contractors shall coordinate with the finish trades (Finish Flooring, Framing & Gypsum Board) to complete all substrate improvement necessary to achieve finish tolerances.
 - 4. Existing construction documents for the original construction of the Building are available for review by contractors. Conditions that are apparent, reasonably inferable, or disclosed in the available documents shall not be considered "unforeseen conditions" as basis for contractor claims for cost or time extensions. Documents are available for review at the offices of the Owner, and the Design Team.

1.2 DESIGN REQUIREMENTS

- A. The temporary support and protection system and means and methods for same will be selected by the Contractor. The use of vibratory and impact equipment will not be permitted. Design temporary support and protection system based on the dead loads, live loads, construction loads, sequence of construction, and other miscellaneous loads that are anticipated. Contractor is responsible for determining criteria and properties for the design and construction of the temporary supports.
- B. General: The stability and integrity of the structure during construction shall be maintained at levels generally acceptable within the construction industry by the use of bracing, shoring, and underpinning. In no case shall the structure be allowed to become unsafe or unstable during construction.
- C. Bracing and Shoring for Structures:
 - 1. The bracing and shoring systems required to provide temporary support of a structure or portions of a structure, during construction shall be designed to support the dead, live, soil, earthquake and wind loads that may be imposed on the structure during construction in accordance with industry standards and generally accepted engineering principles.
 - 2. The proposed bracing and shoring systems shall have foundations designed for allowable soil bearing pressures in accordance with the Geotechnical investigation prepared for the Project.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.5 SUBMITTALS

- A. Qualification Data: For demolition firm, professional engineer, refrigerant recovery technician.
- B. Provide structural shoring and temporary works plan, stamped and signed by a professional engineer licensed in the State of Washington. Shoring plan will define required shoring and temporary support for the work of the project.
 - 1. Submit drawings and details for the temporary works under loading conditions described in Section 1.3 and as anticipated for the duration of construction. Drawings must include general layout, member sizes, connection details and construction sequence for bracing, shoring and underpinning. No work related to bracing, shoring or underpinning shall take place until the Architect have reviewed the submittal
 - 2. Submit structural stability analysis and other design calculations for bracing, shoring and underpinning showing member stresses and connections due to imposed loads. Provide Code checks confirming that the design meets current Code requirements & Standards
- C. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Name and address of individual (principal of firm) who will be responsible for the demolition procedures
 - 2. Description of procedures and procedures that will be used to protect the personnel involved in the effort
 - 3. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 4. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 5. Coordination for shutoff, capping, and continuation of utility services.
 - 6. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for adjacent building's occupants affected by selective demolition operations.
 - 7. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
 - 8. Means of protection for items to remain and items in path of waste removal from building.
 - 9. Identification of hazardous sanitary landfill which will be used for the disposal of the material, appropriate to the waste stream
- D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

1.6 QUALITY ASSURANCE

- A. Design calculations and drawings of the proposed bracing, shoring, and underpinning of the structure shall be prepared, stamped, and signed by a licensed Professional Engineer registered in the State of Washington
- B. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project. Company specializing in performing the Work of this Section with minimum three (3) years experience
- C. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- D. Regulatory Requirements:
 - 1. Comply with governing EPA notification regulations before beginning selective demolition.

2. Comply with E.P.A. and OSHA regulations throughout the work of this section
 3. Comply with Clean Air Act (CAA) requirements; Section 608
 4. Comply with hauling and disposal regulations of authorities having jurisdiction.
 5. Conform to applicable code for demolition of structure, safety of adjacent structures, dust control and disposal
 6. Obtain required permits from authorities
 7. Notify affected utility companies before starting work and comply with their requirements
 8. Conform to procedures applicable when discovering hazardous or contaminated materials
- E. Standards: Comply with ANSI A10.6 and NFPA 241.
- F. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review structural load limitations of existing structure.
 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 5. Review areas where existing construction is to remain and requires protection.
 - A. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, minor variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
 - B. Partial Demolition and Removal:
 1. Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Storage or sale of removed items on site will not be permitted.
 2. Items to be removed by the Contractor to be retained by the Owner shall be designated "remove and retain". Remove to on-site location as directed.
- 1.7 PROJECT CONDITIONS
- A. Coordinate with Owner's operations involving move-out, salvage, reclamation and recycling activities
 - B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, minor variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work
 - C. Partial Demolition and Removal:
 1. Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Storage or sale of removed items on site will not be permitted
 2. Items to be removed by the Contractor to be retained by the Owner shall be designated "remove and retain". Remove to on-site location as directed
 - D. Protections:
 1. Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work
 2. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain
 3. Protect existing finish work that is to remain in place and becomes exposed during demolition operations
 4. Protect floors and roofing with suitable coverings when necessary

5. Provide temporary weatherproof closures for exterior openings resulting from demolition work
 6. Provide air and dust proof containment barriers at locations where work occurs, protect remainder of the building from contamination, or nuisance caused by residual effects of demolition and construction procedures
 7. Remove protections at completion of work
 - E. Damages: Promptly repair damages caused to adjacent facilities by demolition work
 - F. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 1. Before selective demolition, Owner will remove the following items:
 - a. Loose furnishings, fixtures, and minor miscellaneous equipment
 - G. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
 - H. Hazardous Materials are NOT present:
 1. Inspection and testing for certain materials has been performed. The results are included in the separate report provided following this section.
 2. If suspected hazardous materials are encountered, the Contractor shall immediately notify the Owner and Architect, and handle them in accordance with all applicable local, state, and federal regulations, protecting site, workers and surroundings from contamination
 3. If hazardous materials are encountered, the Contractor shall immediately notify the Owner and Architect, and handle them in accordance with all applicable local, state, and federal regulations, protecting site, workers and surroundings from contamination
 4. Identification: It is the Contractor's responsibility to bring to the attention of the Architect suspected asbestos-containing materials which may be encountered as the work proceeds. Architect will notify Owner. Exploratory operations and laboratory tests will be made by the Owner's consultant if materials that may contain asbestos are encountered
 5. Lead Paint and similar materials: Contractor shall provide lead containing materials identification, control, containment, abatement and disposal previously identified or encountered during the course of demolition and construction, included in the Cost of the Work. Contractor shall be responsible for a program to control lead exposure to workers, and ensure that no lead exposure occurs to the general public
 6. Contractor shall provide and include the cost of containment, temporary storage, neutralizing and proper disposal of all hazardous materials such as solvents, acids, paint strippers and cleaners used in the course of performing the Work
 7. Contractor shall provide and include the cost of removal and delivery to the Owner of any PCB-containing fluorescent lamp ballasts encountered during the course of demolition and construction.
 - I. Storage or sale of removed items or materials on-site is not permitted.
 - J. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 1. Maintain fire-protection facilities in service during selective demolition operations.
 2. Coordinate with the fire marshal for removal and relocation of the existing fire department connection. See the drawings for the temporary fire department connection during construction.
- 1.8 WARRANTY
- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS FOR SHORING AND BRACING

- A. Materials for shoring and bracing shall be undamaged, high quality materials. Remove and

replace any materials that become damaged or are otherwise unusable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 - 1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.
 - 4. Reference division 26 for additional electrical demolition requirements – see section 26 00 20.

3.3 PREPARATION

- A. Contractors are responsible for familiarizing themselves with the condition of the project site
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- C. Locate, identify, stub off, and disconnect utility services not indicated to remain. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shutdown of service is necessary during changeover

- D. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary partitions and barriers to prevent spread of dust, odors and noise. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to permit continued Owner occupancy of the building. Where selective demolition occurs, construct dust-proof partitions of minimum 4-inch studs, with gypsum wall board on non-demolition side and minimum 2 layers 3-mil plastic sheeting. Seal all seams with appropriate tape material
 3. Protect existing materials, existing landscaping materials, appurtenances, structures and utilities which are not to be demolished
 4. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 5. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 6. Cover and protect building improvements, furniture, equipment, and fixtures from soilage or damage when demolition work is performed in areas where such items have not been removed
 7. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."
 8. At locations where demolition or tie-in to existing reinforced concrete structure is indicated, as-built drawings and x-ray analysis shall be conducted prior to demolition activities. Demolition and tie-in shall not disturb existing concrete reinforcing steel
- E. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. Install temporary support and protection system in accordance with reviewed shop drawings and submittal documents
- B. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Include all work necessary to complete the new work shown in all documents within the contract documents, including but not limited to, Architectural, Hazardous Material Abatement, Civil, Structural, Mechanical, and Electrical. Work of this section is not limited to areas indicated in the demolition drawings. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Provide services for effective air, soil and water pollution controls and worker protection as required by authorities having jurisdiction
 3. Spread out equipment and materials loads across structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing
 4. Conduct demolition to minimize interference with adjacent spaces and properties. Utilize demolition procedures that minimize disruption to the surrounding areas and activities. Conduct operations with minimum interference to public or private accesses. Maintain protected egress and access at all times. Provide all necessary measures to ensure no contamination of the existing building systems, including the building air intakes and exhausts
 5. Remove portions of the building indicated using methods as required to provide high quality substrates for work of subsequent phases. Tolerances within 1/8" of required substrate for new finishes shall be deemed acceptable for the work of this section.

6. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 7. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 8. For interior slabs, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible
 9. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools. No over-cuts allowed.
 10. Keep work sprinkled with water to minimize dust. Provide hoses and water connections for this purpose
 11. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 12. Maintain adequate ventilation when using cutting torches.
 13. Cease operations and notify Owner, and Architect/Engineer immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations
 14. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 15. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 16. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 17. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."
- C. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner within five miles of the project site.
 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Removal of Bracing and Shoring
1. Do not unequally or eccentrically load the temporary support system and exercise extreme care in the removal of temporary support system to ensure a slow and even release, and to avoid creating unequal pressures and stresses.
 2. Bracing and shoring shall not be removed until the new members have acquired sufficient strength to support their weight and the loads superimposed thereon safely.
- F. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts. No over-cuts allowed.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
 - 1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
- E. Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Refer to Division 07 Roofing Sections for new roofing requirements.
 - 1. Remove existing roof material and/or membrane, flashings, copings, and roof accessories, in areas indicated.
 - 2. Remove existing roofing system down to substrate in areas indicated.
- F. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site. Remove demolished materials from site promptly.
 - 2. Remove and promptly dispose of contaminated, vermin infested or dangerous materials encountered, per regulatory requirements
 - 3. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 4. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Salvaged Items to be Retained and Re-Used in the Work: Where indicated as "Remove and Retain," or "Relocate", carefully remove indicated items, clean, and reuse as indicated on the drawings and in other sections of the specifications
- C. Burning: Do not burn demolished materials.
- D. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean
- B. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start of operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Concrete foundations and floor slab.
 - 2. Concrete slabs-on-grade in building to be Honed Concrete, decorative finish concrete floor slab.
 - 3. Underslab Vapor Retarders

1.2 DEFINITIONS

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

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Curing compounds.
 - 4. Bonding agents.
 - 5. Adhesives.
 - 6. Semirigid joint filler.
 - 7. Repair materials.
 - 8. Vapor retarders.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.
- B. PC floor finisher required to be on-site as PC areas are poured. PC finisher required to accept final installation of concrete prior to start of any polishing.
- C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. Source limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer

- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete,"
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- 1.5 DELIVERY, STORAGE, AND HANDLING
 - A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
 - A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Products: Subject to compliance with requirements, contractor shall submit necessary products for review.
 - 2. Manufacturers: Subject to compliance with requirements, contractor shall submit necessary products for review.
- 2.2 FORM-FACING MATERIALS
 - A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
 - C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal or glass-fiber-reinforced plastic tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
 - D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
 - E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
 - F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 - G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.
- 2.3 STEEL REINFORCEMENT
 - A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
 - B. Welded Reinforcement Bars: ASTM A 706/A 706M, Grade 60, deformed
 - C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- 2.4 REINFORCEMENT ACCESSORIES
 - A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports

from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement: As Indicated.
 - a. Fly Ash: As Indicated.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate or better, graded. Provide aggregates from a single source.
 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal. 1/2 inches nominal for elevated decks.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

2.7 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 1. Available Products:
 - a. Stego Industries, LLC; Stego Wrap, 15 mils.
 - b. Fortifiers Corporation; Moistop Ultra A.
 - c. Raven Industries Inc.; Vapor Block 15.
 - d. Reef Industries, Inc.; Griffolyn Type-105.
 - e. W.R. Meadows, 15mils
 - f. Viper Vapor Check II, 15 mils
- B. Maintain permeance of less than 0.01 Perms as tested in accordance with mandatory conditioning tests per ASTM E1745 (field condition permeance rating).
- C. Granular Fill: All below slab gravel fill is to meet the requirements stated in Section 9-03.9(3)-Crushed Surfacing in the WSDOT Standards. Comply and verify with the requirements of the civil engineering documents. Reference requirements of the geotechnical investigation report.

2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.

- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating. Dayton Superior Corporation; Safe Cure and Seal (J-19), Euclid Super Diamond Clear VOX, or equal. Certified by curing compound manufacturer to not interfere with bonding of floor covering or coatings.
 - 1. Approved Manufacturer: W.R. Meadows

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: As Indicated.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Foundations: Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: As Indicated.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.

3. Slump Limit: 7 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 4. Air Content: 5 percent, plus or minus 1 percent at point of delivery.
 - B. Interior Slabs: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: As Indicated.
 2. Minimum Cementitious Materials Content: 540 lb/cu. yd.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: 3.5 percent, plus or minus 1 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
 5. Air Content: Do not allow air content of troweled interior finished floors to exceed 3 percent. Eliminate air for polished floor areas.
 6. Maximum Water-Cementitious Materials Ratio: 0.42
- 2.13 FABRICATING REINFORCEMENT
- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
- 2.14 CONCRETE MIXING
- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

- 3.1 FORMWORK
- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
 - B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
 - C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 2. Class B, 1/4 inch for rough-formed finished surfaces.
 - D. Construct forms tight enough to prevent loss of concrete mortar.
 - E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
 - F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
 - G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
 - H. Chamfer exterior corners and edges of permanently exposed concrete.
 - I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
 - J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
 - K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- 3.2 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION
- A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
 - 1. If not otherwise indicated, extend insulation vertically a minimum of 24 inches below exterior grade line behind face of the foundation wall.
 - 2. Reference Division 07 sections for manufacturer requirements and insulation value.
 - B. Protect insulation from displacement during follow-on construction activities, such as but not limited to, floor slab placement.
- 3.3 EMBEDDED ITEMS
- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- 3.4 REMOVING AND REUSING FORMS
- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
 - C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.
- 3.5 VAPOR RETARDERS
- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with the manufacturer's recommended tape.
 - 2. Do not use stakes to hold retarder in place.
 - 3. Use manufacturer's mastic sealant at locations difficult to seam tape for full seal. Do not install mastic in the rain.
 - 4. Repair/patch all punctures with additional layer of vapor retarder. Tape entire perimeter of patch with the manufacturer's recommended tape.
 - 5. Seal entire perimeter of vapor retarder at backside of perimeter stem wall assembly.
- 3.6 STEEL REINFORCEMENT
- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
 - B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
 - C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
 - E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing or 6"

minimum. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 3. Joints shall be at least 25 percent of the slab thickness or at one inch deep minimum.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Re-saw all joints with beveled edge blade to ease edges at all saw-cut joints.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated. Reference civil for additional isolation joint requirements.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Exposed Concrete Saw Cut Joint: Reference drawings for saw cut locations and saw blade profile and contractor submitted layout drawings.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301, 305R and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete on architectural columns:
 - 1. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces to receive trowel finish.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 - b. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- F. Slab Finish at locations to receive Sealed or Painted Finish: Apply towel finish as specified above. After concrete has completely cured, apply sealer or paint floor finish. Patch or prepare the substrate as required by sealer and/or floor paint product requirements.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.
- 3.15 FIELD QUALITY CONTROL
- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Reference structural drawings for additional inspections and test report information.
1. Foundation concrete does not require special inspection, but all other concrete shall be special inspected. Although foundation concrete is not special inspected, concrete testing as outlined below is required.
- B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample for cold weather conditions as indicated on structural drawings.
 6. Compressive-Strength Tests: ASTM C 39; test one cylinder of the laboratory-cured specimens at 7 days and two cylinder specimens at 28 days. The remaining test cylinder is to be held pending review of the 28 day samples. When field cured specimens are required, the same procedures for laboratory-cured specimens is to be followed.
 - a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 13. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.
- C. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION 03 30 00

SECTION 03 35 60 - CONCRETE FLOOR FINISHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Finishing slabs on grade and monolithic floor slabs.
- B. Surface treatment with concrete hardener and sealer.
- C. Polished Concrete (PC) decorative finish where scheduled.
- D. Special protection requirements for Polished Concrete (PC) decorative finish concrete floor slab.
- E. Schedule sequencing for adjacent wall erection of HPC areas.

1.3 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.
- B. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (Errata 2007) .
- C. ANSI A1264-2 Standard for the Provision of Slip Resistance on Walking/Working Surfaces.
- D. ASTM C779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
- E. ASTM C805 Standard Test Method for Rebound Number of Hardened Concrete.
- F. ASTM E 1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996 (Reapproved 2008).
- G. ASTM G23 Practice of Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water Exposure of Nonmetallic Materials.

1.5 SUBMITTALS

- A. See Division 01 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on concrete hardener and sealer, including information on compatibility of different products and limitations.
- D. Qualifications Data: Provide documentation of experience as specified.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301.
- B. Floor Finisher Qualifications: Minimum five (5) years documented experience in work of this section, certified by concrete treatment manufacturer.
 - a. Floor finisher required to be on-site as PC areas are poured and finished by concrete installer. PC finisher required to accept final installation of concrete prior to start of any polishing.
- C. Slip Resistance: After polishing, achieve minimum slip resistance of 0.65 tested to ANSI A1264-2.
- D. Gloss Rating: Final polishing to provide 40 gloss rating for semi-gloss finish.
- E. Pre-installation Conference: Before polishing concrete, conduct conference at Project site to comply with requirements of Division 01 Section "Project Meetings." Notify participants including Owner at least 5 working days before conference.
 - 1. Meet with Owner; Architect and if applicable; testing and inspecting agency representative; concrete installer, concrete polisher, saw cutter and protective coating applicator.
 - 2. Review methods and procedures related to HPC, including manufacturer's written instructions. Discuss wet and dry grinding and determine method of polishing.
 - 3. Examine concrete substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 4. Review sequencing and steps for slab polishing, color application and aggregate seeding.
 - 5. Review temporary protection requirements during and after installation.
 - 6. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.
- F. Mock-up:
 - 1. Construct mock-up area under conditions similar to those that will exist during actual placement, minimum 50 square feet.

2. Provide (4) separate mock-ups with each being a different color. Color choices selected by Architect.
2. Locate where directed.
3. Mock-up may remain, if placed in area to be covered by finish flooring. Final installation of area to receive this exposed finish may not proceed until a mock-up area is accepted.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.9 FIELD CONDITIONS

- A. Coordinate the work with concrete floor placement and concrete floor curing.
- B. Maintain light level equivalent to minimum 200 W light source, placed 8 feet above the floor surface, for each 425 sq ft of floor being finished.
- C. Do not finish floors until interior heating system is operational.
- D. Maintain ambient temperature of 50 degrees F minimum.
- E. Provide ventilation sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

- A. Concrete Treatment:
 1. Green Umbrella Treatments; "Dry Shield "as distributed by Productions Team, Inc.; free from sodium and potassium, neutral pH.
 2. Substitutions: See Division 01 - Product Requirements.
- B. Concrete Color Stain:
 1. Liquid applied, penetrating, reactive stain for application to cured concrete
 2. Basis of Design: L.M. Scofield Company, Product Formula One
 - b. Follow all manufacturer's directions and requirements.
 - c. Color shall be selected by the Owner and Architect from the manufacturer's full range of standard and designer colors. Contractor to provide (3) different color mock up samples for review.
 3. Absolute Concrete Colors – Chemical Stain
 4. W.R. Meadows
 5. LM Scofield
- C. Cleaning Products: Non-corrosive, neutral pH, of type recommended by concrete treatment manufacturer.
- D. Semi Rigid joint Filler, Spal-Pro RS 88 or equal. Install Semi-rigid joint filler in all joints per manufacturer's recommendations. Joint filler to be compatible with concrete color stain and concrete treatment.

2.2 EQUIPMENT

- A. Polishing Equipment: Propane powered, heavy duty commercial floor grinder/polisher.
- B. Auto Scrubber: Minimum 500 pound head pressure, with recovery tank.
- C. Propane Burnisher: Minimum 2000 RPM.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that floor surfaces are acceptable to receive the work of this section.
- B. Verify seeded aggregate and inlaid graphics installed ready for grinding.
- C. Verify that floor surfaces to receive polished treatment were cured using water based curing compound or acceptable moist curing methods.
- D. Cure slabs scheduled for decorative polished finish a minimum 7 to 14 days with a minimum 2500 PSI compressive strength at the time of initial grinding (not the ultimate strength).

3.2 FLOOR FINISHING, GENERAL

- A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1R, to Class A tolerance and as specified below.
- B. Steel trowel surfaces that will receive carpeting, resilient flooring, or thin set ceramic tile.
- C. Steel trowel surfaces that are scheduled to be exposed.
- D. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains as indicated on drawings.
- E. Provide saw cuts as shown on drawings. Spacing of saw cuts shall not exceed 5'-0" in either direction. Saw cut depth shall be 1/3 of the overall slab depth. Replace saw blades frequently to eliminate cracking or spaulding of saw cut edges.

3.3 POLISHED CONCRETE

- A. Concrete slab work and polishing shall be completed and scheduled to allow for full edge of slab to edge of slab polishing and saw-cutting.
 - 1. Reference drawings for saw cut locations.
- B. Preliminary Grinding: Grind to match Architect's sample for extent of aggregate exposure. The intent of the design is to produce a consistent exposure of the various sizes of sand, aggregate and seeded glass.
 - 1. Grind floor using 50 grit metal pads to consistently expose the seeded glass and concrete aggregates. The upper 1/4 inch to 1/2 inch of concrete aggregates should be visible.
 - 2. Scrub and rinse floor.
 - 3. Grind floor using 100 grit metal pads.
 - 4. Scrub and rinse floor.
 - 5. Grind floor using 200 grit semi-metal pads.
 - 6. Scrub and rinse floor.
 - 7. Grind floor using 400 grit pads without any visible surface scratches. Scrub and rinse floor.
- C. Final Polishing: As required to provide smooth, even semi-gloss finish using resin pads in multiple grits to a final 800 grit. Scrub and rinse surfaces as required.
- D. Apply floor protective coating after steps above are complete for final acceptance.
 - 1. Protective coating basis of design: Skudo Commercial Mat System – MT
 - a. Water based liquid base coat.
 - b. Pre-treated mat pressed into base coat.
 - 2. Maintain polished concrete protective coating until 30 days prior to substantial complete. Completely remove protective coating at end of project. Clean floor and complete final burnish and polish application.
- E. Protection and Repairs: Protect HPC surfaces from damage during the construction period as specified in Division 01 and 03. If damage occurs and repairs are deemed required by the Architect, follow the procedure as follows:
 - 1. Blend white and grey cement to match as closely as possible.
 - 2. Add aggregate and sand if damage is deep or exceeds 2 inches in diameter.
 - 3. Add liquid mixture consisting of 1/4 acrylic polymer and 3/4 water.
 - 4. Trowel into damaged area and cure as specified for original slab placement.
 - 5. Polish as specified for original slab placement.
 - 6. Architect recommends avoiding necessity for repairs by using protection appropriate to the exposure.

3.4 CONCRETE PROTECTIVE TREATMENT

- A. Thoroughly clean floors; remove debris, dust or other contaminants.
- B. Densifier: Apply Green Umbrella Dry Shield densifier in a single application using spreader or sprayer in accordance with manufacturer's instructions.
 - 1. Apply treatment in single application using spreader or sprayer.
 - 2. Distribute using exploded-tip bristle broom to uniform coverage.
 - 3. Allow to air dry.
 - 4. At ambient temperatures above 95 degrees F, keep surfaces hydrated for one hour after

- application.
- 5. After drying, remove unreacted material using broom.
- C. Protective Treatment: Apply Micro-Film protective treatment per manufacturer's instructions.
 - 1. Mix concrete treatment 1:1 with water.
 - 2. Apply treatment in after final polishing in single application using T-bar applicator and micro-head.
 - 3. Allow minimum one hour drying time between applications.
 - 4. Allow to cure a minimum of 4 to 5 hours.
 - 5. High speed burnish using black or hogs hair pad.

3.5 TOLERANCES

- A. An independent testing agency, as specified in Division 01, shall inspect finished slabs for flatness. HPC finisher required to achieve finished slab flatness as noted below.
- B. Measure for F(F) and F(L) tolerances for floors in accordance with ASTM E 1155, within 48 hours after slab installation.
- C. Finish concrete to achieve the following tolerances:
 - 1. Maximum Variation of Surface Flatness For Exposed Concrete Floors: F(F) 35 and F(L) 25.
 - 2. Maximum Variation of Surface Flatness Under Seamless Resilient Flooring and Thin Set Ceramic Tile: F(F) 30 and F(L) 20.
 - 3. Maximum Variation of Surface Flatness Under Carpeting: F(F) 25 and F(L) 20.
- D. Correct the slab surface if tolerances are less than specified.
- E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.
- F. Measure gloss rating of polished concrete surfaces using Horbia 320 gloss meter; repolish if required to achieve specified gloss rating.
- G. Measure slip resistance using BOT-3000 slip-tester by Universal Walkway Testing; ensure compliance with specified slip resistance rating.

3.6 PROTECTION

- A. Close treated and finished areas to traffic until concrete treatment has cured.
- B. Fully protect completed polished slabs with fluid applied base coat and mat sheet coverings for duration of project.

END OF SECTION 03 35 60

SECTION 04 22 00 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
 - 1. Concrete masonry units (CMUs).
 - 2. Mortar and grout.
 - 3. Reinforcing steel.
 - 4. Ties and anchors.
 - 5. Miscellaneous masonry accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 - 1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
- C. Samples for Final Selection in the form of small-scale units: For the following:
 - 1. Concrete masonry units showing match to pre-selected colors
- D. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.
 - 1. For masonry units include material test reports substantiating compliance with requirements.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.
Determine net-area compressive strength (f'_m) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.4 QUALITY ASSURANCE

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required. Acceptable concrete masonry unit manufacturers must have five years minimum experience.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- C. Conform to International Masonry Industry All Weather Council (IMIAC) when placing masonry in cold weather.
 - 1. Maintain mortar temperatures between 40°F and 120°F at the time of mixing.
 - 2. Produce grout temperatures between 70°F and 120°F at the time of mixing.
 - 3. Protect materials from moisture and freezing.
 - 4. Eliminate installation of frozen units (those with temperatures 20°F and below).
 - 5. Protect the completed, or partially completed, masonry for the prescribed period of time to prevent freezing of mortar and grout, and the intrusion of excess water from rain or snow.
- D. Conform to International Masonry Industry All Weather Council (IMIAC) when placing masonry in hot weather

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with industry standards cold-weather construction requirements.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to:
 - 1. Mutual Materials Co. (Basis of Design for integral color CMU)
 - 2. Western Materials
 - 3. Basalite Concrete Products
 - 4. White Block – Spokane
 - 5. Builders Masonry Products
 - 6. Central Premix – Spokane
 - 7. Amcor
 - 8. Substitutions: Under provisions of Division 01

2.2 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.3 CONCRETE MASONRY UNITS (CMUs)

- A. Concrete Masonry Units: ASTM C 90.

1. Provide special shapes for sill, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners, unless otherwise indicated in the construction documents.
3. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
4. Weight Classification: Medium weight.
5. All exterior CMU walls to be integral colored and finished with water-proof sealer, with color as selected by Architect except at architectural integral color unit features as noted..
6. CMU Schedule: Refers to typical sizes, face pattern and color only. Refer to plans, sections, and wall types to determine depth, type, and any special required shapes or configurations.
7. Astraglaize glaze faced CMU, "Vivid Red". Provide all necessary trims and shapes as required for layout indicated in the drawings
8. CMU Schedule (dimensions and sizes are nominal): All colors refer to Mutual Materials.

Type 1	Split Face	8x8x16	Integral Color – Charcoal Gray
Type 2	Glazed Face	8x8x16	Trenwyth AstraGlaze Glazed "Crimson" Blend

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.
- D. Mortar Cement: ASTM C 1329.
- E. Mortar Pigments: None.
- F. Aggregate for Mortar: ASTM C 144.
- G. Aggregate for Grout: ASTM C 404.
- H. Water: Clean and Potable.

2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615, Grade 60, deformed.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.
 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
 2. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
 3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.

2.7 MISCELLANEOUS ANCHORS

- A. Anchor Bolts: steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane.
- B. Preformed Control-Joint Gaskets: Designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt). Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.
 - 1. Available Products:
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - 2. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.
- E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials Fabrikleen Masonry Cleaner Type R, or as recommended by selected Masonry product supplier
- F. Approved Masonry Sealers: Tnemec Silane/Siloxane Water Repellent, or other previously approved product as recommended by selected Masonry product supplier. Apply two coats by tank sprayer. Apply to 4" run-down each coat.

2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Limit cementitious materials in mortar to portland cement and lime.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry, use Type S.
 - 2. Mortar Mixing
 - a. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270
 - b. Do not use antifreeze compounds to lower the freezing point of mortar or grout
- C. Grout for Unit Masonry: Comply with ASTM C 476
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - 2. Bond beams and lintels: 2000 psi strength at 28 days; 7-8 inches slump, premixed type in accordance with ASTM C94
 - 3. Provide grout with a slump of 8 inches as measured according to ASTM C 143

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
- C. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

- D. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. Preparation
 - 1. Supply metal anchors for placement. Direct correct placement
 - 2. Obtain door frames and related embedded anchors. Verify items provided by other sections of work are properly sized and located
 - 3. Establish lines, levels, and coursing. Protect from disturbance
 - 4. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing

3.2 INSTALLATION, GENERAL

- A. Install all masonry material in compliance with Industry Standards and as indicated and shown in the construction documents.
- B. Install all masonry material in compliance with weather conditions.
- C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- D. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- E. Build chases and recesses to accommodate items specified in this and other Sections.
- F. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- G. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- H. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- I. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
 - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 - 5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
 - 6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/32 inch except due to warpage of masonry units within tolerances specified for warpage of units.
- J. Cold-Weather Construction:
 - 1. General: All materials shall be delivered in a usable condition and stored to prevent wetting by capillary action, rain and snow. The tops of all walls not enclosed or sheltered shall be covered with a strong weather-resistive material at the end of each day or shutdown. Partially completed walls shall be covered at all times when work is not in progress. Covers shall be draped over the wall and extend a minimum of 2 feet down both sides and shall be securely held in place, except when additional protection is required.
 - 2. Preparation: If ice or snow has inadvertently formed on a masonry bed, it shall be thawed by application of heat carefully applied until top surface of masonry is dry to the touch. A

section of masonry deemed frozen and damaged shall be removed before continuing construction of that section.

3. Construction: Masonry units shall be dry at time of placement. Wet or frozen masonry units shall not be laid. Special requirements for various temperature ranges are as follows:
 - a. Air temperature 40 deg F to 32 deg F: Sand or mixing water shall be heated to produce mortar temperature between 60 deg F and 120 deg F
 - b. Air temperature 32 deg F to 25 deg F: Sand and mixing water shall be heated to produce mortar temperatures between 60 deg F to 120 deg F. Maintain mortar temperatures on boards above freezing
 - c. Air temperature 25 deg F to 20 deg F: Sand and mixing water shall be heated to produce mortar temperatures between 60 deg F to 120 deg F. Maintain mortar temperatures on boards above freezing. Salamanders or other source of heat shall be used on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 15 miles per hour. Temperature of units when laid shall not be less than 40 deg F
 - d. Air temperature 20 deg F and below: Sand and mixing water shall be heated to produce mortar temperatures between 60 deg F to 120 deg F. Enclosure and auxiliary shall be provided to maintain air temperature above freezing. Temperature of unit when laid shall not be less than 40 deg F
4. Protection when the mean daily air temperature is 40 deg F to 32 deg F, masonry shall be protected from rain or snow at all times until the masonry system is sealed by covering with a weather-resistive membrane.
5. When the mean daily air temperature 32 deg F to 25 deg F, masonry shall be completely covered with weather-resistive membrane for 24 hours
6. When the mean daily air temperature 25 deg F to 20 deg F, masonry shall be completely covered with insulating blankets or equally protected for 24 hours
7. When the mean daily air temperature is 20 deg F or below, masonry temperature shall be maintained above freezing for 24 hours by enclosure and supplementary heat, by electric heating blankets, infrared heat lamps or other approved methods
8. Placing grout and protection of grouted masonry. When air temperatures fall below 40 deg F, grout mixing water and aggregate shall be heated to produce grout temperatures between 60 deg F to 120 deg F. Masonry to be grouted shall be maintained above freezing during grout placement and for at least 24 hours after placement. When atmospheric temperatures fall below 40 deg F, enclosures shall be provided around the masonry during grout placement and for at least 24 hours after placement.
9. Any expert opinions regarding acceptability of the installed units and mortar required by the Architect/Engineer shall be at the Contractors cost

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Masonry: Unless otherwise indicated, lay masonry in running bond or as indicated on Drawings.
- C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

- G. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow concrete masonry units as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.5 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 - 1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 16 inches o.c. horizontally.

3.6 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement. Joint spacing shall be provide at 24 feet o.c. or as shown on drawings.

3.7 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Protection
 - 1. Maintain protective boards at exposed external corners which may be damaged by construction activities
 - 2. Provide protection without damaging completed work
 - 3. At day's end, cover unfinished walls to prevent moisture infiltration
- E. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.8 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches.
 3. Place and consolidate grout fill without disturbing reinforcing
 4. Fill all reinforced cells with grout

3.9 FIELD QUALITY CONTROL

- A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
 1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
 2. Allow and coordinate special inspections as defined in Structural drawings.
- B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:
 1. Payment for these services will be made by Owner.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.
- E. Mortar Test (Property Specification): For each mix provided, per ASTM C780. Test mortar for compressive strength.
- F. Grout Test (Compressive Strength): For each mix provided, per ASTM 1019.

END OF SECTION 04 22 00

05 12 00 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Structural steel
 - 2. Base plates, anchor bolts, and shims
 - 3. Grout.

1.2 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
- C. Welding certificates.
- D. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
 - 1. Structural steel including chemical and physical properties.
 - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 3. Shop primers.
 - 4. Nonshrink grout.

1.4 QUALITY ASSURANCE

- A. Qualifications
 - 1. Fabricator: Fabricators shall be AISC Certified or approved by the City of Pullman
 - 2. Welders: Provide certification that welders to be employed in the work have been approved by the City of Pullman or have satisfactorily passed WABO qualification tests
 - 3. Erector: Company specializing in performing the work of this Section with minimum 5 years documented experience
- B. Fabricate structural steel members in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings
- C. Perform work in accordance with AISC-Specification for Architecturally Exposed Structural Steel (AESS) where finished work will be exposed to view.
- D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel."
- E. Acceptance: Metal fabrications exposed to view shall be of the highest quality and in accordance with applicable portions of AISC (American Institute of Steel Construction) - Specification for Architecturally Exposed Structural Steel (AESS). Quality of appearance shall be grounds for acceptance or rejection of the work of this section, decisions regarding appearance quality shall be at the discretion of the architect / engineer

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Load structural members or assembled units in such a manner that they may be transported and unloaded without being excessively stressed, deformed or otherwise damaged.

- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.6 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992.
- B. Channels, Angles, Plate and Bar: ASTM A 36.
- C. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- D. Steel Pipe: ASTM A 53, Grade B.
- E. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
- B. Threaded or Anchor Rods: ASTM F1554, or ASTM A 36.
 - 1. Nuts: ASTM A 563 heavy hex carbon steel.
 - 2. Plate Washers: ASTM A 36 carbon steel.
 - 3. Washers: ASTM F 436 hardened carbon steel.
- C. Headed Studs: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

2.3 PRIMER

- A. Primer: Fabricators standard lead-free rust-inhibiting primer.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's Specification for Structural Steel Buildings--Allowable Stress Design.
 - 1. Camber structural-steel members where indicated.
 - 2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

- E. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.
 - F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- 2.6 SHOP CONNECTIONS
- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tight.
 - B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
- 2.7 SHOP PRIMING
- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - D. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted

PART 3 - EXECUTION

- 3.1 EXAMINATION
- A. Verify elevations of concrete-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
 - B. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 PREPARATION
- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
- 3.3 ERECTION
- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design."
 - B. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - C. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.

- D. Splice members only where indicated.
- E. Do not use thermal cutting during erection.
- F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- G. Touch- up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint. Apply paint to exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 1.0 mils

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tight.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
 - 1. Allow and coordinate special inspections as defined in Structural drawings.
- B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Touchup Painting: After installation, promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories and abutting structural steel.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION 05 12 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel framing and supports for mechanical and electrical equipment.
 - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 3. Gutter support strap brackets
 - 4. Shelf angles and lintels.
 - 5. Loose bearing and leveling plates.
 - 6. Miscellaneous steel trim including edge angles.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.2 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Perforated Metal panel product, if used
 - 2. Paint products.
 - 3. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
- D. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Qualifications
 - 1. Fabricator: Company specializing in performing the work of this Section with minimum 5 years documented experience
 - 2. Erector: Company specializing in performing the work of this Section with minimum 5 years documented experience
- B. Fabricate structural steel members in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings
- C. Perform work in accordance with AISC-Specification for Architecturally Exposed Structural Steel (AESS) where finished work will be exposed to view.
- D. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."

2. AWS D1.2, "Structural Welding Code--Aluminum."
 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 4. AWS D1.6, "Structural Welding Code--Stainless Steel."
- E. Acceptance: Metal fabrications exposed to view shall be of the highest quality and in accordance with applicable portions of AISC (American Institute of Steel Construction) - Specification for Architecturally Exposed Structural Steel (AESS). Quality of appearance shall be grounds for acceptance or rejection of the work of this section, decisions regarding appearance quality shall be at the discretion of the architect / engineer. Work that is rejected on the grounds of appearance shall be repaired or replaced with no additional cost to Owner.
- F. Mock-up:
1. Erect sample mock-up installation for each fabrication type to be installed on the project, include supports, rails, panels, characteristic patterns, and accessories. provide the following:
 - a. Exterior canopy and entry assemblies
 - b. Gutter support bracket, coordinate with Division 07 Gutters
 2. Do not proceed with purchase, fabrication or installation of multiple items until mock-up has been accepted.
 3. Locate where directed. Coordinate as necessary
 4. When accepted, mock-up will demonstrate minimum standard for the Work. Mock-up may remain as part of the Work
- 1.5 PROJECT CONDITIONS
- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
 2. Provide allowance for trimming and fitting at site.
- 1.6 COORDINATION
- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Rolled-Steel Floor Plate: ASTM A 786, rolled from plate complying with ASTM A 36 or ASTM A 283, Grade C or D.
- E. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- F. Steel Tubing: ASTM A 500, cold-formed steel tubing.

- G. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- H. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

2.3 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6, schedule 40 minimum.
- C. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at locations concealed inside of exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.
- D. Anchor Bolts: ASTM F 1554, Grade 36.
 - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- E. Eyebolts: ASTM A 489.
- F. Machine Screws: ASME B18.6.3.
- G. Lag Bolts: ASME B18.2.1.
- H. Wood Screws: Flat head, ASME B18.6.1.
- I. Plain Washers: Round, ASME B18.22.1.
- J. Lock Washers: Helical, spring type, ASME B18.21.1.
- K. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- L. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 09 painting Sections.
- C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 - 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Available Products:
 - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
 - b. Carboline Company; Carbozinc 621.

- c. ICI Devco Coatings; Catha-Coat 313.
- d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
- e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
- f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
- g. Tnemec Company, Inc.; Tneme-Zinc 90-97.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20. If painting work occurs within the interior of the building, paint shall comply with VOC limits stated in Section 01 81 14.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187. If painting work occurs within the interior of the building, paint shall comply with VOC limits stated in Section 01 81 14.
- F. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.
- G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- H. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.6 FABRICATION, GENERAL

- A. Workmanship:
 - 1. Use materials of size and thickness shown or, if not shown, of required size and thickness to produce strength and durability in finished product. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components or work
 - 2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise shown. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work
- B. Form exposed connection with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not show, socket type flat-head (countersunk) screws or bolts. Provide sufficient backing at screw locations to cover at least three threads
- C. Provide for anchorage of type suitable for use with supporting structure. Fabricate and space anchoring devices as shown and as required to provide adequate support for intended use
- D. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- E. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- F. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- G. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- H. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- I. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

- J. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
 - K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
 - L. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.
- 2.7 MISCELLANEOUS FRAMING AND SUPPORTS
- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
 - B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts if units are installed after concrete is placed.
 - C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
 - D. Galvanize miscellaneous framing and supports where indicated.
 - E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.
- 2.8 GUTTER SUPPORT STRAP BRACKETS
- A. Fabricate steel gutter support brackets from 3/16" x 1-1/2" x length required for gutter profile and attachment to building structure. Form bracket to match gutter shape.
 - B. Place gutter support brackets at 34" on center at all gutters (align with standing seam at metal roof panels where used).
 - C. Field weld to structural steel with 3/16" continuous fillet weld or bolt into wood sheathing with 3/16" diameter lag bolts (2 bolts per strap minimum).
 - D. Finish shall be shop applied powder coat finish with rust inhibitor, color to match exact gutter finish.
- 2.9 LOOSE BEARING AND LEVELING PLATE
- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchors and for grouting.
 - B. Galvanize plates after fabrication.
 - C. Prime plates with zinc-rich primer.
- 2.10 SHELF ANGLES and LOOSE STEEL LINTELS
- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
 - 1. Provide mitered and welded units at corners.
 - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
 - B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
 - C. Galvanize shelf angles located in exterior walls.
 - D. Prime shelf angles located in exterior walls with zinc-rich primer.
 - E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.11 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates, shims, spacers and angles not specified in other Sections, for items supported from concrete and/or steel construction as needed to complete the Work.

2.12 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize exterior miscellaneous steel trim.
- D. Prime interior miscellaneous steel trim, with zinc-rich primer.

2.13 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. At all steel fabrications that will be exposed to the exterior upon completion of the project, steel fabrications shall be galvanized, and prepared for field painting
- D. At all steel fabrications that will be at interior locations, steel fabrications shall be shop primed.

2.14 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 153, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS
- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.
- 3.3 INSTALLING BEARING AND LEVELING PLATES
- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
- 3.4 ADJUSTING AND CLEANING
- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Framing with treated and untreated dimensional lumber.
 - 2. Wood blocking, backing, furring, nailers and grounds in equipment bases, walls and ceiling for support of all wall and/or ceiling mounted equipment, fixtures, railings, grab bars, doorstops and miscellaneous surface mounted items.
 - 3. Plywood backing panels.
 - 4. Preservative treatment of wood
 - 5. Pre-fabricated connectors

1.2 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. RIS: Redwood Inspection Service.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPAA: Western Wood Products Association.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Wood-preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Engineered wood products.
 - 4. Power-driven fasteners.
 - 5. Powder-actuated fasteners.
 - 6. Expansion anchors.

- 7. Metal framing anchors.
- 1.4 QUALITY ASSURANCE
 - A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.
- 1.5 DELIVERY, STORAGE, AND HANDLING
 - A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

- 2.1 WOOD PRODUCTS, GENERAL
 - A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 4. Provide dressed lumber, S4S, unless otherwise indicated.
 - 5. Lumber products included in the finished project, shall comply with the VOC requirements stated in section 01 81 14.
- 2.2 WOOD-PRESERVATIVE-TREATED LUMBER
 - A. Preservative Treatment by Pressure Process: AWP C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWP C31 with inorganic boron (SBX).
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
 - B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
 - C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.
 - D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.
- 2.3 DIMENSION LUMBER FRAMING
 - A. Maximum Moisture Content: 19 percent

- B. Interior framing:
 - 1. Hem-fir (north); NLGA.
 - 2. Douglas fir-larch; WCLIB or WWP.
 - 3. Spruce-pine-fir; NLGA.
 - 4. Hem-fir; WCLIB, or WWP.
 - 5. Northern species; NLGA.
 - 6. Western woods; WCLIB or WWP.
 - C. Joists, Rafters, and Other Framing Not Listed Above:
 - 1. Hem-fir (north); NLGA.
 - 2. Douglas fir-larch; WCLIB or WWP.
 - 3. Spruce-pine-fir; NLGA.
 - 4. Hem-fir; WCLIB or WWP.
 - 5. Douglas fir-larch (north); NLGA.
- 2.4 MISCELLANEOUS LUMBER
- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Cants.
 - 5. Furring.
 - 6. Grounds.
 - B. For items of dimension lumber size,
 - 1. Hem-fir (north); NLGA.
 - 2. Spruce-pine-fir; NLGA.
 - 3. Hem-fir; WCLIB, or WWP.
 - 4. Western woods; WCLIB or WWP.
 - 5. Northern species; NLGA.
 - C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
 - D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
 - E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.
- 2.5 PLYWOOD BACKING PANELS
- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.
 - B. Wall backing for future wall mounted installations: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, 3/8-inch nominal thickness.
 - C. Plywood and sheathing products included in the finished project, shall comply with the VOC requirements stated in section 01 81 14
- 2.6 FASTENERS
- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
 - B. Nails, Brads, and Staples: ASTM F 1667.
 - C. Power-Driven Fasteners: NES NER-272.
 - D. Wood Screws: ASME B18.6.1.
 - E. Lag Bolts: ASME B18.2.1.

- F. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.
 - G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.
- 2.7 METAL FRAMING ANCHORS
- A. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - 1. Use for interior locations where stainless steel is not indicated.
 - B. Bridging: Rigid, V-section, nail-less type, 0.050 inch thick, length to suit joist size and spacing.
 - C. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch- minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.
 - D. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
 - 1. Width: 3/4 inch.
 - 2. Thickness: [0.050 inch
 - 3. Length: 16 inches.
 - E. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches wide by 0.050 inch thick by 36 inches long.
- 2.8 MISCELLANEOUS MATERIALS
- A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
 - B. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

- 3.1 INSTALLATION, GENERAL
- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
 - B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
 - C. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
 - D. Do not splice members between supports, unless otherwise indicated.
 - E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c

2. Coordinate installation of Concealed Backing, Flooring, Grounds and Cants with other work.
 - F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
 - G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
 - H. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 1. Use inorganic boron for items that are continuously protected from liquid water.
 2. Use copper naphthenate for items not continuously protected from liquid water.
 - I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - J. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.
 - K. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 1. Comply with approved fastener patterns where applicable
 2. Use finishing nails, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
- 3.2 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION
- A. Provide solid wood blocking, backing, furring, nailers and grounds in equipment bases, walls and ceiling for support of all wall and/or ceiling mounted equipment, fixtures, railings, grab bars, doorstops and miscellaneous surface mounted items.
 - B. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
 - C. Provide solid fire treated wood blocking or sheathing backing for all wall mounted equipment, chalkboards, tack boards, shelf standards, wall cabinets, mirrors, toilet accessories, partitions, panels shelving, casework, fixtures, door stops, etc.
 - D. At existing framed wall and ceiling construction, install solid fire treated wood blocking for all equipment, chalkboards, tack boards, shelf standards, wall cabinets, mirrors, toilet accessories, partitions, panels shelving, casework, fixtures, door stops, etc. Remove existing finishes as necessary to install solid blocking and/or backing. Patch back finishes to match existing adjacent surfaces.
 - E. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
 - F. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Roof sheathing, for patch in locations at junctions between new CLT and existing roof sheathing.
 - 2. Wall equipment support sheathing.
 - 3. Fascia and miscellaneous framing sheathing.

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- C. Plywood: DOC PS 1.
- D. Oriented Strand Board: DOC PS 2.

2.2 WALL SHEATHING

- A. Plywood Wall Sheathing: Exterior, Structural I sheathing.

2.3 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exposure 1 sheathing.
- B. Oriented-Strand-Board Roof Sheathing: Exposure 1 sheathing.

2.4 FLOOR SHEATHING

- A. Plywood Floor Sheathing: DOC PS 1, single-floor panels.
- B. Oriented-Strand-Board Combination Subfloor-Underlayment: Exposure 1 single-floor panels.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
 - C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
 - D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
 - E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- 3.2 WOOD STRUCTURAL PANEL INSTALLATION
- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
 - B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail to wood framing
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 06 16 00

SECTION 06 18 00 - GLUED-LAMINATED CONSTRUCTION

PART 1- GENERAL

1.1 SUMMARY

- A. Furnish all labor to install.
- B. Section Includes
 - 1. Glue laminated wood beams, architectural appearance grade with exterior rated glues and finishes for exposed and concealed beams
 - 2. Steel hardware and attachment brackets.
- C. System Description
 - 1. Design Loads: Per structural calculations.

1.2 REFERENCES

- A. AITC - American Institute of Timber Construction.
- B. ANSI A190.1 - Structural Glued Laminated Timber.
- C. ASTM A 36 - Specification for Structural Steel.
- D. ASTM D 2559 - Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions.
- E. ASTM A 307 - Specification for carbon steel, bolts, and studs 60,000 psi minimum tensile strength.

1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 01.
- B. Indicate sizes and spacing of members, cambers, bearing and anchor details.
- C. Sustainable Design Submittal:
 - 1. Submit certification that the products of this section are manufactured within a 500 mile radius of the project site. Product Data for materials regionally manufactured and extracted. Include statement indicating costs for each product complying with the 500 mile radius requirement

1.4 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer: Company specializing in manufacture of glue laminated structural units with three years minimum experience, and certified by the AITC in accordance with ANSI A190.1.
 - 2. Erector: Company specializing in erection of glue laminated structural units with five years experience.
- B. Regulatory Requirements
 - 1. Conform to I.B.C. for loads, seismic zoning, and other load criteria.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.
- C. Protect members in accordance with AITC requirements for individually wrapped material.
- D. Leave individual wrapping in place until finishing occurs.

PART 2- PRODUCTS

2.1 MANUFACTURERS - not used.

2.2 MATERIALS

- A. Lumber: Douglas Fir or Southern Pine lumber conforming to grading rules and the following values:
 - 1. Bending (Fb):
 - a. GluLam Beams Fb: 2400 psi.
 - 2. Tension Parallel to Grain (Ft):
 - a. GluLam Beams Ft: 1100 psi.
 - 3. Compression Parallel to Grain (Fc):
 - a. GluLam Beams Fc: 1650 psi.
 - 4. Compression Perpendicular to Grain Bottom (Fcl):
 - a. GluLam Beams Fcl: 650 psi.
 - 5. Compression Perpendicular to Grain Top (Fcl):
 - a. GluLam Beams Fcl: 650 psi.
 - 6. Horizontal Shear (Fv):
 - a. GluLam Beams Fv: 265 psi.
 - 7. Modulus of Elasticity (E):
 - a. GluLam Beams E: 1.8×10^6 psi.
- B. Adhesive: ASTM D 2559 - For wet condition of service.
- C. Sealer - Penetrating surface sealer suitable for site finish per division 09.
- D. Grade: architectural appearance grade, with exterior rated glues and finishes for exposed beams

2.3 ACCESSORIES

- A. Steel Connections and Brackets: ASTM A 36 - Weldable quality, shop primed painted.
- B. Thru-Bolts: ASTM A-307 Steel
- C. Hardware: ASTM A 336 - Structural quality steel; shop primed painted.
- D. Anchor Bolts: ASTM A 307 Steel.
- E. Bearing Plate Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
- F. Protective Paper Wrap: 30 lb. Asphalt - impregnated building paper.

2.4 FABRICATION

- A. Fabricate glue laminated structural members in accordance with AITC architectural grade.
 - 1. Provide architectural grade for exposed locations (exterior and interior).
 - 2. Provide industrial grade for concealed locations.
- B. Verify dimensions and site conditions prior to fabrication.
- C. Cut and fit component parts accurately to length to achieve tight joint fit.
- D. Fabricate member with camber only where specified by Structural Engineer.
- E. Do not splice or join members in locations other than that indicated, without permission.
- F. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.
- G. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

PART 3- EXECUTION

3.1 EXAMINATION

- A. Verify that supports are ready to receive trusses or joists.
- B. Verify sufficient end bearing area.
- C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

- A. Coordinate placement of bearing and support items.

3.3 ERECTION

- A. Set structural members level and plumb, in correct positions.
- B. Provide temporary bracing and anchorage to hold members in place until permanently secured.
- C. Fit members together accurately without trimming, cutting, or any other unauthorized modification.
- D. Install building paper wrap between ledgers and concrete or masonry walls.
- E. Tolerances
 - 1. Framing Members: 1/2 inch maximum from true position.

END OF SECTION 06 18 00

SECTION 06 20 00 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Providing and installing finish carpentry items, other than custom casework
 - 2. Items include, but are not limited to Interior standing trim, running trim, window sills, and other items noted on the drawings.
 - 3. Interior ornamental work.
 - 4. Hardware and attachment accessories

1.2 DEFINITIONS

- A. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NHLA: National Hardwood Lumber Association.
 - 3. NLGA: National Lumber Grades Authority.
 - 4. WCLIB: West Coast Lumber Inspection Bureau.
 - 5. WWPAA: Western Wood Products Association.
- B. MDF: Medium-density fiberboard.
- C. MDO Plywood: Plywood with a medium-density overlay on the face.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical treatment manufacturer's written instructions for finishing treated material.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Samples for Verification:
 - 1. For each species and cut of lumber and panel products with non-factory-applied finish, with 1/2 of exposed surface finished, 50 sq. in. for lumber and 8 by 10 inches for panels.
 - 2. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8 by 10 inches for panels.
- C. Research/Evaluation Reports: Showing that fire-retardant-treated wood complies with building code in effect for Project.
- D. Warranty: Special warranty specified in this Section.
- E. Mock-Ups
 - 1. Erect mock-ups of each specific installation type for review and approval of the architect. Mock-ups shall include the specified materials, joinery, characteristic patterns, and accessories
 - 2. Locate where directed. Coordinate as necessary
 - 3. When accepted, mock-up will demonstrate minimum standard for the Work. Mock-up may remain as part of the Work

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Perform work in accordance with AWI Custom Grade standards, as a minimum requirement
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece
- B. Softwood Plywood: DOC PS 1.
- C. Hardboard: AHA A135.4.
- D. MDF: ANSI A208.2, Grade 130 made with binder containing no urea-formaldehyde resin.
- E. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea-formaldehyde resin.
- F. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
- G. Finishes: Reference Finish Schedule, Finish Material Designations

2.2 STANDING AND RUNNING TRIM

- A. AWI Grade: Custom
- B. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish), at all locations unless noted otherwise:
 - 1. Species and Grade: **VG Fir; transparent finish** to match architect's sample; NHLA. Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building, unless otherwise indicated.
 - 2. Maximum Moisture Content: 9 percent.
 - 3. Finger Jointing: Not allowed.

4. Gluing for Width: Not allowed
5. Veneered Material: Not allowed.
6. Face Surface: Surfaced (smooth).
7. Matching: Selected for compatible grain and color.
8. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work
9. Assemble casings in plant except where limitations of access to place of installation require field assembly
10. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together
- C. Lumber Trim for Opaque Finish (Painted):
 1. Species and Grade: Douglas fir-larch or Douglas fir south, Superior or C & Btr finish; NLGA, WCLIB, or WWPA.
 2. Species and Grade: Alder, aspen, basswood, cottonwood, gum, magnolia, soft maple, sycamore, tupelo, or yellow poplar; A finish; NHLA.
 3. Maximum Moisture Content: 15 percent.
 4. Finger Jointing: Allowed.
 5. Face Surface: Surfaced (smooth).
 6. Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
 1. Where galvanized finish is indicated, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153/A 153M.
- B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
 1. Use wood glue that has a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.
 1. Use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
 1. Use adhesive that has a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 FABRICATION

- A. Back out or kerf backs of Interior standing and running trim except shoe and crown molds except those with ends exposed in finished work:
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 48 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- D. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer. Carefully scribe cabinetwork which is against other building materials, leaving gaps of 1/32 inch maximum. Do not use additional overlay trim for this purpose
 - 2. When necessary to cut and fit on site, make material with ample allowance for cutting. Provide trim for scribing and site cutting.
 - 3. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
 - 4. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 5. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts (not applicable to casework).
 - 6. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated (not applicable to casework).
 - 7. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.
 - 8. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening, unless covered by trim.
 - a. Install flush paneling with no more than 1/16" in 96" vertical cup or bow and 1/8" in 96" horizontal variation from a true plane.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints possible, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 36 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members, standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - 2. Install trim after gypsum board joint finishing operations are completed.
 - 3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

4. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 5. Install handrails on metal brackets specified securely, fastened to wall framing.
 6. Install standing and running trim with no more variation from a straight line than 1/8" in 96".
- 3.5 ADJUSTING
- A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.
- 3.6 CLEANING
- A. Clean interior finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.
- 3.7 PROTECTION
- A. Protect installed products from damage from weather and other causes during remainder of the construction period.
 - B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 00

SECTION 07 08 00 – COMMISSIONING OF AIR BARRIER AND BUILDING ENVELOPE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. References
 - 2. Air Barrier Code Requirements
 - 3. Air Barrier System Characteristics
 - 4. Quality Assurance
 - 5. Qualifications
 - 6. Responsibilities of Parties for Testing
 - 7. Execution of testing procedures
 - 8. Reporting

1.2 REFERENCES

- A. WAC 51-11C-040240 - Air Leakage
 - 1. IECC with Washington State Amendments, 2015, Sections C402.4, Air Leakage (Mandatory).
- B. National Environmental Balancing Bureau (NEBB):
 - 1. NEBB – Procedural Standards for Building Enclosure Testing.
- C. ASTM International:
 - 1. ASTM E1186 – Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.
 - 2. ASTM E779 – Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
 - 3. ASTM E1827 – Standard Test Method for Determining Airtightness of Buildings Using an Orifice Blower Door.
- D. International Organization for Standardization (ISO):
 - 1. ISO 6781 – Qualitative Detection of Thermal Irregularities in Building Envelopes – Infrared Method.

1.3 AIR BARRIER CODE REQUIREMENTS

- A. A continuous air barrier shall be provided throughout the building thermal envelope. The air barriers shall be permitted to be located on the inside or outside of the building envelope, located within the assemblies composing the envelope or any combination thereof. The air barrier shall comply with WAC 51-11C-402.1.1 and C402.1.2.
- B. The continuous air barrier shall be constructed to comply with the following:
 - 1. The air barrier shall be continuous for all assemblies that are in the thermal envelope of the building and across joints and assemblies.
 - 2. Air barrier joints and seams shall be sealed, including sealing transitions in places and changes in materials. Air barrier penetrations shall be sealed in accordance with code Section C402.4.2. The joints and seals shall be securely installed in or on the joint of its entire length so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure from wind, stack effect, and mechanical ventilation.
 - 3. Recessed lighting fixtures shall comply with code section C402.2.8. Where similar objects are installed which penetrate the air barrier, provisions shall be made to maintain the integrity of the air barrier.
- C. Air Barrier Penetrations:
 - 1. Penetrations of the air barrier and paths of air leakage shall be caulked, gasketed, or otherwise sealed in a manner compatible with the construction materials or location. Joints and seals shall be sealed in the same manner or taped with a moisture vapor-permeable wrapping material. Sealing materials shall be appropriate to the construction materials being sealed.
- D. Building Test IAW Section C402.1.2.3

1. The completed building shall be tested and the air leakage rate of the building envelope shall not exceed 0.40 CFM/ft² at a pressure differential of 0.3 inches water gauge in accordance with ASTM E779 or an equivalent method approved by the code official. A report that includes the tested surface area, floor area, air by volume, stories above grade and leakage rates shall be submitted to the building owner and code official. If the tested rate exceeds the defined limits, a visual inspection of the air barrier shall be conducted and any leaks noted shall be sealed to the extent practicable. An additional report identifying the corrective actions taken to seal air leaks shall be submitted to the building owner and code official and any further requirements to meet the leakage air rate will be waived.
- 1.4 AIR BARRIER CHARACTERISTICS
 - A. The airtight components of the building enclosure and the joints, junctures and transitions between materials, products and assemblies forming the building enclosure are called the air barrier system. These are typically, but not limited to the following joints or assemblies where connections are made:
 1. Foundation and walls
 2. Walls and windows
 3. Walls and doors
 4. Different wall systems
 5. Walls and roof
 6. Walls and roof over unconditioned spaces
 7. Walls, floors, and roofs across construction, control and expansion joints
 8. Walls, floors and roofs to utility, pipe and duct penetrations through the air barrier
- 1.5 QUALITY ASSURANCE
 - A. Engage the services of a qualified air barrier inspector to oversee the sequencing and installation of the air barrier component materials and assemblies, to oversee the proper joining and sealing of the materials and assemblies, and to oversee the sealing of penetrations of the air barrier materials and assemblies.
 - B. Building Envelope technician shall prepare report forms in accordance with the requirements of the NEBB Procedural Standards for Building Envelope Testing.
- 1.6 QUALIFICATIONS
 - A. The Air Barrier Testing agency shall be certified by one of the following organizations to perform inspections and testing:
 1. National Environmental Balancing Bureau (NEBB)
 2. American Air Barrier Association (AABA)
 - B. Air barrier inspector duties on this project shall be conducted in conjunction with the commissioning process. The Contractor shall employ a testing sub-contractor that is certified as defined above.
- 1.7 RESPONSIBILITIES
 - A. Responsibilities indicated for Architect/Engineer, General Contractor and Air Barrier Inspector/testing technician are provided only to clarify the process.
 - B. Architect/Engineer Responsibilities:
 1. Furnish design narratives and plan sheet details or other documentation, including Owner Project Requirements and Basis of Design documentation, to outline the air barrier system, components, and construction thereof.
 2. Provide a conformed set of contract documents pertaining to the air barrier, including but not limited to, drawings, specifications, approved submittals, current approved change orders and any contract modifications affecting the air barrier.
 3. In the construction documents, clearly define the building enclosure boundary and indicate the location of the air barrier throughout the building including floors, walls and ceiling or roof area, square footage of areas to be tested within the air barrier boundaries,

- type and construction of assemblies within the air barrier and method of testing to be performed (Blower door or Building Air Moving Equipment Test Method).
4. Coordinate resolution of system deficiencies identified during testing, according to contract documents.
- C. Contractor Responsibilities:
1. Coordination of Sub-Contractors: Provide coordination between the sub-contractors involved in the construction of the air barrier system, coordinate the sequence of construction to ensure the continuity of the air barrier system joints, junctures, penetrations, and transitions between materials and assemblies of materials and products from the substructure to walls to roof. Provide quality assurance procedures and verification as specified. Facilitate inspections, tests and other quality control services specified or requested by the BE Technician.
 2. Organize pre-construction conferences between the subcontractors involved in the construction or penetration of the air barrier system and the air barrier testing technician to discuss each sub-contractor's responsibilities to ensure air tight barrier in the different sections to be installed by the different sub-contractors.
 3. Construct mock-up demonstrating each joint, juncture and transition between materials, products and assemblies of products specified in different specification sections and plan sheets to be installed. Mock up shall be reviewed and approved by the Owner, Architect and building envelope inspector/technician.
 4. Develop a project schedule with input from the building envelope inspection firm that coordinates the work of their disciplines and provides adequate time in the construction process to allow for successful completion of building envelope testing and any remedial work.
 5. Ensure the building enclosure is complete, including but not limited to, all structural components, the air and vapor barriers complete, door sweeps and weather stripping complete, floors and ceilings complete.
 6. Provide all project preparation and setup for BE testing, including but not limited to temporary sealing of intentional openings, removing ceiling tiles, opening access doors, opening interior doors and securing them so they do not close during testing. This may include preparation of adjoining spaces and staging the building so no people will be opening doors or windows during the envelope testing. A guide checklist is provided at the end of this specification.
 7. Provide either temporary or permanent power for BE testing equipment.
 8. Remove sufficient ceiling tiles for lay in ceilings, or open sufficient access panels for hard ceilings to equalize the pressure between the ceiling cavity and space being tested. Replace tiles at the conclusion of testing.
 9. If the building equipment is to be utilized for testing, provide the following:
 - a) Ensure that all necessary building systems are complete and operating in a safe manner.
 - b) Complete the installation of permanent power systems serving the equipment to be used for the BE testing. Electrical systems shall be properly installed in accordance with all applicable codes to ensure the safety of personnel involved in the testing.
 - c) Perform start up of all building systems in accordance with manufacturer's recommendations.
 - d) Complete the installation, programming, calibration and start up of all building control systems.
 10. Upon completion of inspection, testing or similar services, repair damaged construction and restore substrates and finishes, protect construction exposed by or for quality control activities and protect repaired construction.
- D. Building Envelope Inspector/Testing Technician
1. Provide necessary equipment and technical expertise to inspect building envelope and air barrier components, render opinion as to the quality of construction and adherence to applicable codes, and provide observation/testing reports to the building owner or code official as applicable upon completion of each inspection.

2. Provide necessary equipment and conduct air barrier testing in accordance with applicable codes and guidelines. Upon completion of air barrier testing, provide the building owner and code official with a comprehensive report of findings.
 3. Assist the Architect/Consultant and Contractors in identifying issues with the construction team with resolution of issues discovered during inspections and testing.
 4. Examine construction documents to become familiar with project requirements and discover conditions in systems/design that may preclude proper testing of the building envelope systems and equipment. Report deficiencies to the Architect for resolution.
- E. Reports
1. During construction of the building envelope inspector/technician shall inspect and document conditions at various stages and prepare a report citing the date, weather conditions, observations as to quality of work and pictures supporting the observations.
 2. Upon completion of testing, the building envelop test technician shall provide a report to the building owner and code official outlining the details of the test procedures, test results, any deficiencies discovered and recommended measures to correct the deficiencies.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. The building envelope test technician or firm is responsible for providing equipment to be used in the testing of the air barrier. This includes, but is not limited to, blower door test apparatus, infrared camera, digital camera, and air pressurization measurement equipment.

PART 3 - EXECUTION

3.1 AIR BARRIER PRE-TEST READINESS CHECKLIST

- A. Prior to starting the air barrier testing, the contractor shall make the building ready for testing, utilizing the following checklist for guidance. Notify the building envelop testing agency or technician of any issues with items noted on the checklist. Completed checklist shall be submitted to the testing agency/technician prior to testing and verified prior beginning air barrier testing.
- B. Air Barrier Pre-Test Cheklist Form – See form on the following page.

3.2 HVAC PREPARATION FOR BUILDING ENVELOPE TESTING

- A. Refer to Division 01 section "Testing and Inspection Services" for air leakage testing requirements and additional information required to complete the testing.
- B. HVAC Preparation: As specified in NEBB BET Procedural Standards – Table 8.1.
 1. Seal exhaust fans with back draft dampers.
 2. Seal supply fans with back draft dampers.
 3. Close furnace room door (for furnace outside the test zone).
 4. Close combustion air intake dampers for boilers.
 5. Turn off recirculating air handlers, make-up air units, energy recovery units, supply fans, furnaces, fan coil units, boilers, gas hot water heaters and exhaust fans - All equipment requiring combustion air (including kitchen equipment).
 6. Seal outdoor air inlets and exhaust outlets (by dampers and/or masking) inside the test zone.
 7. Close and mask motorized dampers.
 8. Mask undampened HVAC openings.
 9. Seal ventilators designed for continuous use.
 10. Seal supply and exhaust ventilator dampers.
 11. Seal off ventilation to other zones.
 12. Seal window air conditioners and through wall air conditioners to outside air vent.
 13. Fill floor drains and plumbing traps.

- 14. Seal all HVAC ducts going from inside the test zone to outside the test zone and back into the test zone.
 - 15. Isolate movement and mask gravity dampers.
 - C. Provide a responsible HVAC technician with the authority to place the HVAC system in the correct mode for the pressure test. Allow the testing agency unhindered access to mechanical rooms, air handlers, exhaust fans, and outdoor air and exhaust dampers.
 - D. Provide a responsible technician with access to and the authority to reset circuit breakers.
 - E. Close and latch all windows and doors and allow no access in the test envelope during the test.
 - F. Assist the testing agency representative in removing all door hardware and other objects that interfere with test equipment set-up
 - G. No work shall be performed in the test area while the test is in progress. Comply with ASTM E779-10, 7.0, to ensure any occupational hazards associated with operating test fans are eliminated.
- 3.3 BUILDING AIR BARRIER TEST
- A. The building air barrier test shall follow the guidelines outlined in one or more reference in paragraph 1.2 of this section. If the air barrier cannot be tested by pressurization and depressurization, then the building may be tested in the positive (pressurization) mode only.
 - B. The fan pressurization test to determine final compliance with the air barrier requirements shall be conducted with all components of the air barrier system have been installed and inspected, and have passed any intermediate inspections or procedures as outlined in the construction documents. The test may be conducted before finishes that are not part of the air barrier system have been installed. For example, if suspended ceiling tile, interior gypsum board or cladding systems are not part of the air barrier system, the test may be conducted before they are installed. Also, any interior doors or pass through spaces and finishes that are not part of the air barrier may be completed after the air barrier test is conducted.
 - C. Completed test results shall be reported to the building Owner and code official. If there are any remedial actions required to achieve a successful test, the Building Envelope Technician shall report them to the General Contractor for necessary action.
- 3.4 BLOWER DOOR TESTING GENERAL PROCEDURES
- A. The blower door shall be installed in an appropriate entry door, window or vent opening. The openings must be sealed or taped to avoid any air leakage at these points. Orient the blower door appropriately for pressurization or depressurization as required. Installation should have minimum of obstructions to airflow in and out of the building.
 - B. Install the pressure measuring instrument across the building envelope. It is recommended that more than one location be utilized for the pressure measurement, being careful to avoid extremes in outside pressure (wind, architectural features that may interfere with accuracy of readings, etc.).
 - C. Measure and record wind velocity, indoor and outdoor temperatures at the beginning of the test so that average values can be calculated.
 - D. Before beginning test, zero the pressure sensor, then measure and record the baseline building differential pressure across the airflow measurement device with the blower off.
 - E. Start the blower door fans and pressurize/depressurize the building to the highest induced pressure differential. Measure and record the building envelope pressure differential. If there are fluctuations in pressure due to wind, take pressure measurements on the windward and leeward sides of the building and average the readings. If the building's height or building configuration causes internal building pressure fluctuations, then take multiple readings and average.
 - F. Perform a minimum of 10 building envelope pressure differentials and corresponding airflow measurements in both the pressurization and de-pressurization modes (a total of 20 readings). Measurements shall be taken over a minimum of 10 seconds.
 - G. Measure and record wind velocity, indoor and outdoor temperatures at the end of the test so that their average values can be calculated.
 - H. Phased projects, or areas under renovation with new exterior envelopes may be tested separately in lieu of a whole building test.

3.5 THERMOGRAPHY TEST GENERAL PROCEDURES

- A. Test the building using infrared thermography technology in accordance with ASTM C1060 or ISA 6781. Take thermal images before the air barrier testing and again during the air barrier test so areas where there are envelope leaks are detected.
- B. If the building air barrier test fails, perform the thermography procedures before and during subsequent tests to document repairs or areas where deficiencies still exist.
- C. Provide a report including thermographic images in color and a color temperature scale for comparison. The report should identify the high temperature reading, outdoor air temperature and building indoor temperature in addition to the exterior wind speed and direction. Note any areas of deficiency in the building envelope, and recommended actions to remedy deficiencies, and note all actions taken to remedy deficiencies. The final report shall note that all deficiencies have been corrected or what areas could not be practicably repaired. Copies of the report shall be included in the O&M and Commissioning records.

END OF SECTION 07 08 00

AIR BARRIER PRE-TEST CHECKLIST

BUILDING COMPONENT	ENVELOPE CONDITION		GC INITIAL
	CLOSED	OPEN	
Exhaust fans with back draft dampers	Sealed	No Preparation	
Supply fans with backdraft dampers	Sealed	No Preparation	
Mechanical Room doors if outside test zone	Closed	Closed	
Combustion air intake dampers for boilers	Closed	Closed	
Outside air damper for air handler inside test area	Sealed	Closed	
Outside air intake for air handler inside test area without damper	Sealed	No Preparation	
Exhaust, Air Handling Units, Make Up Air Units, Energy Recovery Units, Supply Fans, Furnaces, Fan Coil Units, Boilers, Gas Hot Water Heaters, All equipment requiring combustion air (including kitchen equipment, HVAC, etc.)	Off	Off	
Fan inlet grilles with motorized damper	Closed	Closed	
Fan inlet grilles without motorized damper	Sealed	No Preparation	
Ventilators designed for continuous use	Sealed	Sealed	
Supply and Exhaust ventilation dampers	Sealed	Held Closed	
Clothes Dryer	Off	Off	
Clothes Dryer if connected to dryer vent	No Preparation	No Preparation	
Vented combustion appliance	Off	Off	
Ventilation to other zones	Sealed	Sealed	
Windows	Closed and Latched	Closed and Latched	
Exterior Doors	Closed and Latched	Closed and Latched	
Window Air Conditioners	Sealed	No Preparation	
Through the wall AC outside air vent	Sealed	No Preparation	
All HVAC ducts going from inside test area to outside test area or outside into the test area	Sealed	Sealed	
All electrical conduits going from inside the test area to outside the test area or outside into the test area	Sealed	Sealed	
Openings within the test area (doors, windows, etc.)	Open	Open	
Floor drains and drain traps	Filled	Filled	
Elevator Pressure relief openings	Closed	Closed	
Elevator doors	Closed	Closed	
Elevator door frame spacing between the elevator door and frame if elevator connects an area outside the air barrier	Sealed	Open	
Elevator door frame spacing between the elevator door and frame if the elevator connects an area within the air barrier	Open	Open	
Rooms with exterior, non-ducted louvers (interior doors)	Closed	Closed	
Loading Dock Doors (interior doors)	Closed	Closed	
Other openings between test area and exterior	Closed or Sealed	Closed or Sealed	

The above items have been completed and checked prior to air barrier testing

Contractor: _____ Test Technician: _____ Date: _____

SECTION 07 11 13 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Cold-applied, emulsified-asphalt damp proofing. Install at sub-grade side of retaining walls and the exterior side of all foundation walls and footings. Do not expose above finish grade.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
- B. Material Certificates: For each product, signed by manufacturers.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain primary damp proofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.4 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit damp proofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of damp proofing in enclosed spaces. Maintain ventilation until damp proofing has cured.

PART 2 - PRODUCTS

2.1 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ChemMasters Corp.
 - 2. Degussa Building Systems; Sonneborn Brand Products.
 - 3. Gardner Gibson, Inc.
 - 4. Henry Company.
 - 5. Karnak Corporation.
 - 6. Koppers Inc.
 - 7. Malarkey Roofing Products.
 - 8. Meadows, W. R., Inc.
 - 9. Tamms Industries, Inc.
- C. Trowel Coats: ASTM D 1227, Type II, Class 1.
- D. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
- E. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
- F. VOC Content: 0.25 lb/gal. or less.

2.2 PROTECTION COURSE

- A. Protection Course: Un-faced, fan-folded, extruded-polystyrene board insulation, nominal thickness 1/4 inch with compressive strength of not less than 8 psi per ASTM D 1621.

2.3 MISCELLANEOUS MATERIALS

- A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
- B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- C. Patching Compound: Epoxy or latex-modified repair mortar of type recommended by damp proofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
 - 1. Proceed with damp proofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
 - 2. Test for surface moisture according to ASTM D 4263.

3.2 PREPARATION

- A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with damp proofing. Prevent damp proofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.
- C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
 - 1. Apply additional coats if recommended by manufacturer or if required to achieve coverages indicated.
 - 2. Allow each coat of damp proofing to cure 24 hours before applying subsequent coats.
 - 3. Allow 48 hours drying time prior to backfilling.
- B. Apply damp proofing to footings and foundation walls where opposite side of wall faces building interior.
 - 1. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches over outside face of footing.
 - 2. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of damp proofing. Damp proofing coat for embedding fabric is in addition to other coats required.
 - 4. Remove all damp proofing that is exposed after adjacent finish grade is achieved.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. On Concrete Foundations Foundation Walls: Apply 2 brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, or 1 trowel coat at not less than 4 gal./100 sq. ft..
- B. On Unexposed Face of Concrete Retaining Walls: Apply 1 brush or spray coat at not less than 1.25 gal./100 sq. ft..
- C. Apply from finish grade elevation to bottom of footings
- D. Seal items projecting through damp proofing surface with mastic. Seal watertight

3.5 INSTALLATION OF PROTECTION COURSE

- A. Install protection course over completed-and-cured damp proofing. Comply with damp proofing material manufacturer's written recommendations for attaching protection course.
 - 1. Support protection course with spot application of adhesive of type recommended by protection board manufacturer over cured coating.
 - 2. Install protection course within 24 hours of installation of damp proofing (while coating is tacky) to ensure adhesion.

3.6 CLEANING

- A. Remove damp proofing materials from surfaces not intended to receive damp proofing. Applied damp proofing shall not be visible once final finish grade is achieved or adjacent building element is set.
- B. Remove damp proofing materials, including protection board from surfaces exposed to view after finish grading is complete.

END OF SECTION 07 11 13

SECTION 07 21 13 - BOARD INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Rigid board insulation at perimeter foundation walls, and sub-floor insulation for Building.
- B. Performance Requirements
 - 1. Materials of this Section shall provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials in this Section.

1.2 REFERENCES

- A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
- B. ASTM International (ASTM) (www.astm.org):
 - 1. C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - 2. C203 - Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
 - 3. C209 - Standard Test Method for Cellulosic Fiber Insulating Board.
 - 4. C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - 5. C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - 6. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 7. E96 - Standard Test Method for Water Vapor Transmission of Materials.
 - 8. E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.
- C. Current International Building Code.

1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Provide data on product characteristics, performance criteria, and limitations.
- C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Samples: 12 by 12 inch samples of each insulation.
- F. Sustainable Design Criteria - Product Data for building insulation to be Greenguard certified or specified as no added urea formaldehyde resins used during manufacturing.

1.4 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three (3) years experience.
 - 2. Applicator: Company specializing in performing the work of this section with minimum three years experience, approved/certified by manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - a. Retain subparagraph below if test results are indicated with other product requirements in Part 2. Retain only test methods applicable to types of characteristics specified.
 - b. Surface-Burning Characteristics: ASTM E 84.
 - c. Retain subparagraph below only if products specified in Part 2 are part of a fire-resistance-rated assembly.
 - d. Fire-Resistance Ratings: ASTM E 119.

- e. Pass-fail test in subparagraph below is for measuring combustibility and is referenced in codes to determine if elementary products are noncombustible. Only selected un-faced mineral-fiber insulation and un-faced cellular-glass insulation pass this test. Delete if not required. See Evaluations.
- f. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
 - 1. Protect plastic insulation as follows:
 - a. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - b. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 - c. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.
- B. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation

1.6 PROJECT/SITE CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate Work under provisions of Instructions to Bidders.
- B. Sequence work to ensure timely placement of insulation within construction spaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers - Extruded Polystyrene Board Insulation XPS
 - 1. Dow Chemical. (www.building.dow.com)
 - 2. CertainTeed. (www.certainteed.com)
 - 3. Owens-Corning. (www.owenscorning.com)
 - 4. Substitutions of equivalent products under Division 01.
- B. FOAM-PLASTIC FOUNDATION WALL BOARD INSULATION
 - 1. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:
 - a. Available Manufacturers:
 - 1. DiversiFoam Products.
 - 2. Dow Chemical Company.
 - 3. Owens Corning.
 - 4. Pactiv Building Products Division.
 - b. Type IV, 1.60 lb/cu. ft., unless otherwise indicated.
 - c. Two inches thick, R-10
 - d. Comply with WSSP requirements stated in section 01.
 - a. Substitutions of equivalent products under provision in Division 01.

2.2 INSULATION FASTNERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:
 - 1. Available Products:

- a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
 - b. Eckel Industries of Canada; Stic-Klip Type N Fasteners.
 - c. Gemco; Spindle Type.
- 2. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch between face of insulation and substrate to which anchor is attached.
 - a. Available Products:
 - 1. Gemco; Clutch Clip
- 3. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
 - a. Available Products:
 - 1. AGM Industries, Inc.; TACTOO Adhesive.
 - 2. Eckel Industries of Canada; Stic-Klip Type S Adhesive.
 - 3. Gemco; Tuff Bond Hanger Adhesive.

2.3 ACCESSORIES

- A. Tape: Minimum 3 inches wide, pressure sensitive, waterproof, as recommended by Manufacturer.
- B. Liquid spray flashing: Provide insulation Manufacturer's recommended board joint commercial liquid spray flashing and sealant for sealing joints, seams, openings, counter-flashing and penetrations through the insulation layer

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify site conditions under provisions of Division 01.
- B. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation.
- C. Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials or substances that may impede installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Substrate:
 - 1. Remove protrusions flush with adjacent surface.
 - 2. Remove dirt, dust, oil, grease, and other materials that could impair adhesion.

3.3 INSTALLATION OF VAPOR RETARDERS

- A. Reference section 03 30 00 for under-slab vapor barrier requirements.
- B. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- C. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c. maximum.
- D. Before installing vapor retarder, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- E. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- F. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

- G. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.4 INSTALLATION

- A. General:
 - 1. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
 - 2. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
 - 3. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
 - 4. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- B. Foundation:
 - 1. Apply adhesive in continuous beads per board length at 1 bead per vertical foot minimum.
 - 2. Adhere boards to foundation wall perimeter, horizontally. Place boards in a method to maximize contact bedding. Butt ends tight to adjacent board and to protrusions.
 - 3. Install on inside face of wall from top of footing to top of concrete slab elevation.
 - 4. Butt edges and ends tight to adjacent boards, at perimeter, and around penetrations.
 - 5. Cut and fit insulation tight at perimeter and around penetrations.
 - 6. Tape seal to perimeter and at joints between insulation pieces.
 - 7. If not otherwise indicated, extend insulation vertically a minimum of **24 inches** below exterior grade line behind face of the foundation wall.
- C. Walls:
 - 1. Fasten boards to wall with anchors and veneer ties. Apply adhesive in continuous beads per board length at one bead per vertical foot minimum.
 - 2. Butt edges and ends tight to adjacent boards, at perimeter, and around penetrations.
 - 3. Cut and fit insulation tight at perimeter and around penetrations.
 - 4. Seal to perimeter, joints, seams, openings, counter-flashing and penetrations through the insulation layer using Manufacturers documented approved tape or liquid spray sealant.
 - 5. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.
 - a. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
 - b. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system
 - 6. Wall board shall be covered within 60 days of installation to avoid UV damage to weather barrier face. All board left exposed for greater than 60 days shall be removed and replaced with new wall board.

3.5 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division 01.

3.6 PROTECTION

- A. Protect finished Work under provisions of Instructions to Bidders.
- B. Do not permit Work to be damaged prior to covering insulation.
- C. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 13

SECTION 07 21 16 - BLANKET INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Blanket insulation in exterior wall, floor, ceiling, and roof assemblies.
 - 2. Acoustical blanket insulation in interior walls where shown on Drawings.
 - 3. Acoustical/Sound attenuation batt insulation in interior walls where shown on Drawings.
 - 4. Installation of vapor retarders specified in Division 07.
- B. Performance Requirements:
 - 1. Materials of this Section shall provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials in this Section.
 - 2. Materials of this Section shall provide continuity of vapor and air barrier at building enclosure elements in conjunction with vapor retarders and air barriers.

1.2 REFERENCES

- A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
- B. ASTM International – American Society for Testing and Materials. (ASTM) (www.astm.org):
 - 1. C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot-Plate Apparatus.
 - 2. C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
 - 3. C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 4. C1029 - Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
 - 5. C1289- Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
 - 6. D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 - 7. D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 - 8. D2842 Standard Test Method for Water Absorption of Rigid Cellular Plastics
 - 9. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 10. E96 - Standard Test Methods for Water Vapor Transmission of Materials.
 - 11. E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.
- C. Current edition - International Building Code.

1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Provide data on product characteristics, performance criteria, and limitations.
- C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Quality Control Submittals:
 - 1. Certificates of Compliance: Certification from an independent testing laboratory that insulation meets fire hazard classification requirements.
- F. Sustainable Design Criteria: Product Data for building insulation to be Greenguard certified or specified as no added urea formaldehyde resins used during manufacturing.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years' experience.

2. Applicator: Company specializing in performing the work of this section with minimum three (3) years' experience, approved/certified by Manufacturer.
 - B. Fire Hazard Classification:
 1. Noncombustible, tested to ASTM E136.
 2. Flame spread/smoke developed rating of 25/50 or less, tested to ASTM E84.
 - C. Pre-Installation Conference
 1. Convene one week prior to commencing work of this section, under provisions of Division 01.
- 1.5 PROJECT/SITE CONDITIONS
- A. Store insulation in clean, dry, sheltered area, off ground or floor, until used. Protect against wetting and moisture absorption
- 1.6 SEQUENCING AND SCHEDULING
- A. Coordinate the Work with Division 07 – Vapor Retarder and Division 07 – Air Barrier.
 - B. Coordinate Work under provisions of Division 01.
 - C. Sequence work to ensure timely placement of insulation within construction spaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Batt and Blanket Insulation:
 1. Knauf Insulation. (www.knaufinsulation.us)
Product: Faced and un-faced fiberglass batt and blanket insulation.
 2. Owens-Corning. (www.owenscorning.com)
 3. Substitutions: Under provisions of Division 01.
- B. Sound Insulation:
 1. Knauf Insulation. (www.knaufinsulation.us)
Product: Un-faced fiberglass batt sound attenuation insulation.
 2. Owens-Corning. (www.owenscorning.com)
 3. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

- A. Exterior Stud Walls: Un-faced pre-formed glass mineral fiber batt, friction fit (where interior vapor barrier and wall finish is indicated).
 1. Thermal Insulation
 - a. Thermal resistance: R of 13 (4 inch nominal walls), R of 21 (6 inch nominal walls) and R of 25 (8 inch nominal walls).
 - b. Batt width: Match framing spacing for friction fit.
- B. Miscellaneous wall infill framing (above finish): Faced pre-formed glass mineral fiber batt.
 1. Thermal Insulation
 - a. Thermal Resistance: R of 21 (6 inch nominal walls)
 - b. Batt width: Match framing spacing and provide extra wide stapling flanges as required for installation shown.
 - c. Facing FSK (Foil-Scrim-Kraft) vapor retarder facing.
- C. Interior stud walls: Un-faced pre-formed glass mineral fiber sound attenuation batt insulation, friction fit.
 1. Acoustic insulation, ASTM C665 Type I, ASTM E136
 - a. Minimum of 10 STC improvement.
 - b. Thickness as required to fill nominal stud cavity (3.5 or 5.5 inch)
 - c. Batt width (5-1/4 inch, 22 inch as required for friction fit).

2.3 INSULATION FASTNERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:
 - 1. Available Products:
 - a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
 - b. Eckel Industries of Canada; Stic-Klip Type N Fasteners.
 - c. Gemco; Spindle Type.
 - 2. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch between face of insulation and substrate to which anchor is attached.
 - a. Available Products:
 - 1. Gemco; Clutch Clip
 - 3. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
 - a. Available Products:
 - 1. AGM Industries, Inc.; TACTOO Adhesive.
 - 2. Eckel Industries of Canada; Stic-Klip Type S Adhesive.
 - 3. Gemco: Tuff Bond Hanger Adhesive.

2.4 ACCESSORIES AND MATERIALS

- A. Include insulation baffles where required for continuous ventilation. Include dimensional lumber furring strips as staple flanges to span truss webs where insulation is indicated at margin below top chord of trusses.
- B. Tape: Minimum 4 inches wide, pressure sensitive, foil faced, waterproof.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify site conditions under provisions of Division 01.
- B. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation.
- C. Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials or substances that may impede installation.

3.2 PREPARATION

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

3.3 INSTALLATION

- A. Install in accordance with NAIMA "Recommendations for Installation in Residential and Other Light-Frame Construction – Fiber Glass Building Insulation" and manufacturer's instructions.
- B. Surface Application: Apply insulation directly to surface with appropriate spindle or prong-type anchors.
 - 1. Fasten anchors to steel surfaces by welding the pin to metal or by using pre-attached heads and welded through the insulation.
 - 2. Fasten anchors to other substrates with adhesive. Follow manufacturer's recommendations for surface preparation and adhesive pattern.
 - 3. Impale insulation on anchor and secure with washer.
 - 4. Select pin lengths to ensure tight fit. Protect pin tips where subject to human contact
 - 5. See manufacturer's diagram for impaling pin pattern.
- C. Between Studs, Rafters, and Joists:
 - 1. Un-faced Insulation: Friction fit insulation between framing members after cover material has been installed on one side of cavity. In applications without a cover material, use wire or metal straps to hold insulation in place.

2. Faced Insulation: Staple attachment flanges to face or side of framing member every 8 to 12 inches (200 to 305 mm) on verticals, every 6 to 8 inches (150 to 200 mm) on horizontals and slopes.
 3. Faced Insulation: Friction fit insulation between framing members after cover material has been installed on one side of cavity. In applications without a cover material, use wire or metal straps to hold insulation in place.
- D. Over Suspended Ceilings:
1. Install insulation with face contacting back of ceiling panels; butt insulation tightly together at edges to prevent thermal leaks.
- E. Maintain vapor retarder integrity by tightly abutting adjacent insulation.
- F. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- G. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- H. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- I. Install 3-inch- thick or 5-inch thick, un-faced sound attenuation blanket insulation in walls indicated and over suspended ceilings at partitions in a width that extends insulation 48 inches on either side of partition.
- J. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
- K. Insulation Tape:
1. Repair punctures or tears in vapor retarder facing by taping.
 2. Follow tape Manufacture's application recommendations.
 3. Apply with vapor barrier facing towards interior of structure.
 4. Tape seal lapped flanges, butt ends, and tears and holes in facings.
- 3.4 FIELD QUALITY CONTROL
- A. Field inspection and testing will be performed under provisions of Division 01.
- 3.5 PROTECTION
- A. Protect finished Work under provisions of Division 01.
- B. Do not permit Work to be damaged prior to covering insulation.

END OF SECTION 07 21 16

SECTION 07 21 29 - SPRAYED INSULATION

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fiber Insulation Spray applied to achieve a thermal and air seal.
 - 2. Foam-in-place masonry insulation, placed in all open cells of new concrete masonry walls.
 - 3. Spray polyurethane foam insulation at all exterior wall and roof envelope voids and crevices including but not limited to: walls, door frames, window frames, roof deck, and storefront conditions.
 - 4. Spray polyurethane foam insulation at all interior sound rated wall voids and crevices including but not limited to: walls, door frames, relite frames, and roof/ceiling deck. Note: filling voids shall occur at any wall shown to include acoustical insulation in the wall type.
- B. Performance Requirements:
 - 1. Materials of this Section shall provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials in this Section.
 - 2. Materials of this Section shall provide continuity of vapor and air barrier at building enclosure elements in conjunction with vapor retarders and air barriers.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - 2. C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 3. C1029 - Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
 - 4. C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facing.
 - 5. D1621 - Standard Test Method of Compressive Properties of Rigid Cellular Plastics.
 - 6. D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 - 7. D2126 - Standard Test Method for Response for Rigid Cellular Plastics to Thermal and Humid Aging.
 - 8. D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics
 - 9. D5116 - Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.
 - 10. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 11. E96 - Standard Test Methods for Water Vapor Transmission of Materials
 - 12. E283 - Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.
 - 13. E1623 - Standard Test Method for Determination of Fire and Thermal Parameters of Materials, Products, and Systems Using and Intermediate Scale Calorimeter (ICAL)
- B. Current International Building Code.

1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Provide data on product characteristics, performance criteria, and limitations.
- C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Quality Control Submittals
 - 1. Certificates of Compliance: Certification from an independent testing laboratory that insulation meets fire hazard classification requirements.

- F. Sustainable Design Criteria: Product Data for building insulation to be Greengard certified or specified as no added urea formaldehyde resins used during manufacturing.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Minimum five (5) years documented experience in work of this Section.
- B. Fire Hazard Classification: Maximum flame spread/smoke developed rating of 25/450, tested to ASTM E84.
- C. Qualifications
 - 1. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years' experience.
 - 2. Applicator: Company specializing in performing the work of this section with minimum three years' experience, approved/certified by manufacturer.
- D. Pre-Installation Conference
 - 1. Convene one week prior to commencing work of this section, under provisions of Instructions to Bidders.

1.5 PROJECT CONDITIONS

- A. Do not apply insulation when air or surface temperature is less than 50 degrees F, nor when such temperatures are anticipated within 24 hours after application.
- B. Consult Manufacturer for application procedures during excessively humid or other adverse weather conditions.
- C. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate the Work with Division 07 for installation of weather barrier and vapor retarders.
- B. Do not position ducts, piping, conduit, and other suspended equipment that will interfere with uniform application until after application.
- C. Place conduit, boxes, wiring, plumbing lines, and other components prior to application of insulation where these can be anticipated in advance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. CertainTeed Corp. (www.certainteed.com)
 - 1. Product: Closed Cell Certa-Spray Foam
- B. BASF Corporation (www.basf.com)
 - 1. Product: Spraytight
- C. BaySystems North America, LLC. (www.baysystems-northamerica.com)
 - 1. Product: Ecobay
- D. Dow Chemical Company (www.dow.com)
 - 1. Product: Froth-Pak
- E. Icynene (www.icynene.com)
 - 1. Product MD-C-200
- F. Accella Polyurethane Systems
 - 1. Product: equal to basis of design.
- G. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

- A. Closed Cell Polyurethane Foam Insulation:
 - 1. ASTM C1029, Type II, with maximum flame-spread and smoke-developed indexes of 25 and 460, respectively, per ASTM E84.
 - 2. Thermal Performance (aged): Tested in accordance with ASTM C518 and/or ASTM C177 at 75 degrees F mean temperature.
 - a. Thickness 1 inch, R-Value 5.8 (h-ft2-degreedF)/Btu.

- b. Thickness 6 inches, R-Value 38.4 (h-ft2-degreesF)/Btu.
- 3. Apply to a thickness to achieve a minimum R rating of 38. (Approximately 6 inches thick).
- 4. Physical and Mechanical Properties:
 - a. Core Density: 1.9-2.4 pcf when tested in accordance with ASTM D1622.
 - b. Thermal Resistance (Initial): 6.4 when tested in accordance with ASTM C518 at 75 degrees F, (h-ft2 – degrees F)/Btu.
 - c. Closed Cell Content: 88-95 percent when tested in accordance with ASTM D2842.
 - d. Compressive Strength: Greater than 25 psi when tested in accordance with ASTM D1621.
 - e. Tensile Strength: 23 psi when tested in accordance with ASTM E1623.
 - f. Water Absorption: Less than 2 percent by volume when tested in accordance with ASTM D2842.
 - g. Dimensional Stability: Less than 9 percent by volume when tested in accordance with ASTM D2126 at 75 degrees F/95 percent RH, 28 Day.
 - h. Water Vapor Transmission: 1.3 perm/inch when tested in accordance with ASTM E96.
 - i. Air Permeability: 0.013 when tested in accordance with ASTM E283 at 1 inch thickness, L/s/m2.
 - j. Fungi Resistance: Pass, with no growth when tested in accordance with ASTM C1338.
- 5. Fire performance:
 - a. Flame Spread: Less than 25 when tested in accordance with ASTM E84.
 - b. Smoke: Less than 450 when tested in accordance with ASTM E84.
- 6. Fire performance:
 - a. Flame Spread: Less than 25 when tested in accordance with ASTM E84.
 - b. Smoke: Less than 450 when tested in accordance with ASTM E84.
- 7. Products used within the building shell shall comply with the VOC limit requirements stated in section 01 81 14.

B. FOAM-IN-PLACE MASONRY INSULATION

- 1. Available Manufacturers:
 - a. Tailored Chemical Products, Inc. Product: Core-Fill 500
 - b. CoreFoam Inc. Product: CoreFoam
 - c. Substitution Requests under provisions of Division 01
- 2. ASTM E-84: Flame spread less than 25, Smoke developed less than 450.
- 3. Thermal Conductivity: R-value 4.6 per inch minimum

2.3 ACCESSORIES, MATERIALS AND FASTENERS

- A. Adhesive and anchoring attachment method as recommended by Manufacturer. Provide all materials required for complete and proper installation of insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify site conditions under provisions of Division 01.
- B. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation.
- C. Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials or substances that may impede installation.

3.2 PREPARATION

- A. Clean surfaces to remove oil, grease, dirt, and other materials that could impair bond.
- B. Test painted steel surfaces to verify that paint will not impair bond.
- C. Protect adjacent surfaces from accidental application.
- D. Coordinate foam-in-place injection holes with masonry bond beams.

3.3 APPLICATION

- A. Install in strict accordance with Manufacturer's published instructions.
- B. Product must be installed according to local code, and must be applied by a qualified applicator.
- C. Fill all open cells of exterior masonry walls not grouted-solid. Reference drawings for locations. Patch masonry injection holes for smooth surface.
- D. Apply insulation by spray method, to uniform monolithic density without voids.
- E. Apply to achieve thermal resistance R-Value of 38 minimum.
- F. Apply insulation to seal voids at truss ends to prevent wind scouring of ceiling insulation.
- G. Seal plumbing stacks, electrical wiring and other penetrations into attic to control air leakage.
- H. Do not install spray foam insulation in areas where it will be in contact with equipment or materials with operating temperatures of 180 degrees F or greater.
- I. Apply insulation in unvented roof spaces and cathedral ceiling areas.
- J. Fill all perimeter building envelope voids for air tightness standards of the Energy Star Program. In-fill all voids with spray insulation for complete thermal and air seal.
- K. Apply sealant to joints between structural assemblies as specified in 079200 – Joint Sealants.
- L. Inspection will include verification of insulation and density.

3.4 ADJUSTING

- A. Inspect areas for complete coverage; correct unacceptable work and patch.
- B. Patch damaged and cut areas.
- C. Replace areas where excessive shrinkage or cracking is evident.

3.5 PROTECTION

- A. Protect finished Work under provisions of Instructions to Bidders.
- B. Do not permit Work to be damaged prior to covering insulation.

END OF SECTION 07 21 29

SECTION 07 22 16 - ROOF BOARD INSULATION

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Rigid insulation system standing seam system.
 - 2. Rigid insulation system for low slope single ply membrane roof systems.

1.2 REFERENCES

- A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
- B. American Society of Civil Engineers (ASCE) Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International (ASTM):
 - 1. C208 - Standard Specification for Cellulosic Fiber Insulating Board.
 - 2. C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - 3. C728 - Standard Specification for Perlite Thermal Insulation Board.
 - 4. C1177- Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - 5. C1278 - Standard Specification for Fiber-Reinforced Gypsum Panel.
 - 6. C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - 7. D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - 8. E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- D. Factory Mutual Insurance Co. (FM) Property Loss Prevention Data Sheet 1-28 - Design Wind Loads.
- E. Current edition – International Building Code.
- F. Current edition – International Fire Code.
- G. Current edition – International Mechanical Code.
- H. Current edition – International Plumbing Code.
- I. Current edition – International Energy Efficiency Code.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements: Design roofing system to resist minimum wind loads in accordance with FM I-28.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Submittals for Review:
 - 1. Product Data: Manufacturer's descriptive data including thermal values.
 - 2. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
 - 3. Shop drawings indicating taper plan, showing roof slopes.
 - 4. Shop drawings for insulation fastening patterns for corner, perimeter, and field-of-roof locations.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum five (5) years documented experience in work of this Section.
- B. Roof Insulation Attachment: Conform to requirements for FM 1-90 Windstorm Classification.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Protect materials against moisture absorption, direct sunlight, damage, and temperatures above 110 degrees F and below 30 degrees F.
- B. Store materials off ground or roof deck on pallets. Cover materials stored outside with breathable covering, properly vented.

PART 2 - PRODUCTS

2.1 Rigid insulation system STANDING SEAM SYSTEM

- A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.
- B. Insulation
 - 1. Insulation: Closed cell Polyisocyanurate board with fiber reinforced facers uniforming to FS-HH-I-1972/GEN with minimum aged R-Value listed, as required to satisfy Class B fire hazard classification. Minimum thickness: as required to provide listed R-Value over any occupied, heated spaces. Stagger overlapping rigid insulation seams. Install 6 inch thickness (2 layers minimum) for **R-38 thermal value**.
 - 2. Tapered Insulation for crickets: Closed cell Polyisocyanurate board with fiber reinforced facers uniforming to FS-HH-I-1972/GEN with minimum aged R-Value listed per drawings, as required to satisfy Class B fire hazard classification. Taper as required to provide ½" per foot slope as finished in the field. Apply all tapered insulation between layers of required insulation.
 - 3. Separation Sheet: As required by manufacturer.
 - 4. Insulation or protection board must be accepted in writing by the membrane manufacturer. All insulations must be approved by their manufacturer for mechanically attached installations.
 - 5. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated. Fabricate all saddles, crickets, tapered edge strips, cants and other insulation shapes in polyisocyanurate to match board insulation.
- C. Fasteners:
 - 1. Corrosion resistant screw fastener as recommended by roof membrane manufacturer.
 - 2. Factory Mutual Tested and Approved with three (3) inches coated disc for 1-90 rating, length required to penetrate metal deck one inch.

2.2 Rigid insulation system for low slope single ply membrane roof systems and low slope metal roof system:

- A. Roof Board Insulation:
 - 1. Manufacturer: Sika Sarnafil. (www.usa.sarnafil.sika.com). Substitutions: Under provisions of Division 01.
 - 2. General: Preformed roof insulation boards manufactured or approved by single ply membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.
 - 3. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, glass-fiber mat facer on both major surfaces. Install thickness to get required r-value (2 layers minimum) for **R-38 thermal value**.

4. ASTM C1289, Type II, Class 1, 20 PSI Min., felt or glass-fiber mat facer on both major surfaces.
 5. Roof insulation must be installed in multiple offset layers as directed by Membrane Manufacturer.
 6. Roof insulation materials must pass FM 4450 or UL 1256 for limits of support of combustion or roofing system must include a thermal barrier complying with ASTM E 119.
- B. Roof Board Tapered Insulation:
1. Manufacturer: Insulfoam. (www.insulfoam.com). Substitutions: Under provisions of Division 01.
 2. Expanded Polystyrene Tapered Insulation.
 3. Provide factory-tapered insulation boards fabricated to slope of ¼ inch or ½ inch per foot min. unless otherwise indicated.
 4. Provide ASTM C578, Type II, 1.5 lb/ft min. density closed cell expanded polystyrene board contour taper tile.
 5. Tapered insulation to sandwich between layers of polyisocyanurate board.
 6. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain.
 7. Fabricate to slopes indicated.
 8. Fabricate all saddles, crickets, tapered edge strips, cants and other insulation shapes in polyisocyanurate to match board insulation.
- C. Cover Board:
1. Manufacturer: Georgia Pacific DensDeck. (www.buildgp.com). Substitutions: Under provisions of Division 01.
- D. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick, factory primed. Only provide coverboard if required by roofing manufacturer to meet IBC Section 2603.4 requirements for a Class B classification.
- 1.
 2. Dens Deck and Dens Deck Prime where indicated.
 3. Board size shall be 4-foot by 4-foot, unless otherwise authorized in writing by the adhesive manufacturer.

2.2 ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- B. Fasteners:
1. Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system Manufacturer.

PART 3 - EXECUTION

3.1 ROOFING INSULATION INSTALLATION – Low Slope Single Ply Roofing (reference 07 54 00)

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- A. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.
- B. Install tapered insulation under area of roofing to conform to slopes indicated.
- C. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more

layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
- D. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- F. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 1. Fasten insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
 2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
- G. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 1. Fasten first layer of insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
 2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
 3. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 4. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- H. Loosely Laid Insulation: Loosely lay insulation units over substrate.
- I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
 1. Fasten cover boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
 2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.2 THERMAL INSULATION INSTALLATION – Standing Seam Metal Roofing (Reference 07 61 13)

- A. Polyethylene Vapor Retarder: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Repair tears or punctures immediately before concealment by other work.
- B. Board Insulation: Extend insulation in thickness as indicated to cover entire roof, stagger seams. Comply with installation requirements of insulation and roofing systems manufacturers.
 1. Erect insulation and hold in place with furring members spaced 24 inches o.c. Securely attach narrow flanges of furring members to roof deck with screws spaced 24 inches o.c. Over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.

2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
3. As applicable, use adhesive to install and attach roof insulation to the indicated substrate
4. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

3.3 TOLERANCES

- A. Surface Flatness of Insulation: Plus or minus 1/4 inch in 10 feet maximum.

END OF SECTION 07 22 16

SECTION 07 26 00 - VAPOR RETARDERS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sheet and sealant materials for controlling vapor diffusion at exterior walls.
 - 2. Sheet and sealant materials for controlling vapor diffusion at roof deck.
- B. Performance Requirements
 - 1. Materials of this Section shall provide continuity of vapor at building enclosure elements, in conjunction with air barrier materials in Division 07.

1.2 REFERENCES

- A. Comply with all References in effect, most active, or latest version as of the date of the Contract Documents.
- B. ASTM International (ASTM):
 - 1. D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 - 2. D1709 - Standard Test Method for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
 - 3. D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
 - 4. E96 - Standard Test Method for Water Vapor Transmission of Materials.
 - 5. E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - 6. E1249 - Standard Practice for Minimizing Dosimetry Errors in Radiation Hardness Testing of Silicon Electronic Devices Using Co-60 Sources.
 - 7. E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 - 8. E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- C. International Building Code, current edition. (IBC).

1.3 SUBMITTALS

- A. Submittals for Review:
 - 1. Product Data: Include product description and performance characteristics.
 - 2. Samples: 12 by 12 inch vapor retarder samples.
 - 3. Independent laboratory test results showing compliance with ASTM standards.
 - 4. All mandatory ASTM testing must be performed on a single product roll.
 - 5. Manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- A. Permeance of less than 0.01 perms per ASTM E96 or ASTM E1249 as tested in accordance with mandatory conditioning tests per ASTM E1745.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Wall, Roof and Floor Vapor Retarder Manufacturers:
 - 1. Reinforced -Polyethylene Vapor Retarders: 2 outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft. with maximum permeance rating of 0.0507 perm.
 - a. Available Products
 - 1. Raven Industries Inc.; DURA-SKRIM 6WW.
 - 2. Reef Industries, Inc.; Griffolyn T-65.

- 3. Exceed requirements of ASTM D4397 and E154.
- b. Substitutions: Under provisions of Division 01.

2.2 ACCESSORIES

- A. Adhesive:
 - 1. Compatible with vapor retarder and substrate, permanently non-hardening.
- B. Joint Tape:
 - 1. Minimum 3 inches wide, pressure sensitive, waterproof, and documented compatible with vapor retarder.
 - 2. Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Vapor Proofing Mastic:
 - 1. Waterproof and documented compatible with vapor retarder.
- D. Perimeter Seal Accessories:
 - 1. Tack tape and termination bar documented compatible with vapor retarder.
 - 2. Single- Component Non-sag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.

PART 3 - EXECUTION

3.1 INSTALLATION – WALLS, ROOF AND FLOOR

- A. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Provide complete and continuous vapor retarder at exterior walls except where interrupted by glazing or other openings.
- C. Locate wall vapor retarder on interior side of wall framing and insulation.
- D. Install vapor retarder on metal roof deck under insulation.
- E. Install wood floor vapor retarder in two (2) layers.
- F. Apply adhesive to substrate in accordance with Manufacturer's instructions for application and coverage.
- G. Install vapor retarder without tears, voids, and holes.
- H. Lap ends and edges minimum 4 inches over adjacent sheets. Seal laps with tape.
- I. Extend vapor retarder to full perimeter of adjacent door frames, window frames, openings, and to utility and other penetrations interrupting plane of membrane.
- J. Tape seal lapped joints, tears, holes, perimeter, and penetrations through vapor retarder. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
- K. Before installing vapor retarder, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- L. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

3.2 REPAIR

- A. Inspect vapor retarder for damage just prior to covering.
- B. Clean damaged areas and cover with additional vapor retarder material cut minimum 6 inches larger than damaged area on all sides. Seal to main vapor retarder with continuous tape.

END OF SECTION 07 26 00

SECTION 07 42 13 – METAL WALL PANELS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preformed metal panel system, with related anchorage cleats, flashings, trim and accessory components.
 - 3. Exposed fastener exterior metal wall panel.
 - 5. Building wrap back-up over exterior walls.
- B. Design Requirements
 - 1. System to accommodate, without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.
 - 2. Accommodate positive drainage for moisture entering or condensation occurring within panel system, to exterior.

1.2 REFERENCES

- A. American Society for Testing and Materials.
 - B117: Method of Salt Spray Testing.
 - D822: Practice for operating light and water exposure apparatus (carbon arc type) for testing paint.
 - D1735: Method for water for testing of organic coatings.
- B. Federal Test Method Standards (FSC 8010).
 - 141A/6152: Accelerated weathering (enclosed arc apparatus).
 - 141A/6160: Conducting exterior exposure tests of paints on metals.
- C. National Coil Coaters Association.
 - NCCA II-6: Test method for measurement of impact resistance of painted aluminum or steel.
 - NCCA II-12: Specification for determination of relative pencil hardness.
 - NCCA II-16: Test method for determination of film adhesion by “cross hatch” tape test after reverse impact.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory-, shop- and field-assembled work.
 - 1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
 - a. Flashing and trim.
 - b. Anchorage systems.
- C. Samples for Initial Selection: For each type of metal wall panel indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.
 - 2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Metal Wall Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal wall panel accessories.
 - 2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.

- 3. Accessories: 12-inch- long Samples for each type of accessory.
- E. Qualification Data: For Installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product. Test reports from certified lab on ASTM E-84
- G. Maintenance Data: For metal wall panels to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of metal wall panel from single source from single manufacturer.
- C. Fire-Resistance Ratings: Where indicated, provide metal wall panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall panel, including soffit, as shown on Drawings, including insulation, supports, attachments, and accessories.
 - 2. Conduct water spray test of mockup of metal wall panel assembly, testing for water penetration according to AAMA 501.2.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Pre-installation Conference:
 - 1. Meet with Owner, Architect, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels, including installers of doors, windows, and louvers.
 - 2. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
 - 3. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 - 4. Review temporary protection requirements for metal wall panel assembly during and after installation.
 - 5. Review wall panel observation and repair procedures after metal wall panel installation.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal wall panel for period of metal wall panel installation.
- E. Protect foam-plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.

3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.
- 1.6 PROJECT / SITE CONDITIONS
 - A. Field Measurements, verify that field measurements are as indicated on shop drawings.
 - 1.7 EXTENDED WARRANTY
 - A. Provide under provisions of Division 01
 - B. Finish Warranty: Furnish panel manufacturer's written warranty covering failure of the factory applied exterior finish on metal wall panel within the warranty period of 20 years after the date of substantial completion of the project.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
 - A. Metal Panel System (reference drawings):
 1. See sub-sections below
 - B. Substitutions: Under provisions of Division 01.
- 2.2 METAL WALL PANELS
 - A. General: Provide factory-formed metal wall panels, in vertical orientation designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
 - B. Metal Wall Panel:
 1. Basis-of-Design Product: Subject to compliance with requirements, provide: AEP Span Flush Panel, concealed fastener Full 12" panel – non-perforated with 2 pencil ribs; or comparable product by one of the following:
 - a. CENTRIA Architectural Systems.
 - b. Fabral.
 - c. IMETCO.
 - d. MBCI; a division of NCI Building Systems, L. P.
 - e. Metal-Fab Manufacturing, LLC.
 - f. Metal Sales Manufacturing Corporation.
 2. Material: Zinc-coated (galvanized) steel sheet, 22 gauge nominal thickness.
 - a. Bare Steel Finish: Zincolume Plus.
 - b. Color: Dura Tech 5000 Colors (PVDF), final color to be match WSU Standard "Anthracite".
 3. Panel Coverage: 12 inches.
 4. Rib Height: 7/8" inch.
 5. Sealant: Factory applied within interlocking joint.
 6. Attachment: Concealed fastener.
 7. Performance/Certifications: Air/ Water Infiltration (ASTM), Fire Resistance - Wall (UL 263), Wind Uplift, IBC Code Compliance Report.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Examine substrate surfaces to receive metal panel system and associated work and condition which work will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.
 - B. Verify that building framing members are ready to receive panel system.
 - C. Beginning installation indicated acceptance of substrate conditions

3.2 PREPARATION

- A. Prepare substrate surfaces to insure proper and adequate installation in accordance with the contract document and approved shop drawings, or manufacturer's requirements.
- B. Field measure and verify dimensions as required.
- C. Protect adjacent areas or surfaces from damage as a result of the work in this section.

3.3 INSTALLATION

- A. Fasten panels to structural supports; erect panels plumb, level and true to intended plane.
- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/8 inch.
- C. Maximum offset from true alignment between adjacent members butting or in line: 1/16 inch.
- D. Anchor panels securely in place in accordance with manufacturer's approved submission drawings.
- E. Conform to manufacturer's instructions for installation attachment systems.
- F. Surfaces to receive panels shall be even, smooth, sound, clean and free from defects detrimental to panel installation. Needed correction of these surfaces shall be the responsibility of someone other than the panel manufacturer or the installer.
- G. Weatherseal all joints as required using methods and materials as recommended by the manufacturer. Seal and place gaskets to prevent weather penetration. Maintain neat appearance
- H. Locate joints over supports. End lap minimum 2 inches.
- I. Use concealed fasteners, clips, and cleats for wall panels and trims.
- J. In addition to complying with requirements in "Metal Roof Panel Installation, General" Article, install metal panels to comply with requirements in this article.
- K. Flash and seal panels with weather closures where metal panels meet walls, soffit and at perimeter of all openings.
- L. Metal Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fascia meet soffits, along lower panel edges, and at perimeter of all openings.

3.4 CLEANING

- A. Clean work under provisions of Division 01.
- B. Remove site cuttings from finish surfaces.
- C. Clean and wash pre-finished surfaces with mild soap and water, rinse with clean water.

END OF SECTION 07 42 13

SECTION 07 54 00 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 – GENERAL

1.1 SUMMARY

- A. Work Includes:
 - 1. Mechanically fastened membrane roofing system.
 - 2. Special coated metal flashings.
 - 3. Counterflashing membrane termination.
 - 4. Cover board
- B. System Description
 - 1. Thermoplastic sheet membrane roof assembly to conform to UL and IBC requirements for a Class B fire classification assembly.
 - 2. The work of this section shall include all necessary materials and installation to comply with the stated Building Code requirements. Should materials or methods beyond those specified herein be necessary for any manufacturer's system to comply with those stated requirements, the additional materials or methods shall be provided at no additional cost to the Project.

1.2 REFERENCES

- A. ASTM C 79 - Specification for Gypsum Sheathing Board.
- B. ASTM C 177 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
- C. ASTM C 578 - Specification for preformed, cellular Polystyrene Thermal Insulation.
- D. ASTM C 728 - Specification for Perlite Thermal Insulation Board.
- E. FS-HH-I-1972/Gen - Insulation Board, Thermal, Faced, Polyethylene or Polyisocyanurate.
- F. FM 4470 (Factory Mutual (FM) Engineering Corporation) - Roof Assembly Classifications.
- G. NRCA (National Roofing Contractors Association) - Roofing and Waterproofing Manual.
- H. UL 790 - Fire Hazard Classifications and IBC Fire Classification of 'B' minimum and UL 1256.
- I. Wind resistance per IBC 1504.1 and 1609.1.1 90 mph min. 3 second gust.
- J. ASTM C 518 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- K. Federal Specification No. HH-1-1972/GEN.

1.3 SUBMITTALS

- A. Under provisions of Division 01.
- B. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials. Include a seaming plan, with all flashing conditions indicated. These drawings shall be approved by the membrane manufacturer prior to the start of work. These must include: outline and size of the roof, location and type of penetrations, perimeter and penetration flashing detail references, and a copy of any non-standard details to be used. Details which do not conform to standard details must be accompanied by certification that the membrane manufacturer accepts these details for the overall warranted system.
- C. Product Data: Provide characteristics on membrane materials, flashing materials, insulation and anchorage/attachment material. Include all materials to be used on the project, including materials not provided by the membrane manufacturer.
- D. Compliance with specified physical properties and manufacturing requirements including: Physical properties, Thickness requirements, and Length of present membrane formulation.

- E. Manufacturer's Installation Instructions: Indicate special precautions required for seaming the membrane.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Accurately completed Request for Warranty form including information required for Roofing Membrane Manufacturer to issue a warranty at the completion of the project.
- H. Submit support data and test results showing that roofing system and accessories create a Class C roof minimum.
- I. Manufacturers:
 - 1. Pre-installation notification: include manufacturer reviewed and accepted sections, details, and Notice of Award documents identifying roofing and substrate assembly and specified warranty requirements.
 - 2. Warranty shall include exclusions and coverage including specified wind speeds, etc.
 - 3. Certification that manufacturer is in agreement to provide technical assistance such as a pre-job installation meeting, specified field inspections of the roofing installation and a final roofing inspection.
- J. Samples: For each product included in membrane roofing system
- K. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer: Company specializing in manufacturing the products specified in this section with five years experience.
 - 2. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing roofing similar to that required for this Project and who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product, before work commences.
 - 3. Perform Work in accordance with manufacturer's instructions.
- B. Regulatory Requirements: Fire-Test-Response Characteristics: Provide roofing materials with the fire-tests-response characteristics indicated as determined by testing identical products per test method indicated below by UL, FM, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency
 - 1. Exterior Fire-Test Exposure: Class B; ASTM E 108, for application and slopes indicated.
 - 2. Fire-Resistance Ratings; ASTM E 119, for fire-resistance-rated roof assemblies of which roofing materials are a part.
- C. Pre-installation Conference: Before installing roofing system, conduct conference at Project site to comply with requirements of Division 01 Section "Project Meetings." Notify participants including Owner at least 5 working days before conference.
 - 1. Meet with Owner; Architect and Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer, roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 4. Review loading limitations of deck during and after roofing.
 - 5. Review flashings, special roofing details, roof drainage, roof

- penetrations, equipment curbs, and condition of other construction that will affect roofing.
 - 6. Review governing regulations and requirements for insurance, certificates, and inspection and testing, if applicable.
 - 7. Review temporary protection requirements for roofing system during and after installation.
 - 8. Review roof observation and repair procedures after roofing installation.
 - 9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.
 - D. Apply roofing system using a roofing contractor authorized by roofing membrane manufacturer.
 - E. Inspection: Upon completion of the installation, an inspection shall be made by a representative of roofing membrane manufacturer to ascertain that the roofing membrane system has been installed according to specifications and details. Upon approval of the project, a Warranty shall be written.
- 1.5 DELIVERY, STORAGE AND HANDLING
- A. Transport, handle, store and protect products under provisions of Division 01.
 - B. All materials shall be delivered with appropriate packaging labels indicating appropriate warnings, storage conditions, lot numbers, and usage instructions.
 - C. Materials shall be stored in original undamaged packaging and storage conditions shall be maintained in accordance with manufacturers' requirements.
 - D. Store products in weather protected environment, clear of ground and moisture.
 - E. Adhesives, solvents, and caulks as indicated are extremely flammable and/or toxic. Follow precautions indicated on can and carton labels
- 1.6 SITE / PROJECT CONDITIONS
- A. Environmental Requirements
 - 1. Under Provisions of Division 01.
 - 2. Project Conditions: weather limitations: proceed with roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturers' written instructions and warranty requirements
 - 3. Do not apply roofing membrane during inclement weather. Follow manufacturer's instructions for cold temperature installation.
 - 4. Do not apply roofing membrane to damp or frozen deck surface.
 - 5. Surfaces to be bonded shall be dry, clean and free of debris. Suitable surfaces are considered to be smooth, and solid for receiving adhered roofing membranes
 - 6. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
 - 7. Use of Vapor Retarder: Install type recommended by roofing manufacturer.
- 1.7 SEQUENCING AND SCHEDULING
- A. Coordination
 - 1. Under provisions of Division 01.
 - 2. Coordinate the work with the installation of associated metal flashings, as the work of this section proceeds.
- 1.8 EXTENDED WARRANTY
- C. Submit and provide under provisions of Division 1
 - D. A roofing membrane manufacturer's representative shall inspect the installation of the Roofing System upon completion when presented for system warranty consideration
 - E. Upon acceptance thorough inspection, the manufacturer and installer shall execute the special warranties of this section

- F. Provide twenty (20) year water tightness warranty for water penetration and integrity of seals from date of substantial completion.
- G. Warranty: Include coverage of materials and installation for repairs resulting from failure of roofing system to resist penetration of moisture and to resist 90 mph wind. Liability under the warranty is set at the original price paid by the Owner for purchase and installation of the roof system.
- H. Provide Installer's extended warranty for a period of two (2) years from date of substantial completion.
- I. Warranty shall be no dollar limit (NDL). Manufacturer's standard without monetary limitations. Warranty shall state that ponding conditions will not void warranty.
- J. The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the contractor under requirements of the Contract Documents

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Membrane Material
 - a. Carlisle SynTec Incorporated.
 - b. Firestone Building Products Company.
 - c. Johns Manville.
 - d. GAF Everguard Extreme
 - 1. Substitutions - Under Provisions of Division 01.
- B. Insulation
 - 1. Manufacturer's standard as specified
 - 2. Schullar Roofing Systems
- C. Tapered Insulation
 - 1. Manufacturer's standard as specified
- D. Substitutions under provisions of Division 01, direct to architect on special substitution request form following this section.

2.2 MATERIALS

- A. Membrane shall be .060 in. nominal thickness overall, scrim-reinforced, Ethylene Propylene-based sheet 76.5 in. wide by appropriate length conforming to the minimum physical properties. Packaging to bear the UL label.
- B. Perimeter sheets: Perimeter Sheet with a minimum width of 38.25 inches and a maximum width of 52.5 inches. Two perimeter sheets shall be installed at all exterior roof perimeters that are not bordered by a parapet wall or an adjoining building a minimum of 24-in. higher than roof level.
- C. Membrane color shall be gray.
- D. Flashing shall be .045- in. thick membrane for walls and curbs regardless of roof cover sheet thickness. Unreinforced .055-in. thick, Ethylene Propylene-based membrane shall be supplied for field fabricated vent stacks, pipes, drains and corners.
- E. Adhesives, Sealants, Primers and Caulks:
 - Bonding Adhesive is designed for bonding TPO membranes to approved roof substrate surfaces.
 - Seam Caulk- designed to be used as a water cutoff mastic, sealant to top off pitch boxes, and an exterior grade caulk for metal work.
 - 3. Cut-Edge Sealant - a solvent-based caulk developed to seal exposed cut edges of reinforced membrane.
 - Seam Cleaner - a surface cleaner for use with TPO roofing systems.
- F. Mechanical Attachment:

1. Membrane: #14-10 fastener with 2-in. or 2 3/8-in. barbed metal seam plate, or as recommended by the membrane manufacturer
 2. Insulation: #12 or #14-10 fastener with 2 7/8-in. insulation plate, or as recommended by the membrane manufacturer
- G. Insulation: Insulation and isolation board must be accepted in writing by roofing membrane manufacturer. All insulations must be approved by their manufacturer for the specific installations.
- H. Edge Metal Systems. Edge Metal details and material as required by roofing membrane manufacturer. Termination bars fastened at 6" on center.
- J. Prefabricated Pipe Boots: Provide pre-fabricated pipe boots for correct size of roof penetrations as indicated.
- K. Prefabricated Corners: Provide pre-fabricated inside and outside flashing corners for correct size of roof penetration and curb flashing as indicated.
- M. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.

2.3 ACCESSORIES

- A. Roofing Screws: Galvanized, or non-ferrous type, size as required to suit application.
- B. Sealants: As recommended by membrane manufacturer.
- C. Strip Reglet Device: Galvanized steel; surface mounted, binder bars, maximum possible length per location, with attachment flanges.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, free of depressions, waves, or projections, and properly sloped to drain.
- D. Verify deck surfaces are dry and free of snow or ice. Confirm dry deck by moisture meter with 12 percent moisture maximum.
- E. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and wood nailing strips are in place.

3.2 PREPARATION

- A. The contractor shall be responsible for the suitability of the substrate surface to accept roofing membrane. In all cases, prior to the start of work, the substrate and parapet walls shall be smooth and free of debris, sharp edges, and other surface irregularities that will be detrimental to the installation. Any unevenness or joint gaps greater than 1/4-inch in the membrane substrate must be filled. When occurring, fill with appropriate and properly secured insulation or material approved by roofing membrane manufacturer.
- B. Metal deck shall have approved isolation board/sheathing and insulation layer fastened in place prior to installation of membrane.
- C. Vapor Retarder
 1. Apply vapor retarder to substrate surface with adhesive in accordance with manufacturer's instructions.
 2. Extend vapor retarder under cant strips and blocking to deck edge.
 3. Lap flexible flashing over vapor barrier of wall construction to provide continuity of vapor barrier seal. Coordinate with section 07 92 00.
- D. Nailers: Pressure preservative treated, wooden nailers shall be installed at gravel stops or drip edges.
 1. Nailer shall be anchored with a suitable fastener for the application having a minimum withdrawal resistance of 100 lbs staggered 6-in. o.c.

within 8 ft. of an outside corner, and 12-in. o.c. along other perimeter areas.

2. All construction: Nail thickness shall be chosen to match the top surface of adjacent construction (+or-) 1/4-inch.

3.3 APPLICATION

A. Membrane

1. Install roofing membrane over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
2. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
3. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
4. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
5. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
6. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
7. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
8. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
9. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
10. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
11. In-Splice Attachment: Secure one edge of roofing membrane using fastening plates or metal battens centered within membrane splice and mechanically fasten roofing membrane to roof deck. Field-splice seam.
12. Through-Membrane Attachment: Secure roofing membrane using fastening plates or metal battens and mechanically fasten roofing membrane to roof deck. Cover battens and fasteners with a continuous cover strip.
13. Install roofing membrane and auxiliary materials to tie in to existing roofing.
14. Roofing contractor shall coordinate installation to ensure the system is made watertight at the end of each workday.
15. Install a manufacture red approved assembly for a fully adhered system over the mechanical chase overbuild to accommodate the 4.5:12 slope.

B. Lap splice: Membrane shall be overlapped and hot air welded without any contaminants (adhesive, dirt, debris, etc.) prevalent in the seam.

1. Hot air welding: An automatic hot-air welder and hand-held welder which are functionally in top condition are required for membrane applications.
2. The entire lap edge must be probed with approved seam probing tool (Sears cotter-pin extractor) after it has cooled completely to verify seam consistency. Probing before the seam area has cooled will damage the membrane. In addition there should be destructive tests performed daily on a 3-in. wide area of seam weld to verify good peel strength. A properly welded seam will have membrane delamination from scrim prior to weld failure. Destructive tests on welds should be done for the first seam of the day, first seam after the welder has been allowed to cool

- down, and after any extreme changes in weather conditions. Cut edges shall be caulked by applying Primer/Caulk from a squeeze bottle.
- C. Perimeter fastening: Wood nailers are required for perimeter gravel stops or drip edges. Membrane may be fastened at other transitions, e.g. walls and curbs, by use of Hi-Tuff 2-in. plates and screws.
 - 1. Fire Treated Wooden Nailers: See requirements above and Division 06.
 - 2. Base of parapet or curb: Membrane shall be mechanically fastened 12-in. o.c. through Plate, Membrane, and insulation into deck. Fastening shall occur at parapet walls, curbs, skylights, expansion joints, and any other roof penetrations that exceed 24-inches in any dimension.
 - D. Special Fastening Pattern:
 - 1. All fasteners are recommended to be installed with a depth-sensing screw gun to prevent overdriving or under driving.
 - 2. One half sheet shall be laid out in a picture frame around the perimeter and fully attached.
 - 3. The perimeter side of the half sheet shall be fastened per the approved perimeter detail. The field side seam shall be fastened at 9-in. o.c.
 - E. Flashings and Accessories: Flashing: Perimeters, curbs, vents, expansion joints, drains, and other details shall be flashed
 - 1. Apply flexible flashings to seal membrane to vertical elements.
 - 2. Secure to nailing strips at min. 8 inches o.c.
 - 3. Coordinate installation of roof scuppers, gravel stops and related flashings.
 - 4. Seal flashings and flanges of items penetrating membrane.
 - 5. Apply Bonding Adhesive to both underside of flashing membrane and surface to which it is to be bonded
 - 6. Bonding Adhesive shall be allowed to dry until tacky to finger touch and until it does not string or stick to a dry finger. Roll the flashing into the dry adhesive. Care must be taken to assure that the flashing does not bridge where there is any elevation or directional change. Completely roll the flashing membrane against the substrate applying pressure to the entire surface area.
 - 7. All flashing shall be mechanically fastened at the top, under or through appropriate counterflashing with approved fasteners.
 - 8. Expansion joints shall be installed in accordance with standard manufacturer's details.
 - 9. Roof drains shall be installed in accordance with standard manufacturer's details. All bolts must be properly secured to supply 100% continuous compression of the clamping ring. Field seams shall not be run through drains.
 - F. Overnight seal/temporary water stop: Shall be made by a sealant method approved manufacturer to protect the insulation from inclement weather at the end of a day's work. The membrane is extended beyond the insulation and set into the approved overnight seal material. Roofing contractor shall coordinate installation to ensure the system is made watertight at the end of each work day.

3.4 FIELD QUALITY CONTROL

- A. Field inspection and testing under provisions of Division 01.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.
- C. Verify field strength of seams a minimum of twice daily, according to manufacturer's written instructions, and repair seam sample areas
- D. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect and Owner prior to final pay request. Architect 48 hours in advance of the date and time of inspection

- E. A representative of the roofing manufacturer is to perform an on-site inspection of the completed system and certify, in writing, that the system has been installed per manufacturer's requirements and as required for a 15-year warranty.
- F. Contractor shall correct identified defects or irregularities.

3.5 CLEANING

- A. Under provisions of Division 01.
- B. In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.
- C. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.7 PROTECTION OF FINISHED WORK

- A. Under provisions of Division 01.
- B. Protect building surfaces against damage from roofing work.
- C. Where traffic must continue over finished roof membrane, protect surfaces.
- D. Protect sheet membrane roofing from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- E. Correct deficiencies in or remove roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair sheet flashing to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements

END OF SECTION 07 54 00

SECTION 07 61 13 – STANDING SEAM METAL ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Pre-coated standing-seamed steel roofing system and associated flashings.
 - 2. Counter-flashings for roof-mounted equipment.
 - 3. Field installed thermal insulation.
 - 4. Snow guard rails.
 - 5. Energy Performance: Provide roof panels with solar reflectance index not less than **29** when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency
 - 6. Energy Performance: Provide roof panels that are listed on the U.S. Department of Energy's ENERGY STAR Roof Products Qualified Product List for steep-slope roof products

1.2 REFERENCES

- A. ASTM A 792 - Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process for Roofing and Siding.
- B. ASTM A 446 - Specification for Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- C. NAAMM - Metal Finish Handbook.
- D. NRCA (National Roofing Contractors Association) - Roofing Manual.
- E. SMACNA - Architectural Sheet Metal Manual. "Fourth Edition".

1.3 SUBMITTALS

- A. Submit shop drawings under provisions of Division 01.
- B. Sustainable Design Criteria: For roof panels, indicating that panels comply with solar reflectance index requirement
- C. Indicate on shop drawings, material profile, jointing pattern, jointing details, fastening methods, sealants, underlayment, and installation details.
- D. Shop drawings are to be approved by manufacturer.
- E. Wind-Uplift Resistance: Submit engineering data, prepared by a licensed engineer, showing all conditions to meet a UL 90 rating. Reference Section Division 06 Sheathing and drawings.
- E. Hydrostatic-Head Resistance: Submit engineering data for no water penetration when tested according to ASTM E 2140.
- F. Fire Rating: Submit engineering data for Underwriters' Laboratories, Inc., (UL) Class A roofing material acceptable for use in an approved Class A fire rating per UL 790
- F. Qualification Data: For qualified installer.
- G. Provide engineering data, prepared by a licensed engineer, showing layout and spacing of snow guards.

1.4 QUALITY ASSURANCE

- A. Installer: Company specializing in sheet metal roof installations with three years documented experience.
- B. Perform work in accordance with NRCA Roofing Manual.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site, store and protect under provisions of Division 01.
- B. Stack preformed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials during storage which may cause discoloration or staining.

1.6 SPECIAL WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - Finish Warranty Period: 20 years from date of Substantial Completion
- B. Upon acceptance through on-site inspection, the manufacturer and installer shall execute the special warranties following this section. Refer to Roofing Warranty, following this specification section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of design AEP Span (BHP), Product: SpanSeam (manufactured in Tacoma, Washington)

AEP Span (BHP) – Design Span hp
2141 Milwaukee Way.
Tacoma, WA. 98421
Phone: 1-800-733-4933

- A. Subject to compliance with the requirements, including regional manufacturing, products that may provide equivalent products are:

Fabral
3449 Hempland Rd / P.O. Box 4608
Lancaster, Pennsylvania 17604-4608
Phone: 1-800-477-2741

Metal Sales Manufacturing
7800 State Rd. 60
Sellersburg, Indiana 47172
Phone: 1-812-246-1935

MBCI
PO Box 16027
Salt Lake City, UT 84116
Phone: 801-530-4975

Berridge Manufacturing
7100 212th St SW
Edmonds, WA 98026
Phone: 1-800-645-5330

2.2 MATERIALS

- A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755
- B. Recycled Content: Provide steel sheet with average recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content is not less than **25** percent.
- C. Roof Panel Coverage: 16 inches.
- D. Standing Seam: 2"
- E. Roofing Panels – 22 gauge, flat panel (no striations)

2.3 ACCESSORIES

- A. Fasteners: Galvanized steel with neoprene washers. Finish exposed fasteners same as flashing metal. Engineer fastener layout and spacing requirements with roof wood sheathing substrate as specified.
- B. Sealant: As recommended by manufacturer.
- C. Bedding Compound: As recommended by manufacturer.
- D. Reglets: Recessed type, pre-finished steel.
- E. Sub-framing and Blocking: As required by manufacturer.
- G. Ice Shield Membrane Underlayment: Equal to Ice and Water Shield as manufactured by Grace Construction Products, .040 mil thickness. Provide as underlayment over all areas of standing seam metal roofing installation.

- H. Flexible Pipe flashings; Neoprene type, as manufactured by Dek Tite or equivalent.
- I. Plate Washers: Provide minimum 3"x3" spacer/plate washer at each roof clip/anchor location to avoid crushing rigid insulation below.
- J. Flashing and Trim: Coordinate with Division 07 "Sheet Metal Flashing and Trim." Formed from same material as roof panels, prepainted with coil coating, minimum 0.018 inch thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.
- K. Gutters: Coordinate with Division 07 "Sheet Metal Flashing and Trim" and Division 05 "Gutter Support Brackets"
- L. Downspouts: Coordinate with Division 07 "Sheet Metal Flashing and Trim."
- M. Roof Curbs: Coordinate with Division 07 "Sheet Metal Flashing and Trim." Fabricated from same material as roof panels, minimum 0.048 inch thick; with bottom of skirt profiled to match roof panel profiles, and welded top box and integral full-length cricket. Fabricate curb subframing of minimum 0.0598-inch-thick, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads, of size and height indicated. Finish roof curbs to match metal roof panels.

2.4 FIELD-INSTALLED THERMAL INSULATION

- A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.
- B. Insulation
 - 1. Insulation: Closed cell Polyisocyanurate board with fiber reinforced facers uniforming to FS-HH-I-1972/GEN with minimum aged R-Value listed per drawings, as required to satisfy Class B fire hazard classification. Minimum thickness: as required to provide listed R-Value over any occupied, heated spaces. Stagger overlapping rigid insulation seams.
 - 2. Tapered Insulation for crickets: Closed cell Polyisocyanurate board with fiber reinforced facers uniforming to FS-HH-I-1972/GEN with minimum aged R-Value listed per drawings, as required to satisfy Class B fire hazard classification. Taper as required to provide ½" per foot slope as finished in the field. Apply all tapered insulation between layers of required insulation.
 - 3. Separation Sheet: As required by manufacturer.
 - 4. Insulation or protection board must be accepted in writing by the membrane manufacturer. All insulations must be approved by their manufacturer for mechanically attached installations.
 - 5. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated. Fabricate all saddles, crickets, tapered edge strips, cants and other insulation shapes in polyisocyanurate to match board insulation.
- C. Fasteners:
 - 1. Corrosion resistant screw fastener as recommended by roof membrane manufacturer.
 - 2. Factory Mutual Tested and Approved with three (3) inches coated disc for 1-90 rating, length required to penetrate metal deck one inch.

2.5 SNOW GUARD

- A. General: Provide snow guard rail system to control snow migration.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Alpine Snow Guards,
 - b. S-5 with ColorGard
 - c. Snojax Inc.
 - d. Polar Blox

2. System Requirements:
 - a. Horizontal rail (8 feet in length) to match color of metal roof panels. Provide fully engineered system, occurring 4'-0" in from all roof edges.
 - b. Stainless steel mounting bracket and stainless steel set screws installed at every other standing seam rib (minimum). Brackets shall fasten (or clamp) to standing seam rib and not create any penetrations in the metal roof system. Aluminum mounting brackets are allowed.

2.6 FABRICATION

A. Shop Assembly

1. Form sections true to shape, accurate in size, square, and free from distortion or defects.
2. Fabricate cleats of same material as sheet, inter-lockable with sheet.
3. Fabricate starter strips of same material as sheet, continuous, inter-lockable with sheet.
4. Form pieces in longest practical lengths.
5. Hem exposed edges on underside 1/2 inch; miter and seam corners.
6. Form material with locking standing seams.

B. Shop Finishing

1. All roofing, flashings, curbs and accessories are to be pre-coated with Kynar 500 finish.
2. Color: As selected by Architect, from entire range of Kynar 500 finishes, color to be similar to Kynar 500/Duratech 5000 color: "Cool" Roof Color, confirm color selection prior to final material order.
3. Galvanized Steel: 0.022 inch thick – minimum 24 gauge continuous extruded.

C. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

- 2.4.1.1 Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- 2.4.1.2 End Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- 2.4.1.3 End Seams for Other Than Aluminum: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- 2.4.1.4 Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- 2.4.1.5 Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
- 2.4.1.6 Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect roof deck to verify deck or substrate is clean and smooth, free of depressions, waves, or projections, properly sloped to valley and eaves.
- B. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, and reglets are in place.
- C. Beginning of installation indicates acceptance of existing conditions.

3.2 PREPARATION

- A. Field measure site conditions prior to fabricating work.
- B. Install starter and edge strips, and cleats before starting installation.
- C. Install reglets true to lines and levels.
- D. Protect elements surrounding work of this Section from damage or disfigurement.

3.3 INSTALLATION

- A. Conform to drawings and shop drawings.
- B. Provide Ice Shield Membrane as full coverage underlayment over entire area of the standing seam metal roofing of the project.
- D. Apply ice shield membrane underlayment over entire roof deck. Provide minimum 6" minimum end and side laps.
- E. Standing Seam Roofing
 - 1. Installation is to be in strict compliance with manufacturer's requirements and details to achieve the attached warranty.
 - 2. Any deviation from published manufacturer's installation must be approved in writing from the manufacturer's representative and received by Architect prior to work proceeding.
 - 3. All components of the roofing system are to be modified as required to accommodate insulation thickness.
- F. Snow Guards:
 - 1. Snow guards are to be installed in areas shown on drawings.
 - 2. Install as indicated on engineered shop drawings.
 - 3. Anchor to standing seam sheet metal roofing and do not damage or penetrate the primary roofing system as recommended by manufacturer.
- G. THERMAL INSULATION INSTALLATION
 - 1. Polyethylene Vapor Retarder: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Repair tears or punctures immediately before concealment by other work.
 - 2. Board Insulation: Extend insulation in thickness as indicated to cover entire roof, stagger seams. Comply with installation requirements of insulation and roofing systems manufacturers.
 - a. Erect insulation and hold in place with furring members spaced 24 inches o.c. Securely attach narrow flanges of furring members to roof deck with screws spaced 24 inches o.c. Over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
 - b. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
 - c. As applicable, use adhesive to install and attach roof insulation to the indicated substrate
 - d. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

3.4 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Division 01.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.
- C. A representative of the roofing manufacturer is to perform an on-site inspection of the completed system and certify, in writing, that the system has been installed per manufacturer's requirements and as required to achieve the attached warranty.
- D. Field inspection to be performed by SMACNA representative for standing seam roof assembly to be in accordance with the SMACNA Architectural Sheet Metal Manual.
- E. Contractor shall correct identified defects or irregularities.

3.5 CLEANING

- A. Under provisions of Division 01.
- B. In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.
- C. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.6 PROTECTION OF FINISHED WORK

- A. Under provisions of Division 01.
- B. Protect building surfaces against damage from roofing work.

ROOFING WARRANTY

WHEREAS _____

of (Address) _____

herein called the "Roofing Contractor", has performed roofing and associated ("work") on following project:

Owner: _____

Address: _____

Name and Type of Building: _____

Address: _____

Area of Work: _____ Date of Acceptance: _____

Warranty Period: Three (3) years Date of Expiration: _____

AND WHEREAS Roofing Contractor has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period.

NOW THEREFORE Roofing Contractor hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work, and as are necessary to maintain said work in watertight condition. In addition to making the work watertight, the Roofing Contractor shall remove and/or repair blisters, ridges, flashings, splits and other irregularities which in the opinion of the Roofing Manufacturer's technical representative do not conform to acceptable roofing practices and conditions. These repairs shall be made prior to expiration of the three (3) year Warranty Period and to the satisfaction of the Roofing Manufacturer's technical representative.

This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by: a) lightning, windstorm; b) fire; c) failure of roofing system substrate including cracking, settlement, excessive deflection, deterioration, and decomposition; d) faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work; and e) activity on roofing by others including construction contractors, maintenance personnel, other persons, and animals whether authorized or unauthorized by Owner.

When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Contractor, and until cost and expense thereof has been paid by Owner or by another responsible party so designated.

2. The Roofing Contractor is responsible for damage to work covered by this Warranty, but is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.

3. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Contractor, including cutting, patching and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void upon date of said alterations, but only to extent said alterations affect work covered by this Warranty. If Owner engages Roofing Contractor to perform said alterations, Warranty shall not become null and void, unless Roofing Contractor

tor, prior to proceeding with said work, shall claim that said alterations would like damage or deteriorate work, thereby reasonably justifying a limitation or termination of this warranty.

4. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void upon date of said change, but only to extent said change affects work covered by this Warranty.

5. The Owner shall promptly notify Roofing Contractor of observed, known or suspected leaks, defect or deterioration, and shall afford reasonable opportunity for Roofing Contractor to inspect work, and to examine evidence of such leaks, defects or deterioration.

6. This Warranty is recognized to be the only Warranty of Roofing Contractor on said work, and is in addition to the Roofing Guarantee furnished by the Roofing Manufacturer, and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to him in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Contractor of responsibility for performance of original work in accordance with requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been dully executed this

_____ day of _____, 20____

Cosigned by General Contractor by:

(General Contractor) (Roofing Contractor)

(Business Address) (Business Address)

(Signature) (Signature)

(Title) (Title)

END OF SECTION 07 61 13

SECTION 07 62 00 - SHEET METAL FLASHING & TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formed Products:

- a. Formed roof drainage sheet metal fabrications.
- b. Formed sloped roof sheet metal fabrications.
- c. Formed wall sheet metal fabrications.
- d. Formed equipment support flashing.

1.2 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashing's as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.
9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Accessories and Miscellaneous Materials: Full-size Sample.

D. Qualification Data: For qualified fabricator.

E. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

F. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof eave, approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
 - 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.6 WARRANTY

- A. Provide Owner with a warranty stating that metal flashings and Associated sealants will properly shed water and protect building from physical damage for a minimum period of two years from date of substantial performance of work, as certified by Architect/Engineer, and that damage resulting from failure to provide above stated performances will be repaired to satisfaction of Owner at no additional cost
- B. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

- B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
 - 2. Surface: Smooth, flat.
 - 3. Exposed Coil-Coated Finish:
 - a. Two-coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 4. Color: Shall be approved by Architect and match adjacent material being flashing.
 - 5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
- 2.2 UNDERLAYMENT MATERIALS
- A. Ice Shield Membrane Underlayment: Equal to Ice and Water Shield as manufactured by Grace Construction Products, .040 mil thickness. Provide as underlayment over all areas of sheet metal flashing installation.
 - B. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.
- 2.3 MISCELLANEOUS MATERIALS
- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
 - B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
 - C. Solder:
 - 1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
 - 2. For Zinc: ASTM B 32, 40 percent tin and 60 percent lead with low antimony, as recommended by manufacturer.
 - D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.
 - E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
 - F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
 - G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
 - H. Pre-cast concrete or pre-formed fiberglass splash blocks – provide at all locations where roof scupper drainage discharges onto a lower level roof.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cheney Flashing Company.
 - b. Fry Reglet Corporation.
 - c. Heckmann Building Products Inc.
 - d. Hickman, W. P. Company.
 - e. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
 - f. Keystone Flashing Company, Inc.
 - g. National Sheet Metal Systems, Inc.
 - h. Sandell Manufacturing Company, Inc.
 2. Material: Galvanized steel, 0.022 inch thick.
 3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 4. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
 5. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
 6. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
 7. Finish: With manufacturer's standard color coating.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 2. Obtain field measurements for accurate fit before shop fabrication.
 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.
- D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

- F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- I. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
- B. Reference associated gutter support brackets under Division 05 "Metal Fabrications". Steel fabricated gutter supports are in addition to the concealed strap supports specified herein.
 - 1. Gutter Style: reference drawings for profile and sizes. Comply with SMACNA requirements.
 - 2. Expansion Joints: Built in.
 - 3. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch thick – minimum 24 gauge continuous extruded.
 - b. Concealed Gutter support straps: 0.022 inch thick, 24" on center.
- C. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors. Lower portion of each downspout and custom down spouts at building entries to be tube steel. Reference drawings for locations and details.
 - 1. Fabricated Hanger Style: reference drawings for profile and sizes. Comply with SMACNA requirements..
 - 2. Fabricate from the following materials:
 - a. Galvanized Steel: 18 gauge.
 - b. Tube Steel: 1/8" thick

2.7 ROOF SHEET METAL FABRICATIONS

- A. Roof-Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Furnish with 6-inch- wide, joint cover plates.
 - 1. Joint Style: Lap, 4 inches wide.
 - 2. Fabricate from the following materials:
 - a. Galvanized Steel: 0.028 inch thick.
- B. Copings: Fabricate in minimum 96-inch- (long, but not exceeding 10-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and [drill elongated holes for fasteners on] interior leg. Miter corners, seal, and solder or weld watertight.
 - 1. Coping Profile: reference drawings for profile and sizes. Comply with SMACNA requirements.
 - 2. Joint Style: Butt, with 12-inch- wide, concealed backup plate
 - 3. Fabricate from the following materials:
 - a. Galvanized Steel: 0.040 inch thick.
- C. Roof and Roof to Wall Transition, Roof to Roof Edge Flashing Transition and Fascia Cap Transition Expansion-Joint Cover: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.034 inch thick.
- D. Base Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch thick.
- E. Counterflashing: Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch thick.
 - F. Flashing Receivers: Fabricate from the following materials:
 1. Galvanized Steel: .022 inch thick.
 - G. Roof-Penetration Flashing: Fabricate from the following materials:
 1. Galvanized Steel: 0.028 inch thick.
 - H. Roof-Drain Flashing: Fabricate from the following materials:
 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch thick.
- 2.8 WALL SHEET METAL FABRICATIONS
- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high, end dams where flashing is discontinuous. Fabricate from the following materials:
 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch thick.
 - B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
 - C. Wall Expansion-Joint Cover: Fabricate from the following materials:
 1. Galvanized Steel: 0.028 inch thick.
- 2.9 MISCELLANEOUS SHEET METAL FABRICATIONS
- A. Equipment Support Flashing: Fabricate from the following materials:
 1. Galvanized Steel: 0.028 inch thick.

PART 3 - EXECUTION

- 3.1 EXAMINATION
- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - B. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 UNDERLAYMENT INSTALLATION
- A. General: Install underlayment as indicated in this specification and as shown on Drawings.
 - B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days. Coordinate work with other roofing trades.
- 3.3 INSTALLATION, GENERAL
- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 5. Install sealant tape where indicated.
 6. Torch cutting of sheet metal flashing and trim is not permitted.
 7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal joints as shown and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Pre-tinning is not required for zinc-tin alloy-coated stainless steel.
 2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
- 3.4 ROOF DRAINAGE SYSTEM INSTALLATION
- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Set gutters in gutter support brackets (reference Division 05 "Metal Fabrications") aligned at every-other standing metal roof seam. Attach gutters at eave or fascia to firmly anchored concealed straps spaced not more than 24 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Fasten gutter spacers to front and back of gutter.
 2. Loosely lock straps to front gutter bead and anchor to roof deck.
 3. Anchor and loosely lock back edge of gutter to continuous cleat.
 4. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
 5. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 48 inches o.c. in between.
2. Connect downspouts to underground drainage system indicated with base boot connection to tightline.
- D. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 1. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.
 2. Loosely lock front edge of scupper with conductor head.
- E. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below scupper discharge.
- F. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 24-inch centers.
- D. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.
 1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
 2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.
- E. Insert metal flashings into reglets to form tight fit. Secure in place with plastic wedges at maximum 12 inches on center. Seal flashing into reglets with sealant
- F. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- G. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of anchor and washer at 36-inch centers.
- H. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.
- I. Counterflash mechanical and electrical items projecting through roofing
- J. Provide colored sheetmetal sleeves over mechanical and electrical items projecting through the roof

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04 Section "Unit Masonry."

- C. Reglets: Installation of reglets as indicated."
- D. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches beyond wall openings.

3.7 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.8 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.9 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes joint sealants for the following applications, including preparing sealant substrate surfaces, sealant and expandable backing. This work includes those installations specified by reference to this Section:
 - 1. Exterior joints in the following vertical surfaces and horizontal non-traffic surfaces:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between plant-precast architectural concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Joints in exterior insulation and finish systems.
 - e. Joints between metal panels.
 - f. Joints between different materials listed above.
 - g. Perimeter joints between materials listed above and frames of doors windows and louvers
 - h. Control and expansion joints in ceilings and other overhead surfaces.
 - i. Other joints as indicated.
 - 2. Exterior joints in the following horizontal traffic surfaces:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - b. Other joints as indicated.
 - 3. Interior joints in the following vertical surfaces and horizontal non-traffic surfaces:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical joints on exposed surfaces of partitions.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors, and windows.
 - f. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - g. Other joints as indicated.
 - 4. Interior joints in the following horizontal traffic surfaces:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Other joints as indicated.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- E. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- F. Qualification Data: For Installer.
- G. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
 - H. Field Test Report Log: For each elastomeric sealant application.
 - I. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
 - J. Warranties: Special warranties specified in this Section.
 - K. Sustainable Design Criteria: For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content
- 1.4 QUALITY ASSURANCE
- A. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
 - B. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
 - C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.
 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 2. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
 - D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 4. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 5. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.5 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer [or are below 40 degrees F]
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 5 years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Acoustical Sealant: 250 g/L
 - 2. Architectural Sealants: 250 g/L.
 - 3. Non-membrane Roof Sealants: 300 g/L.
 - 4. Single-Ply Roof Membrane Sealants: 450 g/L.
 - 5. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 6. Sealant Primers for Porous Substrates: 775 g/L.
 - 7. Modified Bituminous Sealant Primers: 500 g/L.
- C. Colors of Exposed Joint Sealants: Integrally colored sealants, as selected by Architect to match adjacent materials.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids: Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600. Provide products and installations that comply with this requirement in Food Preparation and Food Serving Areas of the project.
- E. **Sealant Type #1: Single-Component Silicone Sealant:**
 - 1. Available Products:
 - a. Basis of Design: Dow Corning Corporation; 795
 - b. GE Silicones; SilPruf NB SCS9000.
 - c. GE Silicones; UltraPruf II SCS2900.
 - d. Pecora Corporation; 865.
 - e. Pecora Corporation; 895.
 - f. Pecora Corporation; 898.
 - 2. Type and Grade: S (single component) and NS (non-sag).
 - 3. Class: 50.
 - 4. Use Related to Exposure: NT (non-traffic).
 - 5. Uses Related to Joint Substrates: Coated glass, anodic aluminum, aluminum coated with a high-performance coating, galvanized steel.
 - 6. Stain-Test-Response Characteristics: Non-staining to porous substrates per ASTM C 1248.
- F. **Sealant Type #2: Single-Component Mildew-Resistant Acid-Curing Silicone Sealant:**
 - 1. Available Products:
 - a. Basis of Design: Dow Corning Corporation; 786 Mildew Resistant.
 - b. GE Silicones; Sanitary SCS1700.
 - c. Tremco; Tremsil 200 [White] [Clear].
 - 2. Type and Grade: S (single component) and NS (non-sag).
 - 3. Class: 25.
 - 4. Use Related to Exposure: NT (non-traffic).
 - 5. Uses Related to Joint Substrates: Coated glass, anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, ceramic tile.
- G. **Sealant Type #3: Multicomponent Non-sag Urethane Sealant:**
 - 1. Available Products:
 - a. Basis of Design: Sonneborn, Division of ChemRex Inc.; NP 2.
 - b. Schnee-Morehead, Inc.; Permathane SM 7200.
 - c. Sika Corporation, Inc.; Sikaflex - 2c NS TG.
 - d. Tremco; Vulkem 227.
 - 2. Type and Grade: M (multicomponent) and NS (nonsag).
 - 3. Class: 25.
 - 4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
- H. **Sealant Type #4: Single-Component Self Leveling Urethane Sealant:**
 - 1. Available Products:
 - a. Basis of Design: ChemRex Sonneborn SL-1
 - b. Schnee-Morehead, Inc.; equivalent product to basis of design.
 - c. Sika Corporation, Inc.; equivalent product to basis of design.
 - d. Tremco; equivalent product to basis of design.

2. Type and Grade: S (single component) and SL (self leveling).
 3. Class: 25.
 4. Use Related to Exposure: T (traffic).
- I. **Sealant Type #5: Single-Component Non-sag Urethane Sealant:**
1. Available Products:
 - a. Basis of Design: ChemRex Sonneborn NP-1
 - b. Bostik Findley; Chem-Calk 900.
 - c. Pecora Corporation; Dynatrol I-XL.
 - d. Polymeric Systems Inc.; Flexiprene 1000.
 - e. Polymeric Systems Inc.; PSI-901.
 - f. Schnee-Morehead, Inc.; Permathane SM7100.
 - g. Sika Corporation, Inc.; Sikaflex - 15LM.
 - h. Tremco; DyMonic.
 2. Type and Grade: S (single component) and NS (non-sag).
 3. Class: 25.
 4. Use Related to Exposure: NT (non-traffic).
- 2.4 LATEX JOINT SEALANTS
- A. **Sealant Type #6: Latex Sealant:** Comply with ASTM C 834, Type P, Grade NF, for field applied paint finish.
- B. Available Products:
1. Bostik Findley; Chem-Calk 600.
 2. Pecora Corporation; AC-20+.
 3. Schnee-Morehead, Inc.; SM 8200.
 4. Sonneborn, Division of ChemRex Inc.; Sonolac.
 5. Tremco; Tremflex 834.
- 2.5 ACOUSTICAL JOINT SEALANTS
- A. **Sealant Type #7: Acoustical Sealant for Exposed and Concealed Joints:** Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834 and the following:
1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 2. Available Products:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
1. Available Products:
 - a. Pecora Corporation; BA-98.
 - b. Tremco; Tremco Acoustical Sealant.
- 2.6 PREFORMED TAPE SEALANTS
- A. Back-Bedding Mastic Tape Sealant: Preformed, butyl-based elastomeric tape sealant with a solids content of 100 percent; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 807.3 tape, for applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Tape Sealant: Closed-cell, PVC foam tape sealant; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
1. Type 1, for applications in which tape acts as the primary sealant.

2. Type 2, for applications in which tape is used in combination with a full bead of liquid sealant.

2.7 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 3. Remove laitance and form-release agents from concrete.

4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
 1. Mask all locations where silicone based sealants are installed. No silicone based sealant shall be allowed to migrate onto adjacent finished surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
 4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
- H. Installation of Preformed Tapes: Install according to manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
 - b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab in Appendix X1 in ASTM C 1193, as appropriate for type of joint-sealant application indicated.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
 4. Inspect tested joints and report on the following:
 - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 - b. Whether sealants filled joint cavities and are free of voids.
 - c. Whether sealant dimensions and configurations comply with specified requirements.
 5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.
- 3.5 CLEANING
- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
 - B. Remove any and all sealant material outside of the joint area. Fully remove the sealant material to allow for a complete and satisfactory installation of other finishes including paint.
- 3.6 PROTECTION
- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.
- 3.7 JOINT-SEALANT SCHEDULE
- A. Joint-Sealant Application: Exterior butt joints between metal panels.
 1. Joint Sealant: Sealant Type #1 or as recommended by the metal wall panel manufacturer.
 2. Joint-Sealant Color: To match adjacent material color, as selected by Architect from manufacturer's full and complete range.
 - B. Joint-Sealant Application: Exterior perimeter joints at frames of doors, windows, and louvers.
 1. Joint Sealant: Sealant Type #1.

2. Joint-Sealant Color: To match adjacent material color, as selected by Architect from manufacturer's full and complete range.
- C. Joint-Sealant Application: Interior joints in High Moisture and Mildew Areas, between plumbing fixtures and adjoining walls, floors, and counters.
 1. Joint Sealant: Sealant Type #2.
 2. Joint-Sealant Color: To match adjacent material color, as selected by Architect from manufacturer's full and complete range.
- D. Joint-Sealant Application: Exterior vertical and horizontal non-traffic construction joints in cast-in-place concrete.
 1. Joint Sealant: Sealant Type #3 or #5.
 2. Joint-Sealant Color: To match adjacent material color, as selected by Architect from manufacturer's full and complete range.
- E. Joint-Sealant Application: Exterior horizontal traffic isolation and contraction joints in cast-in-place concrete slabs.
 1. Joint Sealant: Sealant Type #4.
 2. Joint-Sealant Color: To match adjacent material color, as selected by Architect from manufacturer's full and complete range.
- F. Joint-Sealant Application: Exterior vertical and horizontal non-traffic joints between plant-precast architectural concrete units, exterior vertical control and expansion joints in unit masonry, exterior vertical joints between differing materials.
 1. Joint Sealant: Sealant Type #5.
 2. Joint-Sealant Color: To match adjacent material color, as selected by Architect from manufacturer's full and complete range.
- G. Joint-Sealant Application: Interior perimeter joints of exterior openings, perimeter joints between interior ceiling surfaces, interior wall surfaces, trim components, and frames of interior doors, and windows , interior and exterior sealant-pointed mortar joints in glass unit masonry assemblies.
 1. Joint Sealant: Sealant Type #6.
 2. Joint-Sealant Color: To match adjacent material color, as selected by Architect from manufacturer's full and complete range.
- H. Joint-Sealant Application: Acoustical perimeter joints between interior ceiling surfaces, interior wall surfaces and frames of interior doors, and windows. Install on all walls indicated to receive acoustical wall insulation (indicated by wall type reference in the drawings)
 1. Joint Sealant: Sealant Type #7.
 2. Joint-Sealant Color: To match adjacent material color, as selected by Architect from manufacturer's full and complete range.
- I. Joint-Sealants used in food service areas of the building will be specifically approved by governing authorities for use in such locations.

END OF SECTION 07 92 00

Section 08 00 00 - Door Schedule

[illegible]

MARK	LOCATION	DOOR				FRAME			DETAILS		ASSEM	HW	REMARKS
		Size	Type	Material	Finish	Type	Material	Finish	Head	Jamb	RATING		
1. Reference sheet A6.00 for door and frames types. All exterior doors to have door position switches.													

SECTION 08 11 13 - HOLLOW METAL DOORS & FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Standard hollow metal doors and frames.
- B. Related Sections:
 - 1. Division 08 Section "Flush Wood Faced Doors" for hardware and frame coordination.
 - 2. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
 - 3. Division 09 Sections "Painting" for field painting hollow metal doors and frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
- C. Samples for Verification:
 - 1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
 - 2. For the following items, prepared on Samples about 12 by 12 to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.
- D. Other Action Submittals:
 - 1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

- C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.
 - D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784
 - E. Install doors in accordance with SDI-100 and building code standards for labeled doors
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
 - 1. Provide additional protection to prevent damage to finish of factory-finished units.
 - B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
 - C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.
- 1.6 PROJECT CONDITIONS
- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.
- 1.7 COORDINATION
- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Basis of Design: Ceco Door Products; an Assa Abloy Group company.; Product Imperial Series Doors, Maxim Series Doors, and CF Series Frames
 - 2. Amweld Building Products, LLC.
 - 3. Curries Company; an Assa Abloy Group company.
 - 4. Steelcraft; an Ingersoll-Rand company.
 - 5. Approved equal substitution in accordance with Division 01 procedures and requirements.
- 2.2 MATERIALS
- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
 - B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
 - C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
 - D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
 - E. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
 - F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum

flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

G. Glazing: Comply with requirements in Division 08 Section "Glazing."

H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel.

2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

1) Locations: Exterior doors.

3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.

a. Beveled Edge: 1/8 inch in 2 inches.

4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.

5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick, end closures or channels of same material as face sheets.

6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).

a. Width: 1-3/4 inches.

b. 18 gauge construction.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet.

1. Fabricate frames with mitered or coped corners.

2. Fabricate frames as full profile welded unless otherwise indicated, or in existing conditions, provide knockdown type frames to work in existing masonry conditions.

3. Frames for Level 2 Steel Doors: 16 gauge-thick steel sheet.

4. Frames for Wood Doors: 16 gauge-thick steel sheet.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

D. See division 07 for insulated frames at all exterior walls and all interior sound walls.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.

2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 3. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
 - B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (thick, and as follows:
 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.
- 2.6 STOPS AND MOLDINGS
- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
 - B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
 - C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.
- 2.7 ACCESSORIES
- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
 - B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch wide steel.
 - C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.
 - D. Lite Frames and Glazing
 1. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.
 2. For base bid glazing condition reference specification section 08 80 00.
- 2.8 FABRICATION
- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
 - B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
 - C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.

- 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
- c. Compression Type: Not less than two anchors in each jamb.
- d. Post-installed Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
- 6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

2.9 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch measured at jambs on a perpendicular line from head to floor.

- C. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with SDI 100, Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that are filled with grout containing anti-freezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
 - 3. At all exterior frames and interior frames in acoustically insulated walls fill all voids behind, around, and within hollow metal frames with spray foam insulation behind frames, reference specification section 07 21 29.
 - 4. Metal-Stud Partitions: Fill with spray foam insulation behind frames, reference specification section 07 21 29.
 - 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 - 6. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
 - 7. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 8. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 9. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
 - 10. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

- d. Plumbness: Plus or minus 1/16 inch measured at jambs at floor.
 - C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.
- 3.4 ADJUSTING AND CLEANING
- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
 - B. Remove grout and other bonding material from hollow metal work immediately after installation.
 - C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 08 11 13

SECTION 08 14 00 - FLUSH WOOD FACED DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with hardwood veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 SUBMITTALS

- A. Product Data: For each type of door indicated. Include details of core and edge construction, and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
1. Indicate dimensions and locations of mortises and holes for hardware.
 2. Indicate dimensions and locations of cutouts.
 3. Indicate requirements for veneer matching.
 4. Indicate doors to be factory finished and finish requirements.
 5. Indicate fire-protection ratings for fire-rated doors.
- C. Samples:
1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
 2. Corner sections of doors, approximately 8 by 10 inches with door faces and edges representing actual materials to be used.
 - a. Provide samples for each species of veneer and solid lumber required.
 - b. Provide samples for each color, texture, and pattern of plastic laminate required.
 - c. Finish veneer-faced door samples with same materials proposed for factory-finished doors.
- D. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors from single manufacturer.
- B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated"
1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10B.
1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and

maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

- B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Lynden Doors.
 - 2. Marshfield Door Systems, Inc.
 - 3. Vancouver Door Company.
 - 4. VT Industries

2.2 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade:
 - 1. Heavy Duty unless otherwise indicated.
 - 2. Extra Heavy Duty: Classrooms, public toilets, janitor's closets, exits.
- C. Structural-Composite-Lumber-Core Doors:
 - 1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.

2.3 WOOD VENEER-FACED DOORS

- A. Interior Solid-Core Doors:
 - 1. Grade: 5-ply construction - AWI PC-5, Premium Grade.
 - 2. Wood veneer facing: Plain sliced select vertical grain fir veneer, clear finish, AWI Grade One, 1/50 inch minimum, with matched grain for semi-transparent finish. All exposed wood finishes on the project shall match architect's approved "Clear" stain sample.
 - 3. Colors, Patterns, and Finishes: Reference Finish Schedule and finish materials designations.
 - 4. Exposed Edges: Hardwood stiles and rails to match face veneer, bonded to core.
 - 5. Core: Structural composite lumber, with Factory blocking for hardware
 - 6. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before faces are applied. Faces are bonded to core using a hot press.
 - 7. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES

- A. Metal Frames for Light Openings in fire-rated non-rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

- A. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- B. Openings: Cut and trim openings through doors in factory.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
 - 3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Finish doors at factory.
 - 1. Color: Reference Finish Schedule, Finish Material Designations.
 - 2. Pattern: Reference Finish Schedule, Finish Material Designations

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 00

SECTION 08 14 16 - FLUSH WOOD PLASTIC LAMINATE FACED DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with hardwood veneer faces.
2. Reinstallation of existing doors in new locations
3. Factory finishing flush wood doors.
4. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Plastic laminate, 6 inches square, for each color, texture, and pattern selected.
3. Corner sections of doors, approximately 8 by 10 inches with door faces and edges representing actual materials to be used.
 - a. Provide samples for each species of veneer and solid lumber required.
 - b. Provide samples for each color, texture, and pattern of plastic laminate required.
 - c. Finish veneer-faced door samples with same materials proposed for factory-finished doors.

D. Warranty: Sample of special warranty.

E. Sustainability Design Submittal:

1. Submit certification that the products of this section are manufactured within a 500 mile radius of the project site. Product Data for materials regionally manufactured and extracted. Include statement indicating costs for each product complying with the 500 mile radius requirement

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors from single manufacturer.

B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated"

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10B.

1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

- 1.4 DELIVERY, STORAGE, AND HANDLING
 - A. Comply with requirements of referenced standard and manufacturer's written instructions.
 - B. Package doors individually in plastic bags or cardboard cartons.
 - C. Mark each door on bottom rail with opening number used on Shop Drawings.
- 1.5 PROJECT CONDITIONS
 - A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- 1.6 WARRANTY
 - A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
 - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Lyden Doors.
 - 2. Marshfield Door Systems, Inc.
 - 3. Vancouver Door Company.
 - 4. VT Industries
 - 5. Substitutions under provisions of Division 01.
- 2.2 DOOR CONSTRUCTION, GENERAL
 - A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
 - B. WDMA I.S.1-A Performance Grade:
 - 1. Heavy Duty unless otherwise indicated.
 - 2. Extra Heavy Duty: Classrooms, public toilets, janitor's closets, exits.
 - C. Structural-Composite-Lumber-Core Doors:
 - 1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.
 - D. Fire-Protection-Rated Doors: Provide core specified as needed to provide fire-protection rating indicated.
 - 1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 - 2. Pairs: Provide formed-steel edges and astragals with intumescent seals.
 - a. Finish steel edges and astragals to match door hardware (locksets or exit devices).

2.3 PLASTIC LAMINATE-FACED DOORS

A. Interior Solid-Core Plastic Laminate Faced Doors:

1. Grade: 5-ply construction - AWI PC-5, Premium Grade.
2. Plastic laminate facing: To match existing doors in the building - AWI Grade One, 1/50 inch minimum, with matched grain for field applied transparent finish. Facing finish shall match existing doors in the building..
3. Colors, Patterns, and Finishes: Reference Finish Schedule and finish materials designations.
4. Exposed Edges: Hardwood stiles and rails to match face veneer, bonded to core.
5. Core: Structural composite lumber, with Factory blocking for hardware
6. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before faces are applied. Faces are bonded to core using a hot press.
7. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES

- ### A. Metal Frames for Light Openings in fire-rated non-rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

- ### A. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- ### B. Openings: Cut and trim openings through doors in factory.
1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
 3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

- ### A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- ### B. Finish doors at factory.
1. Color: Reference Finish Schedule, Finish Material Designations.
 2. Pattern: Reference Finish Schedule, Finish Material Designations

PART 3 - EXECUTION

3.1 EXAMINATION

- #### A. Examine doors and installed door frames before hanging doors.
1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- #### B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- #### A. Hardware: For installation, see Division 08 Section "Door Hardware."

- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
 - C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
 - D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
 - E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.
- 3.3 ADJUSTING
- A. Operation: Rehang or replace doors that do not swing or operate freely.
 - B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

SECTION 08 31 13 - ACCESS DOORS & FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. In project areas where required for access to utilities: Non-rated wall and ceiling access doors and frame units. Furnish in quantities and sizes required for access purposes to utilities requiring service and general concealed space/attic access. Coordinate sizes, quantities, and locations with architectural drawings, as well as equipment access for Mechanical and Electrical division.
 - 2. Furnish inserts and anchoring devices that must be built into other work for installation of access doors

1.2 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
- D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.
- E. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.
- B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 or UL 10B for vertical access doors and frames.
 - 2. ASTM E 119 or UL 263 for horizontal access doors and frames.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units.

1.4 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

- C. Steel Sheet: electrolytic zinc-coated, ASTM A 591 with cold-rolled steel sheet substrate complying with ASTM A 1008, Commercial Steel (CS), exposed.
 - D. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 - 2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.
 - E. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.
- 2.2 STAINLESS-STEEL MATERIALS
- A. Rolled-Stainless-Steel Floor Plate: ASTM A 793, manufacturer's standard finish.
 - B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.
 - 1. Finish: Directional Satin Finish, No. 4.
- 2.3 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Acudor Products, Inc.
 - 2. Babcock-Davis; A Cierra Products Co.
 - 3. Bar-Co, Inc. Div.; Alfab, Inc.
 - 4. Cendrex Inc.
 - 5. Dur-Red Products.
 - 6. Elmdor/Stoneman; Div. of Acorn Engineering Co.
 - 7. Jensen Industries.
 - 8. J. L. Industries, Inc.
 - 9. Karp Associates, Inc.
 - 10. Larsen's Manufacturing Company.
 - 11. MIFAB, Inc.
 - 12. Milcor Inc.
 - 13. Nystrom, Inc.
 - 14. Williams Bros. Corporation of America (The).
 - B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel and stainless-steel sheet.
 - 1. Locations: Wall and ceiling surfaces.
 - a. Utilize Stainless steel access doors at Restrooms.
 - b. Utilize Standard units at all other locations.
 - 2. Door: Minimum 0.060-inch- thick sheet metal, set flush with exposed face flange of frame.
 - 3. Frame: Minimum 0.060-inch- thick sheet metal with 1-inch- wide, surface-mounted trim.
 - 4. Hinges: Spring-loaded, concealed-pin type.
 - 5. Lock: Self-latching device with cylinder lock.
- 2.4 FABRICATION
- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
 - B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
 - C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 - 1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.

2. Provide mounting holes in frames for attachment of units to metal or wood framing.
3. Provide mounting holes in frame for attachment of masonry anchors
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 1. For cylinder lock, furnish two keys per lock and key all locks alike.
 2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

SECTION 08 41 13 - ALUMINUM-FRAMED STOREFRONTS, ENTRIES and WINDOW SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Storefront system.
 - 2. Curtain Wall system.
 - 3. Aluminum entry and vestibule doors.
 - 4. All anchors, bridging, brackets, and attachments.
 - 5. Hardware, not specified elsewhere.
- B. System Description
 - 1. System to perform as required below in Performance Requirements
 - 2. System to accommodate, without damage to system or components, or deterioration of perimeter seal: Movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing
 - 3. All required internal steel reinforcement, anchors, bracing, and attachments back to the primary structure of the building (defined as that structure that is shown in the "S" sheets of the drawings) shall be the responsibility of this specification section. Shop drawings shall be engineered and shall clearly indicate all required bracing, bridging, kickers, clips, etc. necessary for the proper installation of the window system

1.2 DEFINITIONS

- A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
 - 1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 - 2. Dimensional tolerances of building frame and other adjacent construction.
 - 3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Noise or vibration created by wind and by thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units.
- B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Loads:
 - 1. Wind Loads:
 - a. Basic Wind Speed: 90 mph.
 - b. Importance Factor: As determined by IBC.
 - c. Exposure Category: B
 - 2. Seismic Loads: As indicated on Drawings.
- D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.
 - E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
 1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
 - F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft..
 - G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
 - H. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
 2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Low Exterior Ambient-Air Temperature: 0 deg F.
 3. Interior Ambient-Air Temperature: 75 deg F.
 - I. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.
 - J. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.
 - K. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by aluminum-framed systems without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
 1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
 2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.
- 1.4 SUBMITTALS
- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
 - B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch lengths of full-size components and showing details of the following:
 1. Joinery, including concealed welds.
 2. Anchorage.
 3. Expansion provisions.
 4. Glazing.
 5. Flashing and drainage (weep holes if required).
- E. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional Washington State engineer responsible for their preparation.
 1. Detail fabrication and assembly of aluminum-framed systems.
 2. Include design calculations.
- F. Qualification Data: For qualified Installer and testing agency.
- G. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- H. Welding certificates.
- I. Preconstruction Test Reports: For sealant.
- J. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.
- K. Source quality-control reports.
- L. Field quality-control reports.
- M. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- N. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- D. Quality-Control Program for Structural-Sealant-Glazed System: Develop quality control program specifically for Project. Document quality-control procedures and verify results for aluminum-framed systems. Comply with ASTM C 1401 recommendations including, but not limited to, system material-qualification procedures, preconstruction sealant-testing program, procedures for system fabrication and installation, and intervals of reviews and checks.
- E. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- F. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

- G. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.
 - H. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."
 - I. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
 - J. Pre-installation Conference: Conduct conference at Project site.
- 1.6 PROJECT CONDITIONS
- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.
- 1.7 WARRANTY
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Adhesive or cohesive sealant failures.
 - e. Water leakage through fixed glazing and framing areas.
 - f. Failure of operating components.
 - 2. Warranty Period: 10 years from date of Substantial Completion.
 - B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
- A. Basis-of-Design Product: Subject to compliance with requirements, provide Aluminum Exterior Storefront, Entry, Curtain Wall and Window System, with 550 Heavy Wall Entrance doors as indicated in the drawings; internally steel reinforced, thermally broken, complete with deflection heads and base tracks with weep holes, for the work of this section. Fluoropon aluminum finish to match architects approved sample.
 - 1. Basis of Design
 - a. Storefront: Kawneer Trifab VG 451 (interior vestibule system)
 - b. Curtain Wall: Kawneer 1600 Wall System 1
 - c. Entry Doors: Kawneer Aluminum Entrances 350 Medium Duty
 - 2. EFCO Corporation, equal product lines to above.
 - 3. United States Aluminum, equal product lines to above.
 - 4. Vistawall Architectural Products; equal product lines to above.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308/B 308M.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 CURTAIN WALL FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken with fiberglass pressure plate.
 - 2. Sizes: 2½ " x 6", reference drawings for locations of each installation,
 - 3. Glazing System: Retained mechanically with gaskets on four sides.
 - 4. Glazing Plane: As indicated in drawings.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. If necessary, use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 STOREFRONT FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken.
 - 2. Sizes: 2 " x 4½", reference drawings for locations of each installation,
 - 3. Glazing System: Retained mechanically with gaskets on four sides.
 - 4. Glazing Plane: As indicated in drawings.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.

3. If necessary, use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
 1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.6 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Basis of Design – Kawneer Aluminum Entrances 350 Medium Duty Door; Medium stile, 5-1/2" vertical face dimension, 2" depth, 3/16" wall thickness, high traffic application.
- B. Aluminum (Entrances and Components):
 1. Material Standard: ASTM B 221; 6063-T6 alloy and temper
 2. The door shall be 2" thick and stile and rail face dimensions of:

Door	Vertical Stile	Top Rail	Bottom Rail
550 Heavy Wall	3-1/2"	3-1/2"	10-1/2"
 3. Major portions of the door members to be 0.188" nominal in thickness and glazing molding to be 0.05" thick
 4. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by The Aluminum Association
 5. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.
 6. Provide adjustable glass jacks to help center the glass in the door opening.
 7. Coordinate rail and stile depths.
 8. Accessories
 - a. Fasteners: Where exposed, shall be aluminum, stainless steel or plated steel.
 - b. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
 - c. Weatherstripping:
 - 1) Meeting stiles on pairs of doors shall be equipped with an adjustable astragal utilizing wool pile with polymeric fin
 - 2) The door weathering on a single acting butt hung door and frame (single or pairs) shall be Kawneer Sealair® weathering. This is comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing
 - 3) Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners.

2.7 ENTRANCE DOOR HARDWARE

- A. General: Provide entrance door hardware, in addition to hardware sets called for in Section 08 71 00 each entrance door to comply with requirements in this Section.
- B. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

- C. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
 - 2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
 - D. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- 2.8 ACCESSORY MATERIALS
- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."
 - 1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.
- 2.9 FABRICATION
- A. Form or extrude aluminum shapes before finishing.
 - B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
 - C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 - D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
 - E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
 - F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
 - H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- 2.10 ALUMINUM FINISHES
- A. Permafluor Architectural Finish, High Performance Paint, AAMA 2605 Requirements
 - 1. Primer: 0.2 – 0.3 mil
 - 2. Topcoat: 1.0 mil minimum
 - 3. Clear Coat: 0.4 – 0.8 mil (required)
 - B. Color: Black, final selection to be selected by architect from manufacturers full standard color range.
- 2.11 SOURCE QUALITY CONTROL
- A. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure non-movement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Division 08 Section "Glazing."
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
 - 1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
 - 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- B. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

- D. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
 - 1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

END OF SECTION 08 41 13

SECTION 08 71 00 - DOOR HARDWARE

PART 1- GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Hardware for Aluminum Storefront Entries, and hollow metal doors.

1.2 REFERENCES

- A. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- B. ANSI A 156 - Door Hardware (ANSI/BHMA Standards)
- C. NFPA 80 - Fire Doors and Windows.
- D. AWI - Architectural Woodwork Institute - Architectural Wood Work Quality Standards.
- E. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
- F. NFPA 252 - Fire Tests of Door Assemblies.
- G. UL 10B - Safety Fire Tests of Door Assemblies.
- H. American Disabilities Act Accessibility Guidelines.
- I. BHMA - Builders Hardware Manufacturers Association - A156 Series.
- J. UL 305 - Safety Panic Hardware.

1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Verification of Door and Hardware Schedule.
- C. Keying Information – sample submittal format follows this section
- D. Key biting schedule data – sample format follows this section
- E. Submittal Sequence: Submit verified schedule at earliest possible date, particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.
- F. Keying Meeting and Schedule: Arrange for a keying meeting with the Architect and Owner, hardware supplier, and other involved parties prior to return of the reviewed finish hardware schedule, to insure all locksets are functionally correct and keying fulfill the project requirements. As soon as possible after the keying conference, typed copies of the keying schedule shall be furnished to the Owner and Architect.
- G. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g. hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings or other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule. Allow 15 days minimum for A/E and WSU to review the submittal
- H. Keying Schedule: Meet with WSU and submit for subsequent approval by WSU, detailed schedule indicating clearly how the WSU final instructions on keying of locks has been fulfilled
- I. Templates: Furnish hardware templates to each fabricator of door, frames and other work to be factory prepared for the installation of hardware. Check shop drawings of such other work to confirm that adequate provisions are made for proper location and installation of hardware.
- J. Contract Close-out Requirements.
 - 1. Project Record Documents.
 - a. Submit under provisions of Division 01.
 - b. Record actual locations of installed cylinders and their master

- key code.
- 2. Operation and Maintenance Data
 - a. Submit under provisions of Division 01.
 - b. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with the following requirements:
 - 1. ANSI A117.1
 - 2. NFPA 101.
 - 3. NFPA 80.
 - 4. NFPA 252.
 - 5. American Disabilities Act Accessibility Guidelines.
 - 6. BHMA - A115 Series.
- B. Qualifications
 - 1. Manufacturer: Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
 - 2. Hardware Supplier: Company specializing in supplying commercial door hardware with 5 years documented experience, approved by manufacturer. Supplier must be within 150 miles of the project.
 - 3. Hardware Supplier Personnel: Employ a certified Architectural Hardware Consultant (AHC) to assist in the work of this section. AHC should review construction documents and verify hardware function for given location and base bid or requirements for a complete code complying, functioning installation.
 - 4. Supplier: A factory certified architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 5 years on projects of a minimum of 150 doors, and who is, or who employs an experienced licensed Architectural Hardware Consultant (AHC) who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements with the WSU, Architect and contractor.
- C. Regulatory Requirements
 - 1. Conform to applicable code for requirements applicable to fire rated doors and frames.
 - 2. Fire Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 01.
- B. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.
- C. Deliver keys to Owner by security shipment direct from hardware supplier.
- D. Inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- E. Provide secure lock-up for hardware delivered to the project but not yet installed. Control handling and installation of hardware items which are not immediately replaceable so that completion of the work will not be delayed by hardware losses, both before and after installation.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate work under provisions of Division 01.
- B. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

1.7 EXTENDED WARRANTY

- A. Under provisions of Division -01. Include coverage for all hardware.
- B. Extended Warranty - Manufacturer's standard for individual item.

1.8 MAINTENANCE

- A. Provide under provisions of Division 01.
- B. Provide special wrenches and tools applicable to each different or special hardware component.
- C. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: The numbers shown for the hardware items are taken from the catalogs of the manufacturers indicated and are for the purpose of establishing quality, design, and function. Except as listed as approved substitutes by item basis, no other manufacturer substitutions will be allowed unless approved by the Architect ten (10) days prior to bid opening. No substitutions will be allowed after bid opening.
- B. The numbers shown in the hardware groups are taken from the catalogs of the following manufacturers and are for the purpose of establishing quality, design and function. Except as listed, no substitution will be allowed unless approved by the Architect.

ITEM	MANUFACTURER	APPROVED SUBSTITUTE
Butts	Ives	Stanley, McKinney
Pivots	Rixson	None
Locksets, Latchsets	Schlage	None
Cylinders	Schlage	None
Exit Devices	Von Duprin	None
Overhead Stops	Glynn Johnson	None
Closers	LCN	None
Wall Stops	Rockwood	Trimco
Protection Plates	Ives	Trimco, Rockwood
Thresholds	Pemko	Zero, National Guard
Door Bottoms	Pemko	Zero, National Guard
Gasketing	Pemko	Zero, National Guard

2.2 MATERIALS/PRODUCTS:

- A. Provide end products of one manufacturer for each item specified..
- B. Finishes: BHMA 1301 Standards.
 - 1. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lockset (or push-pull units) for color and texture.
 - 2. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standard, but in no case less than specified for the applicable units of hardware by referenced standards.
 - 3. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI A156.18 "Materials and Finishes Standard" and Builders Hardware Manufacturer's Association (BHMA), including

coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

4. Hardware in general to be BHMA 626 and /or 652, Satin Chromium Plated. Applicable Stainless Steel hardware shall be BHMA 630, Satin Stainless Steel.
5. Door closers to be in plastic covers finished to match other hardware.
- C. Hardware shall meet NFPA-80 requirements for Fire Assembly Rating and be Underwriters Laboratories, Inc. approved for specific application: See Door Schedule.
- D. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
- E. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws, except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
- F. Provide concealed fasteners for hardware units which are exposed when door is closed, except when no standard units of type specified are available with concealed fasteners. Do not use through-bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each through-bolt or use hex screw fasteners.

2.3 KEYING

- A. Review the keying system with the WSU and provide the type required (master, grandmaster or great-grandmaster), integrated with the existing system
- B. Existing system is: Schlage. (No Substitution). Comply with WSU instructions for master keying, and, except as otherwise indicated; provide individual change keys for each lock which is not designated to be keyed alike with a group of related locks.
- C. Provide construction cores and keys during the construction period. Permanent cores and keys prepared according to the accepted keying schedule will be furnished to the owner by the local factory representative prior to occupancy. The Owner or Owner's agent will install permanent interchangeable cores and return the construction cores to the factory representative.
- D. All cylinders shall be keyed into the existing master key system.
- E. Furnish keys and related hardware in the following quantities:
 0. 6 each Master keys per set.
 1. 2 each Change keys each keyed core.
 2. 6 each Construction master keys.
 3. 4 each Grand master keys.
- F. Key all doors except passage, and noted interior vestibule doors.

2.4 HINGES

- A. General
 1. ANSI A 156J
 2. Quantity per door leaf height (minimum):

1 pair	to 5'-0" high
1-1/2 pair	5'-1" to 7'-7"
2 pair	7'-7" to 10'-0"
 3. Hinge height (minimum):

4 1/2"	to 3'-0" door width
5"	3'-1" to 4'-0"
 4. Hinge width (minimum): twice the door thickness, plus the jamb trim project at 180 degree swing.
 5. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template produced units.

6. Screws: Furnish Phillips flat-head machine and/or wood screws for installation of units. Finish screw heads to match surface of hinges or pivots. Provide stainless steel fasteners on exterior doors.
 7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges - Steel pins.
 - b. Non-Ferrous Hinges - Stainless steel pins.
 - c. Out-Swinging Doors - Non-removable Pins(NRP). Use set screw in barrel type.
 - d. Tips - Flat button and matching plug, finished to match leaves, except where hospital tip (HT) indicated.
- B. Mortise Hinges
1. Full Mortise Hinges, 5-knuckle, flat button tip, anti-friction bearing type. Use Brass/Bronze type hinges on all exterior exposed doors.
 2. Hinge A: High frequency use , heavy weight.

Ives:	5BB1HW Steel (640)
	5BB1HW Brass/Bronze (613)
-
<u>Hinge B:</u>	Average frequency used, standard weight
Ives:	5BB1 Steel (640)
	5BB1 Brass/Bronze (613)
-
4. Other approved Manufacture's: Stanley, McKinney

2.5 LOCKSETS AND LATCHES

- A. General
1. ANSI A156.13, Series 1000 Grade 1
 2. Features:
 - a. Lockset and Trim: BHMA 613 Finished.
1) 17A Trim: (mortise)
 - b. Backset: 2-3/4 inch.
 - c. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock
bolt, with curved lip extended to protect frame, finished to match hardware.
Latchbolt: 3/4" minimum throw.
- B. Mortise & Cylindrical
1. Lockset x ANSI No. _____
 2. ANSI No.

F75	Passage
F76	Privacy
F81	Entry/Office
F84	Classroom
F86	Storage/Mechanical
 - 3.. Other Approved Manufacturers:
 - a. None

2.6 CLOSERS

- A. General
1. ANSI A156.4, Grade 7
ANSI A117.1 Accessi-
bility Code
 2. Provide closer on active leaf of non-rated paired doors.
 3. Install closer on interior (push) side of door.
 4. Size closer as per Manufacturer's recommendations.

5. Install thru-bolts with backer plates on all wood doors.
 6. Provide parallel arm mounting ANSI/BHMA CO2021. Use regular arm mounting only where parallel mounting is not appropriate or recommended.
 7. Provide heavy duty type arms.
 8. Provide hold-open type arms when Indicated; see Hardware Schedule in Section 08 71 00.
 9. Covers: As listed; Color: STAT/DKBR2, BHMA 689.
- B. Schedule:
- | | Item | Location | LCN. |
|----|---------------|----------|----------------|
| 1. | Closer A Door | | 4040XP |
| 2. | Closer B Door | | 4040XP S-Cush, |
| 3. | Closer C Door | | 4040XP EDA |
- C. Other approved Manufacturer's: None
- 2.7 STOPS AND HOLDERS
- A. General
1. ANSI A156.16
ANSI A117.1 Accessibility code.
 2. ANSI/BHMA 613 finished.
 3. Fasteners
 - a. Machine screws and threaded anchors at concrete or masonry.
 - b. Self tapping screws at wood or metal framing.
 4. Metal risers at carpet floors.
 5. Electromagnetic Holder
 - a. ANSI 1156.15.
 - b. Underwriters Laboratory, Inc. (U.L.)
 - c. Fail Safe Operation
 - d. Power Source: 24 V. AC/DC from Fire Alarm System.
 - 1) Coordinate with Division 26.
 - e. Provide extension arms and special mounting plates as required for complete installation of each electromagnetic holder. Contractor shall provide any special mounting hardware as a part of the base bid.
- B. Schedule
- | | | | |
|----|----------------------|--------------|---------------|
| 1. | <u>Stop Wall</u> | WS402CVX 613 | Ives |
| 2. | <u>Overhead Stop</u> | 100s / 90s | Glynn Johnson |
- 2.8 DOOR PLATES
- A. General
1. ANSI A 156.6
 2. Stainless Steel ANSIBHMA 613 finished
 3. Width of door leaf less 1 1/2" at single doors and less 2" at pairs
 4. Solid Metal (0.050 inch), all edges beveled
 5. Install on push side of door
- B. Schedule:
1. Kickplate: width specified x 16" high Ives, Trimco
- 2.9 THRESHOLDS
- A. General
1. ANSI A117.1, Accessibility Code
 2. Aluminum, ANSIBHMA 719 finished
 3. Thermal Break
 4. Stainless Steel Anchors
- B. Schedule:
1. Threshold PEMKO

2.10 WEATHERSTRIP AND SEALS

- A. General
 - 1. NFPA 80, 2-5.4 at fire rated and smoke assembly doors
 - 2. Aluminum, ANSI/BHMA 719 finished
 - 3. Seals, vinyl and silicone
- B. Schedule:
 - 1. Door Seal S88D PEMKO
 - 2. Door Sweep 18062 PEMKO

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify site conditions under provisions of Division 01.
- B. Verify that doors and frames are ready to receive work and dimensions are as instructed by the Manufacturer.
- C. Verify that electric power is available to power operated devices and of the correct characteristics.

3.2 INSTALLATION

- A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.
- B. Use templates provided by hardware item manufacturer.
- C. Conform to ANSI 117.1 and American Disabilities Act Guidelines for positioning requirements for the handicapped.
- D. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted-or finished in another way, coordinate removal, storage and reinstallation or application of surface protection with finishing work specified in the Division 09 sections. Do not install surface-mounted items until finishes have been completed on the substrate.
- E. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- G. Set supporting elements of thresholds for exterior doors in full bed of sealant as specified in Section 07 92 00.

3.3 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division 01.
- B. Architectural Hardware Consultant to inspect finished installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and. as specified.

3.4 ADJUST AND CLEAN

- A. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to punch list, acceptance or occupancy, and make final check and adjustments of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- B. Continued Maintenance Service: Approximately six months after the acceptance of hardware in each area and before substantial completes the installer, accompanied by representatives of the latch and lock, exit device, and closer manufacturers, shall return to the project and re-adjust every item of hardware to restore proper function of doors and

hardware, and to consult with and instruct WSU personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials, or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

- C. Any keys provided for any item whether in this section or any other will be present to the WSU in the key cabinet furnished under this section and such keys will be labeled and tagged in a manner consistent with the instructions supplied by the cabinet manufacturer and agreeable to the WSU.

3.5 HARDWARE SCHEDULE

HW1 Single exterior aluminum entry with access control

- 3 ea Hinge 5BB1HW 626 4 1/2 x 4 1/2 NRP
- 1 ea Schlage CO-100-CY-50-KP
- 1 ea Temp Core 23-030ICX
- 1 ea Permanent Core 20-740XP 626 D145
- 1 ea Closer 4040XP EDA AL
- 1 ea Threshold 1715AK
- 1 ea Door Sweep 18062CNB
- 1 set Gasket S88D
- 1 ea Floor Stop 441 626

HW2 Single interior aluminum vestibule door

- 3 ea Hinge 5BB1HW 613 4 1/2 x 4 1/2 NRP
- 1 ea Dummy Bar 330 626
- 1 ea Pull 990DT 626
- 1 ea Closer 4040XP SCUSH AL x 4040-61 x 4040-30
- 1 set Gasket S88D
- 1 ea Floor Stop 441 626

HW3 Single interior hollow metal door, storage

- 3 ea Hinge 5BB1HW 652 4 1/2 x 4 1/2
- 1 ea Lockset L9070J 17A 626
- 1 ea Temp Core 23-030ICX
- 1 ea Permanent Core 23-030 626 D145
- 1 ea Overhead Stop 450S US32D
- 1 ea Kickplate 8400 10 x 1.5 LDW B4E US32D
- 3 ea Silencers SR64

HW4 Single interior hollow metal door, restroom

- 3 ea Hinge 5BB1HW 652 4 1/2 x 4 1/2
- 1 ea Lockset L9496J 17A 626 (privacy with "occupied" indicator)
- 1 ea Temp Core 23-030ICX
- 1 ea Permanent Core 23-030 626 D145
- 1 ea Closer 4040XP SCUSH AL x 4040-61 x 4040-30
- 1 ea Kickplate 8400 10 x 1.5 LDW B4E US32D
- 3 ea Gasket S88D

END OF SECTION 08 71 00

SECTION 08 80 00 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazing & mirrors for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Exterior and Interior Doors.
 - 3. Interior borrowed lites.
 - 4. Glazed storefront and window systems.
- B. Performance Requirements:
 - 1. Glass and glazing materials of this Section shall provide continuity of building enclosure vapor and air barrier:
 - a. In conjunction with materials described in other sections of Division 07 and Division 08
 - b. To utilize the inner pane of multiple pane sealed units for the continuity of the air and vapor seal
 - c. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant
 - 2. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with IBC requirements and the design criteria contained within the construction documents
 - 3. All glazing shall be type and quality as required to meet UBC requirements for safety glazing. Provide labeling required as per IBC requirements

1.2 REFERENCES

- A. American Architectural Manufacturers Association (AAMA) (www.aamanet.org) 800 - Voluntary Specifications and Test Methods for Sealants.
- B. American National Standards Institute (ANSI) (www.ansi.org) Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.
- C. American Society of Civil Engineers (ASCE) (www.asce.org) 7 - Minimum Design Loads for Buildings and Other Structures.
- D. ASTM International (ASTM) (www.astm.org):
 - 1. C509 - Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
 - 2. C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.
 - 3. C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
 - 4. C920 - Standard Specification for Elastomeric Joint Sealants.
 - 5. C1036 - Standard Specification for Flat Glass.
 - 6. C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT, Coated and Uncoated Glass.
 - 7. C1115 - Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.
 - 8. C1172 - Standard Specification for Laminated Architectural Flat Glass.
 - 9. C1184 - Standard Specification for Structural Silicone Sealants.
 - 10. C1281 - Standard Specification for Preformed Tape Sealants for Glazing Applications.
 - 11. C1294 - Standard Test Method for Compatibility of Insulating Glass Edge Sealants with Liquid-Applied Glazing Materials.
 - 12. C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
 - 13. E119 - Standard Test Method for Fire Tests of Building Construction and Materials.

14. E152 - Standard Test Method for Fire Test of Door Assemblies.
15. E163 - Standard Test Method for Fire Tests of Window Assemblies.
16. E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
17. E 546 - Test Method for Frost/Dew Point of Sealed Insulating Glass Units.
18. E 576 - Test Method for Frost/Dew Point of Sealed Insulating Glass Units in Vertical Position.
19. E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
20. E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
21. F1233 - Standard Specification for Security Glazing Materials and Systems.
- E. Consumer Product Safety Commission (CPSC) (www.cpsc.gov) 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- F. Glass Association of North America (GANA) (www.glasswebsite.com):
 1. Engineering Standards Manual.
 2. Glazing Manual.
 3. Laminated Glass Design Guide.
- G. Insulating Glass Manufacturers Alliance (IGMA) (www.igmaonline.org):
 1. IGMA TB-3001 - Sloped Glazing Guidelines.
- H. National Fenestration Rating Council (NFRC) (www.nfrc.org):
 1. 100 - Procedure for Determining Fenestration Product Thermal Properties.
 2. 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence.
 3. 300 - Procedures for Determining Solar Optical Properties of Simple Fenestration Products.
- I. Underwriters Laboratories (UL) (www.ul.com) 752 - Standard for Safety Bullet-Resisting Equipment.
- J. Current edition International Building Code. (2015 IBC).

1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data on Glass Types Specified: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Manufacturer's Certificate: Certify that sealed insulated glass, meet or exceed specified requirements.
- E. Test Report: Preconstruction adhesion and compatibility test report from glazing sealant manufacturer, based on submitted samples or acceptable data from previous testing of current formulations with similar product.
- F. Submit drawings indicating required backing for mirrors

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with FGMA Glazing Manual, FGMA Sealant Manual, SIGMA and Laminator Safety Glass Association - Standards Manual for glazing installation methods.
- B. Glazing Publications: Comply with the following published recommendations for Mirrors
 1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
 2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- C. Fire Rated Glass Assemblies: Conform to ASTM E119.
- D. Bullet-Resisting Glass: UL 752 Level II.
- E. Installer Qualifications: Minimum 5 years documented experience in work of this Section.
- F. Regulatory Requirements:
 1. Provide safety glass for locations subject to human impact as required by Building

- Code.
- 2. Safety glass: Tested and labeled to CPSC 16 CFR 1201.
- G. Perform Work in accordance with GANA Glazing Manual, GANA Laminated Glass Design Guide, SIGMA TM-3000 and IGMA TB-3001.

1.5 PROJECT/SITE CONDITIONS

- A. Field Measurements
 - 1. Verify that field measurements are as indicated on shop Drawings.
- B. Perform glazing when ambient temperature is above 40 degrees F.
- C. Perform glazing on dry surfaces.

1.6 SEQUENCING AND SCHEDULING

- A. Coordination
 - 1. Coordinate the Work with glazing frames, wall openings, and perimeter air and vapor seal to adjacent Work.

1.7 EXTENDED WARRANTY

- A. Under provisions of Division 01
- B. Manufacturer's Special Warranty Insulating Glass Units: Provide Manufacturer's ten (10) year warranty against material obstruction of vision through unit due to:
 - 1. Intrusion of dust or moisture
 - 2. Internal condensation
 - 3. Film formation on internal glass surfaces caused by failure of hermetic seal except failure caused in whole or in part by breakage or fracturing of any portion of glass surface.
- C. Glass Coatings: Provide Manufacturer's ten (10) year warranty against peeling, cracking, or deterioration of coating under normal condition.
- D. Laminated Glass Units: Provide Manufacturer's five (5) year warranty against manufacturing defects resulting in edge separation, delamination, or material obstruction of vision through glass surface.
- E. Mirrors: Provide Manufacturer's ten (10) year warranty against silver spoilage resulting from manufacturing defects.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 GLASS PRODUCTS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.
 - 1. Ultra-Clear (Low-Iron) Float Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
 - 1. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements".
 - 2. For uncoated glass, comply with requirements for Condition A.
 - 3. For coated vision glass, comply with requirements for Condition C (other uncoated glass).

4. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.
- C. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
 1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
 3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 4. Sealing System: Dual seal, with primary and secondary sealants as follows:
 - a. Manufacturer's standard sealants.
 - b. Polyisobutylene and silicone.
 5. Spacer Specifications: Manufacturer's standard spacer material and construction.

2.3 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 1. EPDM, ASTM C 864.
 2. Silicone, ASTM C 1115.
 3. Thermoplastic polyolefin rubber, ASTM C 1115.
 4. Any material indicated above.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
 1. EPDM.
 2. Silicone.
 3. Thermoplastic polyolefin rubber.
 4. Any material indicated above.
- C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.4 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 1. Neutral-Curing Silicone Glazing Sealants GS-<#>:
 - a. Available Products:
 - 1) Dow Corning Corporation; 791.

- 2) Dow Corning Corporation; 795.
- 3) GE Silicones; SilPruf NB SCS9000.
- 4) GE Silicones; UltraPruf II SCS2900.
- 5) Pecora Corporation; 865.
- 6) Pecora Corporation; 895.
- 7) Pecora Corporation; 898.
- b. Type and Grade: S (single component) and NS (nonsag).
- c. Class: 50.
- d. Use Related to Exposure: NT (nontraffic).
- e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
 - 1) Use O Glazing Substrates: Coated glass color anodic aluminum, aluminum coated with a high-performance coating galvanized steel.

2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.7 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.
- D. Bullet-Resisting Glass:
 1. Comply with UL 752.

2. Laminate glass with laminating film by manufacturer's standard heat and pressure process.
3. Cut glass to required size at factory. Treat edges to prevent moisture intrusion. Coordinate speak-thru void where shown.
4. Discard glass with voids, delamination, or entrapped dirt or foreign matter.

2.8 GLASS PRODUCTS

A. Available Manufacturers:

1. Basis of Design: PPG Industries Inc.
2. Libby-Owens-Ford Company
3. Pilkington
4. Saint Gobain Glass
5. Nippon Electric Glass Co., Ltd., and distributed by Technical Glass Products

B. See drawings for locations where glazing types G# (specified below) are indicated

C. **G1-** Insulated Clear Glazing Units

1. Solar-Control Low-E Insulating-Glass Units: PPG Industries Solar 70XL (2) Starphire
2. Overall Unit Thickness and Thickness of Each Lite: 1" overall, with two ¼" nominal layers of glass with ½" air space between.
3. Interspace Content: Air.
4. Outdoor Lite: Class 1 (clear).
 - a. Annealed or Kind HS (heat strengthened) where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with system performance requirements. Low-E coating sputter coated on number 2 surface
 - b. Color: "Starphire" by PPG.
5. Indoor Lite: Class 1 (clear) float glass,
 - a. Annealed.
6. Low-E Coating: sputtered on second surface.
7. Visible Light Transmittance: 64 percent minimum.
8. Winter Nighttime U-Factor: .28 maximum.
9. Summer Daytime U-Factor: .26 maximum.
10. Solar Heat Gain Coefficient: .27 maximum.
11. Shading Coefficient: 0.32
12. Outdoor Visible Reflectance: 12 percent maximum.

D. **G1S-** Insulated Clear Glazing Units, safety rated for locations subject to impact

1. Solar-Control Low-E Insulating-Glass Units: PPG Industries Solar 70XL (2) Starphire
2. Overall Unit Thickness and Thickness of Each Lite: 1" overall, with two ¼" nominal layers of glass with ½" air space between.
3. Interspace Content: Air.
4. Outdoor Lite: Class 1 (clear).
 - a. Kind FT (fully tempered) where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with system performance requirements
 - b. Color: "Starphire" by PPG.
5. Indoor Lite: Class 1 (clear) float glass.
 - a. Kind FT (fully tempered)
6. Low-E Coating: sputtered on second surface.
7. Visible Light Transmittance: 64 percent minimum.
8. Winter Nighttime U-Factor: .28 maximum.
9. Summer Daytime U-Factor: .26 maximum.
10. Solar Heat Gain Coefficient: .27 maximum.
11. Shading Coefficient: 0.32
12. Outdoor Visible Reflectance: 12 percent maximum.

E. **G2-** Clear Glazing

1. Uncoated Clear Float-Glass Units: Class 1 (clear) float glass; Pilkington Optifloat Clear (single glazed for interior installation)

2. Thickness: 6.0 mm.
- F. **G2S-** Clear Glazing, safety rated for locations subject to impact
 1. Uncoated Clear Float-Glass Units: Class 1 (clear) float glass Kind FT (fully tempered) float glass - Tempered: Pilkington Optifloat Clear (single glazed for interior installation)
 2. Thickness: 6.0 mm.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 1. Manufacturing and installation tolerances, including those for size, square-ness, and offsets at corners.
 2. Presence and functioning of weep system.
 3. Minimum required face or edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm) as follows:
 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
- 3.4 TAPE GLAZING
- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
 - B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
 - C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
 - D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
 - E. Do not remove release paper from tape until just before each glazing unit is installed.
 - F. Apply heel bead of elastomeric sealant.
 - G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
 - H. Apply cap bead of elastomeric sealant over exposed edge of tape.
- 3.5 GASKET GLAZING (DRY)
- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
 - B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
 - C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
 - D. Install gaskets so they protrude past face of glazing stops.
- 3.6 SEALANT GLAZING (WET)
- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
 - B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
 - C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.
- 3.7 CLEANING AND PROTECTION
- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
 - B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
 - C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
 - D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.
- F. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- G. Do not permit edges of mirrors to be exposed to standing water.
- H. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION 08 80 00

WSU GOLF TEAM BUILDING ADDITION
FINISH SCHEDULE[illegible]

ABBREVIATIONS KEY (not all may apply)

BRK	Brick w/ Pre-cast Concrete Base	FF	Factory Finish		NC	No Finished Ceiling			RB	Rubber Base		STRUC	Open to Structure
CMU	Concrete Masonry Unit	FRP	Fiber Reinforced Plastic		NF	No Finish			RST	Rubber Stair Treads and Risers		WC	Vinyl Wall Covering
CONC	Concrete	GWB	Gypsum Wall Board		PFS	Paint Down Floor Sealer			ACT	Suspended Acoustic Ceiling		WALK	Walk Off Tile
CMS	Clear Masonry Sealer	GLASS	Glazing System		PLAM	Plastic Laminate			HPC	Honed Polished Concrete		WD	Wood Floor System
CPT	Carpet	LVT	Luxury Vinyl Tile (Resilient Plank)		PLYWD	Plywood			STL	Steel		ACOUS	Perforate Acoustical Ceiling Deck
CPL	Compact Laminate Panel	MDF	Medium Density Fiberboard		PT	Paint			SV	Sheet Vinyl Flooring w/ Heat Welded Seams		CPT	Compact Laminate Wall Panel
			General Finish Notes:										
			1	Install FRP full height of wall in 4' wide sections unless noted otherwise and provide aluminum joint transitions at all panel edges.									
			2	Install water resistant backer board at plumbing fixture locations.									
			4	Install solid wood blocking/backing at all wall hung equipment prior to gypsum board installation.									
			5	Some toilet accessories to be OFCI. Reference specification 10 28 00.									
			6	Vinyl wall covering shall be installed first and extend behind all wall equipment and casework.									

Material Legend / Key

Reference ABBREVIATION KEY above in Finish Schedule											
Spec.	Section/Item	Reference	Mfgr./Product	Finish Color	Remarks						
Div. 3	Concrete										
03 30 00	Cast In Place Concrete										
03 35 00	Concrete Floor Finishing										
Div. 4	Masonry										
04 20 00	Unit Masonry										
Div. 5	Metals										
05 12 00	Structural Steel	-	-								
		-	-								
05 40 00	Cold Formed Metal Framing	-	-								
05 50 00	Metal Fabrications	-	-								
Div. 6	Wood and Plastics										
06 10 00	Rough Carpentry	-	-								
		-	-								
06 20 00	Interior Finish Carpentry	-	-								
Div. 7	Thermal & Moisture Protection										
07 11 13	Bituminous Dampproofing	-	Approved Mnfr List	Black							
	Thermal Insulation										
07 21 16	Batt Insulation	-	Approved Mnfr List								
07 21 13	Rigid Insulation	-	Approved Mnfr List								
07 21 29	Insulated Sheathing	-	Owens Corning - Foamular CC, XPS								Tape all seams/penetrations
07 26 00	Vapor Retarders	-	Approved Mnfr List								
07 27 00	Weather Barriers	-	Approved Mnfr List								
07 42 13	Pre-Formed Metal Siding and Soffit										
	Exposed Fastener	-									
	Screen Wall	-									
07 54 00	Thermoplastic Polyolefin (TPO) Roofing	-	Carlisle SynTec	White							

Material Legend / Key

Reference ABBREVIATION KEY above in Finish Schedule									
Spec.	Section/Item			Reference	Mfgr./Product		Finish Color		Remarks
07 61 13	Standing Seam Metal Roofing		-		AEP-Span, SpanSeam		owner approved red/crimson		
07 62 00	Sheet Metal Flashing and Trim		-		-		owner approved red/crimson		
	Gutters and Downspouts		-		-				
07 72 00	Roof Accessories		-		Access Hatch		Paint to match roof color		
07 84 13	Penetration Firestopping		-		Approved Mnfr List				
07 92 00	Joint Sealants		-		See Sealant Requirements - Various Mnfr		Match adjacent material color being sealed		
Div. 8	Doors and Windows								
08 11 13	Hollow Metal Doors and Frames		-		Ceco Door Products		Prime finish for field paint - see Division 09 colors to be approved by owner		
			-						
08 31 13	Access Doors and Frames		-		Approved Mnfr List		Shop primed for field painting, match adjacent finish colors to be approved by owner		
			-						
08 41 13	Aluminum-Frame Curtain Wall, Storefronts, Entries & Window Systems								
	Storefront				Kawneer Trifab VG 451 (Interior Vestibule)		Anodized #29 Black		
	Entry Doors				Kawneer Aluminum Entrances 350 Medium Duty		Anodized #29 Black		
	Curtain Wall				Kawneer 1600 Wall System 1		Anodized #29 Black		
08 71 00	Door Hardware		-		See Hardware Requirements - Various Mnfr				
08 80 00	Glazing								
	Insulated Clear Glazing		G1		PPG Industries Solar 70 XL (2)		Starphire		
	Insulated Clear Glazing (safety)		G1S		PPG Industries Solar 70 XL (2)		Starphire		
Div. 9	Finishes								
09 22 16	Non-Structural Metal Framing		-		-				
09 29 00	Gypsum Board		-		-		Typical finish - Level 5, Smooth Wall		
09 65 13	Resilient Base and Accessories								
	Rubber Base		RB-1		Ropee - 4"		Black		
									a 6-8 week lead time.
									Install vertical ashlar
							Blue Streak MHA5913		
09 77 00	Special Wall Surfacing		FRP		WilsonArt Compact Laminate		5014K-19 Battleship, w/ alum trims orient pattern vertically on walls		

Material Legend / Key

[illegible]

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board.
 - 2. Taped and sanded joint treatment
 - 3. Texture finish
 - 4. Installation of acoustical sealant specified in Section 07 92 00, at sound rated walls
 - 5. Installation of access doors specified in Section 08 31 13

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Provide certification that all drywall materials to be incorporated into the project are manufactured in the USA.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
 - 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Mockups: Before beginning gypsum board installation, install mockups of at least 50 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. General: Complying with ASTM C 36 or ASTM C 1396, as applicable to type of gypsum board indicated and whichever is more stringent.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. National Gypsum Company – basis of design
 - 2. American Gypsum Co. – products equal to basis of design
 - 3. BPB America Inc. – products equal to basis of design
 - 4. Certaineed – products equal to basis of design
 - 5. G-P Gypsum – products equal to basis of design
 - 6. Lafarge North America Inc. – products equal to basis of design
 - 7. PABCO Gypsum – products equal to basis of design
 - 8. USG Corporation – products equal to basis of design
- D. All drywall materials incorporated into the project shall be manufactured in the USA.

2.2 FIRE-RESISTANCE RATED GYPSUM BOARD: Use in all locations unless noted otherwise in specifications or drawings.

- A. Basis of Design: Gold Bond® BRAND Fire-Shield® Gypsum Board
 - 1. Type X, Panel Physical Characteristics
 - a. Core: Fire-resistance rated gypsum core
 - b. Surface paper: 100 percent recycled content paper on front, back and long edges
 - c. Long Edges: Tapered
 - d. Overall thickness: 5/8 inch
 - e. Panel complies with Type X requirements of ASTM C 1396

2.3 MOLD AND MOISTURE RESISTANT GYPSUM BOARD; Use throughout rooms at all Restrooms, and within 6'-0" of the center line of any plumbing fixture in other locations.

- A. Basis of Design: Gold Bond® BRAND XP Gypsum Board
 - 1. Panel Physical Characteristics
 - a. Core: Mold and moisture resistant gypsum core
 - b. Surface paper: 100 percent recycled content moisture/mold/mildew resistant paper on front, back, and long edges
 - c. Long Edges: Tapered
 - d. Overall thickness: 1/2 inch
 - e. Panel complies with requirements of ASTM C 1396
 - f. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273
 - g. Environmental Requirements: Provide products that comply with testing and product requirements for low emitting materials

2.4 TRIM ACCESSORIES

- A. Aluminum Trim: Extruded accessories of profiles and dimensions indicated. At all locations calling out for Control Joints in interior elevation drawings of gypsum board walls, the product for this joint shall be:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Basis of Design: Fry Reglet Corp.
 - 1) Wall Reveal: Reveal Molding DRM-625-625
 - 2) Wall "F" Reveal: "F" Reveal FDM 625-150
 - b. Gordon, Inc.; equivalent to above
 - c. Pittcon Industries; equivalent to above

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Clear – Class II anodic finish.
- B. Interior Trim: At all joint locations not defined in interior elevation drawings, joint system complying with ASTM C 1047.
 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - e. Expansion (control) joint.
 - f. Curved-Edge Cornerbead: With notched or flexible flanges.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Wallboard: Paper.
 2. Exterior Gypsum Soffit Board: Paper.
 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
- D. Joint Compound for Exterior Applications:
 1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
 2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.
- E. Joint Compound for Tile Backing Panels:
 1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
 2. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 3. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

- D. Sound Attenuation Blankets: Reference and coordinate with Division 07 "Building Insulation". ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 - E. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."
 - 1. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
 - G. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."
- 2.7 TEXTURE FINISHES
- A. Reference and coordinate with Division 09 "Painting" for products and sequence of primer and gypsum board texture finishes.
 - B. Primer: As recommended by textured finish manufacturer.

PART 3 - EXECUTION

- 3.1 EXAMINATION
- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
 - B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
 - C. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 APPLYING AND FINISHING PANELS, GENERAL
- A. Comply with ASTM C 840.
 - B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
 - C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
 - D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
 - E. Form control and expansion joints with space between edges of adjoining gypsum panels.
 - F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
 - G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
 - H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
 - I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: As indicated on Drawings, typical product for use unless noted otherwise in specifications or drawings.
 - 2. Ceiling Type: As indicated on Drawings.
 - 3. Water-, Moisture- and Mold-Resistant Type: As indicated on Drawings, and use throughout rooms at all Restrooms, Locker Rooms, Kitchens, Janitor Closets, and within 6'-0" of the center line of any plumbing fixture in other locations. Install 24 inches in height continuously at all ceramic wall tile base locations.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
 - 1. Provide control joints in all gypsum board surfaces that extend for greater than 30' in a single plane (i.e. without offset of internal or external corners). Coordinate exact locations of joints with architect prior to framing.
 - 2. Provide control joints at all locations indicated in drawings, reference interior elevations and related drawings.
 - 3. Provide control joints at all locations where supporting substrate framing changes support condition (i.e. transitions from ground supported to suspended soffits and wall surfaces for example).
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. L-Bead: Use where indicated.
 - 4. U-Bead: Use at exposed panel edges.
 - 5. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings. Install in accordance with trim manufacturers recommendations and requirements.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: not used
 - 2. Level 2: Ceiling plenum areas, mechanical mezzanine areas, concealed areas, and where indicated.
 - 3. Level 3: not used.
 - 4. Level 4: not used
 - 5. Level 5: Smooth wall final texture, at all panel surfaces that will be exposed to view, unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.6 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: In accordance with 09 90 00, prepare and apply base coat primer to gypsum panels and other surfaces prior to applying texture finishes. Apply primer to surfaces that are clean, dry, and smooth per Painting Specification.
- B. Final texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.
- D. Finish Primer: In accordance with 09 90 00, prepare and apply top coat primer to gypsum panels and other surfaces after applying texture finishes. Apply finish primer to surfaces that are clean, dry, and smooth per Painting specification.

3.7 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.
- C. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Mockups: Provide resilient products with mockups specified in other Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 300 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

- A. Resilient Base:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong World Industries, Inc.
 - b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - c. Endura Rubber Flooring; Division of Burke Industries, Inc.

- d. Flexco, Inc.
 - e. Johnsonite.
 - f. Mondo Rubber International, Inc.
 - g. Musson, R. C. Rubber Co.
 - h. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
 - i. Roppe Corporation, USA.
 - B. Resilient Base Standard: ASTM F 1861.
 - 1. Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
 - 2. Manufacturing Method: Group I (solid, homogeneous) or Group II (layered).
 - 3. Style: Cove (base with toe), and Straight (base without toe).
 - C. Minimum Thickness: 0.125 inch.
 - D. Height: 4 inches or 6 inches with cove base - as indicated on Drawings.
 - E. Height: 4 inches or 6 inches with cove base at all wet areas (restroom, custodial, kitchen) – as indicated on drawings.
 - F. Lengths: Coils in manufacturer's standard length.
 - G. Outside Corners: Job formed.
 - H. Inside Corners: Job formed.
 - I. Finish: Matte.
 - J. Colors and Patterns: As indicated by manufacturer's designations, reference Finish Schedule Material Finish Designations.
- 2.2 RESILIENT MOLDING ACCESSORY
- A. Resilient Molding Accessory:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - b. Flexco, Inc.
 - c. Johnsonite.
 - d. R.C.A. Rubber Company (The).
 - e. Roppe Corporation, USA.
 - B. Description: Reducer strip for flooring transitions, Joiner for tile and carpet and miscellaneous Transition strips.
 - C. Material: Rubber.
 - D. Flooring Transitions: As indicated or type and size to accommodate transition between flooring materials
 - 1. Confirm other molding, trim, transition strips to suit individual applications and conditions
 - E. Colors and Patterns: As indicated by manufacturer's designations, reference Finish Schedule Material Finish Designations.
- 2.3 INSTALLATION MATERIALS
- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
 - B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Cove Base Adhesives: Not more than 50 g/L.
 - b. Rubber Floor Adhesives: Not more than 60 g/L.
 - C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible. Miter cut to provide tight fitting joint with no gaps.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 77 00 – SPECIAL WALL SURFACING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Glass-fiber reinforced plastic (FRP) wainscott paneling and trim accessories.
 - 2. Compact Laminate Panels (CPL) wainscot paneling and trim accessories

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Submit manufacturers installation instructions
- C. Samples for Initial Selection: For plastic paneling and trim accessories.
- D. Samples for Verification: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.
- B. Manufacturer: Company specializing in manufacturing FRP Panels with 3 years documented experience
- C. Installer: Company specializing in installing FRP Panels with 3 years documented experience
- D. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 26 to 75.
 - 2. Smoke-Developed Index: 450 or less.
- E. Performance Requirements:
 - 1. Resist lateral Impact force of 25 in. lbs. at any point without damage or permanent set. Test Method ASTM D5420.
 - 2. Barcol Hardness: 45 Test Method ASTM D2583.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Protect panel material, packaged adhesives, and sealants from temperature cycling and cold temperatures
- C. Provide continuous ventilation and heating facilities to maintain substrate surface and ambient temperature above 60 degrees F, unless required otherwise by manufacturer's instructions
- D. Do not apply adhesive when substrate surface temperature or ambient temperature is below 60 degrees F or relative humidity is above 50 percent
- E. Maintain these conditions 24 hours before, during and after installation of FRP Panels
- F. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces, during installation

PART 2 - PRODUCTS

2.1 PLASTIC SHEET PANELING

- A. General: Gelcoat-finished, glass-fiber reinforced plastic panels complying with ASTM D 5319.
 - 1. Basis-of-Design Product: as indicated in Finish Material Legend for manufacturer, product and color selections. Subject to compliance with those requirements, provide
 - a. FRP-1: Nudo, Allure, silver 260 with aluminum trims as required

2. By prior substitution request per Division 01 requirements identical product by one of the following may be acceptable:
 - a. WilsonArt Compact Laminate (reference below)
 - b. Marlite, Induro
3. Nominal Thickness: 0.090 inch
4. Surface Finish: As indicated by manufacturer's designations in the Finish Schedule, Finish Materials Designations
5. Color: As indicated by manufacturer's designations in the Finish Schedule, Finish Materials Designations

2.2 COMPACT LAMINATE PANELING

- A. General: High pressure, solid composite panels complying with ASTM D 5319.
 1. Basis-of-Design Product: as indicated in Finish Material Legend for manufacturer, product and color selections. Subject to compliance with those requirements, provide
 - a. CPL-1: WilsonArt Compact Laminate, finish color and pattern as selected from manufacturer's full range, including premium cost selections.
 2. By prior substitution request per Division 01 requirements identical product by one of the following may be acceptable:
 - a. Formica Compact Laminates
 - b. Marlite Compact Laminate
 3. Nominal Thickness: 0.125 inch and 0.25 inch
 4. Surface Finish: As indicated by manufacturer's designations in the Finish Schedule, Finish Materials Designations
 5. Color: As indicated by manufacturer's designations in the Finish Schedule, Finish Materials Designations

2.3 ACCESSORIES

- A. Aluminum Trim Accessories: Manufacturer's aluminum extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
 1. Color: Mill finish aluminum.
- B. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.
- C. Adhesive: As recommended by plastic paneling manufacturer.
 1. VOC Content: 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Sealant: Single-component, Latex sealant recommended by plastic paneling manufacturer and complying with requirements in Division 07 Section "Joint Sealants."
 1. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that substrate surfaces are ready to receive work and conform to requirements of the FRP/CPL Panel manufacturer
- C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.

- B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation. Fill cracks and smooth irregularities with filler; sand smooth.
 - C. Work of this section will include wall floating, filling, shimming and grinding necessary to provide a suitable substrate for the installation of the fiber reinforced panels. In no case will existing substrate joints be allowed to be visible after installation of the panels. Should installed panels telegraph underlying joints then the conditions will be corrected by contractor's expense.
 - D. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.
 - E. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
 - F. Remove electrical, telephone, and wall plates and covers
 - G. Lay out paneling before installing. Locate panel joints where indicated] and to provide equal panels at ends of walls not less than half the width of full panels.
 - 1. Mark plumb lines on substrate at [trim accessory] [panel joint] locations for accurate installation.
 - 2. Locate trim accessories and panel joints to allow clearance at panel edges according to manufacturer's written instructions.
 - H. Vacuum clean surfaces free of loose particles
- 3.3 DELIVERY AND STROAGE
- A. All materials shall be inspected immediately upon delivery and effects reported. Remove panels from shipping skid and restack on a solid, flat, dry surface. Do not stack on fresh concrete floors or other surfaces that may emit moisture. Lay panels flat. Do not store on edge. Panels should be acclimated at least 24 hours in temperature and humidity conditions approximating the operating environment of the finished room. Damaged or deteriorated materials shall be removed from the premises.
- 3.4 INSTALLATION
- A. Install plastic paneling according to manufacturer's written instructions.
 - B. Install panels horizontally in one piece from floor to height of wainscot, as indicated on Drawings. Horizontal joints not indicated in the drawings are not acceptable, Vertical joints only allowed at maximum panel lengths and corners.
 - C. Razor trim edges on flat work table. Do not cut on gypsum board substrate surfaces
 - D. Install panels in a full spread of adhesive to eliminate all bubbles or adhesive voids on back side of panels. Visible mechanical fasteners are not acceptable. Panels that bubble or pull out from wall substrate shall be re-installed with proper adhesive coverage.
 - E. Install inside and outside corner and cap moldings at all applicable locations. Install trim accessories with adhesive and nails.
 - F. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.
 - G. Install wall covering before installation of bases, hardware, or items attached to or spaced slightly from wall surface
 - H. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
 - I. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant. Joint shall not exceed 3/32 inches wide.
 - J. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.
- 3.5 ADJUSTING AND CLEANING
- A. Repair damaged and defective work, where possible, to eliminate functional and visual defects; where not possible to repair, replace work. Adjust joinery for uniform appearance.
 - B. Clean wall panels of excess adhesive, dust, dirt and other contaminants.
 - C. Do not permit work at or near finished wall covered areas

END OF SECTION 09 77 00

SECTION 09 91 00 – PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. All surface preparation throughout the project
2. All site-applied painting and clear finish application on the project, including Site, Mechanical, and Electrical areas of work.
3. Surface finish schedule.

B. Related Sections

1. Mechanical items: Painting of anchors/hangers, piping, mechanical equipment, ductwork, insulation, etc. shall be performed by this section except where specifically stated otherwise in Division 22, or 23. All paint materials and methods, regardless of installer, shall meet the requirements set forth in Section 09 91 00 for Products and Execution. Upon completion of the project, all materials exposed to view shall be painted.
2. Electrical items: Painting of anchors/hangers, piping, mechanical equipment, ductwork, insulation, etc. shall be performed by this section except where specifically stated otherwise in Division 26, 27, or 28. All paint materials and methods, regardless of installer, shall meet the requirements set forth in Section 09 91 00 for Products and Execution. Upon completion of the project, all materials exposed to view shall be painted.

1.2 REFERENCES

- A. ASTM D 16 - Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
- B. ASTM D 2016 - Test Method for Moisture Content of Wood.
- C. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Provide product data on all finishing products.
- C. Submit three (3) 8"x 10" paint draw downs of each specified paint material in each specified color and sheen
- D. Sustainable Design Criteria: For coatings, paints, interior primers, stains, and transparent finishes, including printed statement of VOC content and chemical components. Interior paint shall comply with Green Seal GS-11 Standard.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with three years experience.
2. Applicator: Company specializing in commercial painting and finishing approved by product manufacturer.

B. Field Samples

1. Provide samples under provisions of Division 01.
2. Before proceeding with paint application, finish one complete typical wall with trim, door frames, doors, etc. of each paint type and color scheme required, clearly indicating selected colors, finish texture, materials and workmanship
2. Provide field sample panel, on at least 100-sq. ft. of surface until required sheen, color and texture are achieved.
3. Locate where directed.
4. Once each scheme has written approval of the Architect and the Owner, sample may remain as part of the Work.

5. If approved, sample area will serve as a minimum standard for workmanship throughout work
- C. Regulatory Requirements
 1. Conform to ASTM E 84 for flame/smoke rating requirements for finishes.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.
- C. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.
- D. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.
- E. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.
- F. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.6 PROJECT/SITE CONDITIONS

- A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 50 degrees for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 85 percent unless required otherwise by manufacturer's instructions.
- C. Minimum Application Temperatures for Latex Paints: 50 degrees F; unless required otherwise by manufacturer's instructions.
- D. Minimum Application Temperature for Varnish Finishes: 65 degrees F, unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80-ft candles measured mid-height at substrate surface.

1.7 SPECIAL WARRANTY

- A. Under provisions of Division 01.
- B. Provide Manufacturer's Standard Material Warranty.

1.8 MAINTENANCE

- A. Extra Stock: provide (1) gallon of each type and color of paint or coating used.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. PAINT, STAIN, AND URETHANE
 1. Sherwin-Williams Company
 2. Columbia Paint Corporation
 3. Pittsburgh Paints
 4. Benjamin Moore
 5. Parker Paints
 6. Dupont
- B. HIGH PERFORMANCE COATING – EXPOSED EXTERIOR STEEL
 1. Basis of Design: Sherwin Williams
 - a. By substitution request: Carboline products equivalent to basis of design
 - b. By substitution request: Tnemec products equivalent to basis of design
- C. HIGH PERFORMANCE COATING – Elastomeric Paint
 1. Sherwin Williams
- D. EXTERIOR CLEAR FINISHED WOOD
 1. Sikken's Cetol system
- E. ANTI-GRAFFITI COATING – Exterior Exposed Cast-in-Place Concrete Walls and Concrete Masonry Unit Walls

1. Sherwin Williams B97C00150
 - a. Single Component, non-sacrificial, siloxane coating
- F. PAINTED/SEALED CONCRETE FLOORS
 1. Sherwin Williams Armorseal seal finish system
- G. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

- A. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
- B. Coatings: Good flow and brushing properties; capable of drying or curing free of streaks or sags.
- C. Provide a tint variation between all under coats and the final coat.
- D. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
- E. Refer to schedule at end of Section for surface finishes.
- F. VOC Content of Field-Applied Interior Primers, Paints, Coatings, Stains, and Transparent Finishes: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
 2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
 3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC content not more than 250 g/L.
 4. Floor Coatings: VOC content not more than 100 g/L.
 5. Shellacs, Clear: VOC content not more than 730 g/L.
 6. Shellacs, Pigmented: VOC content not more than 550 g/L.
 7. Clear Wood Finishes, Varnishes: VOC content not more than 350 g/L.
 8. Clear Wood Finishes, Lacquers: VOC content not more than 550 g/L.
 9. Stains: VOC content not more than 250 g/L.
- G. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop.
 1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 2. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.

- q. Lead.
- r. Mercury.
- s. Methyl ethyl ketone.
- t. Methyl isobutyl ketone.
- u. Methylene chloride.
- v. Naphthalene.
- w. Toluene (methylbenzene).
- x. 1,1,1-trichloroethane.
- y. Vinyl chloride.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that substrate is 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. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 3. Interior Located Wood: 15 percent, measured in accordance with ASTM D 2016.
 - 4. Concrete Floors: 12 percent.
 - 5. Beginning of installation indicates acceptance of substrate.
- D. Ensure surface temperatures or the surrounding air temperature is above 45 deg F before applying finishes. Minimum application temperatures for latex paints for interior work is 45 degrees F and 50 degrees F for exterior work. Minimum application temperature for varnish and stain finishes is 65 degrees F.
- E. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 45 degrees F for 24 hours before, during and 48 hours after application of finishes.
- F. Provide minimum 80 foot candles of lighting on surfaces to be finished. No exceptions

3.2 PREPARATION

- A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing for finishing.
- B. Correct defects, patch and fill substrate cracks, dents, holes, and other surface inconsistencies to match adjacent surfaces. Clean surfaces which affect work of this Section.
- C. Shellac and seal marks which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Concrete Floors: Schedule to receive clear wear surface, remove contamination, shot blast and prepare according to wear surface manufacturers instructions. Verify required acid-alkali balance is achieved. Allow to dry.
- F. Concrete floors scheduled to receive sealer: Prepare floor according to sealer manufacturer's instructions.
- G. Gypsum Board Surfaces: Latex fill minor defects. Spot prime defects after repair.
- H. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- I. Concrete or CMU Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose paint, 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. Confirm all surfaces are smooth and structurally sound. All loosely adhering paint, coatings and concrete shall be completely removed by scraping, pressure washing, blasting or other mechanical means. Chalky, oxidized or contami-

nated surfaces must be washed with Marathon Cleaning Concentrate (MCC) or equal biodegradable cleaner.

1. All cracks greater than hairline shall be routed to 1/16" and caulked with NP-1 urethane sealant.
- J. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime metal items including shop primed items.
- K. Steel Doors: Remove surface contamination and oils and wash with solvent. Seal top and bottom edges with primer.
- L. At all existing exterior caulked joints, remove all existing caulking, sealant, and backer materials. Cut, rout, and grind away all material in joints, clean and prepare for painting and re-sealing. After painting re-install sealant at all joint locations, in compliance with section 07 92 00.
- M. Existing wood rafters, joists, exposed wood in smith gym, clean existing dust, dirt, writing or stains off wood, prepare wood for finish per manufacturer's instructions.

3.3 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry.
- C. Apply each coat to uniform finish, without streaking, telegraphing of drywall joints or brush marks.
- D. Apply finish coats of paint slightly darker than preceding prime coat unless otherwise approved.
- E. Sand lightly between coats to achieve required finish.
- F. Allow applied coat to dry before next coat is applied.
- G. Back-roll all spray applied primer and finish coats on gypsum board or plaster finishes.
- H. Prime back surfaces of interior and exterior woodwork with primer paint.
- I. Seal concrete floors with polyurethane sealer.
- J. Elastomeric Paint:
 - a. Application – Primer, apply per manufacturer's full recommendations.
 - b. Application – Topcoat, apply per manufacturer's full recommendations.
- K. Paint all roof top items, including but not limited to, ducts, pipe vents, roof hatches smoke vents, and ladders.
- L. Paint all Mechanical and Electrical Equipment exposed to public view, this shall include but not be limited to, ducts, conduits, fitting, suspension/anchors and boxes. Protect interior reflector surfaces of light fixtures from any paint application or overspray.
- M. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.
- N. Field finish surfaces not factory pre-finished. Extend finish all the way behind all case-work, chalkboards, markerboards, and tackboards to allow relocation
- O. Protection
 1. Adequately protect other surfaces from paint and damage. Repair damage as a result of inadequate or unsuitable protection.
 2. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation area.
 3. Place cotton waste, cloths and materials which may constitute a fire hazard in closed metal containers and remove daily from site.
 4. Remove electrical plates, surface hardware, mechanical equipment, fittings and fastenings, prior to painting operations. These items are to be carefully stored, cleaned and replaced on completion of work in each area. Do not use solvent to clean hardware that may remove permanent lacquer finish.
- P. Mechanical and Electrical Equipment

1. Refer to mechanical and electrical sections with respect to painting and finishing requirements, color coding, identification banding of equipment, ducting, piping and conduit.
2. Remove grilles, covers and access panels for mechanical and electrical systems from location, sand and paint separately.
3. Finish paint primed and existing field painted equipment to color selected.
4. Prime and paint insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars and supports, except where items are plated or covered with a pre-finished coating.

3.4 CLEANING

- A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.
- B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.
- C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.5 PROTECTION

- A. Protect elements surrounding the work of this Section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this Section.
- C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
- D. Remove empty paint containers from site.

3.9 SCHEDULES

- A. Shop-Primed Items for Site Finishing.
 1. Standard steel doors and frames (Division 08): All exposed surfaces, tops and bottoms of doors.
- B. Exterior Surfaces
 1. Exposed Exterior Steel and field painted metals; including existing standing seam roofing, parapet cap flashing, exposed steel brackets, and other similar items (all exterior steel or metal on project unless noted otherwise):
 - a. Thoroughly remove all existing deteriorated finishes and clean surfaces completely. Reference Examination and Preparation sections above, and observe all of the paint manufacturer's recommendations.
 - b. Primer: Sherwin Williams Pro-Cryl Primer, applied at 3.0 mil dry film thickness
 - c. Intermediate Coat: Sherwin Williams Sher-Cryl HPA, applied at 3.0 -4.0 mil thickness
 - d. Finish Coat: Sherwin Williams Sher-Cryl HPA, applied at 3.0 -4.0 mil thickness
 - e. Approved substitution: Carboline or Tnemec system by approved substitution in accordance with Division 01 procedures.
 2. Steel Shop Primed (exterior hollow metal doors and frames only):
 - a. Touch up with zinc chromate primer per TTP-645A specifications.
 - b. Two Coats alkyd enamel, gloss, 3.0 mil gloss per TTP-37D specifications.
 3. Exposed Concrete and Concrete Masonry Units Surfaces to receive clear finish (Clear Masonry Sealer and Graffiti Protection). Integrally colored masonry units as indicated in the drawings and specifications.
 - a. Masonry Sealer, clear finish, 2.0 dry thickness, reference 04 22 00 specification
 - b. One coat non-sacrificial barrier coating, SW B97C00150, clear finish, 9 mil min. dry thickness
 4. Clear Finished Exposed glu-laminated members, CLT panels, and finished carpentry exterior wood trim:

- a. One coat semi-pigmented stain. Penetrating alkyd oil, wiping type, color selected by Architect.
 - b. One coat: Sikksens – Cetol 1 base coat, applied according to manufacturers requirements.
 - c. Two coats Sikksens – Cetol 23 top coats, applied according to manufacturers requirements.
- 5. Exterior exposed cement-fiber, wood-based or similar trim, composite trim, siding and panel products:
 - a. Patch and fill all surface cracks, holes, and irregularities with paintable latex caulking and filling compound (caulking shall be guaranteed for 30 year working life).
 - b. One coat Primer: Exterior primer for acrylic enamels, manufacturer's standard for exterior siding application.
 - c. Two coats Exterior semigloss acrylic enamel. Equal to Columbia Chem-Clad #05059WB, 3.0 mils minimum, and total of two coats.
- C. Interior Surfaces
 - 1. Steel - Primed:
 - a. Touch-up with original primer.
 - b. Paint Finish - One coat acrylic primer. 1.5 mil min.
 - c. Paint Finish - Two coats Alkyd (Pro Mar 200) semi-gloss finish. 3 mil min
 - 2. Steel - Galvanized:
 - a. One coat zinc chromate primer, 2.0 mil, per TTP-645A specifications.
 - b. Paint Finish - One coat acrylic primer. 1.5 mil min.
 - c. Paint Finish - Two coats Alkyd (Pro Mar 200) semi-gloss finish. 3 mil min
 - 3. Gypsum Board:
 - a. Sponge raw drywall tape joints and then apply one coat acrylic latex primer sealer with a vapor transmission rating less than one per TTP-1975 specifications, apply before final gypsum board texture coat.
 - b. One coat acrylic latex primer sealer with a vapor transmission rating less than one per TTP-1975 specifications, apply after final gypsum board texture coat.
 - c. Two coats acrylic latex enamel, semi-gloss sheen, 3.0 mil total of two coats per TTP-1511B specifications.
 - 4. Gypsum Board at toilet rooms and wet areas:
 - a. Sponge raw drywall tape joints and then apply one coat acrylic latex primer sealer with a vapor transmission rating less than one per TTP-1975 specifications, apply before final gypsum board texture coat.
 - b. One coat acrylic latex primer sealer with a vapor transmission rating less than one per TTP-1975 specifications, apply after final gypsum board texture coat.
 - c. Two coats epoxy enamel, semi-gloss sheen 3.0 mil.
 - 5. Concrete Block: to receive clear finish (Clear Masonry Sealer and Graffiti Protection). Integrally colored masonry units as indicated in the drawings and specifications.
 - a. Masonry Sealer, clear finish, 2.0 dry thickness, reference 04 22 00 specification
 - 10. Clear Finished Interior exposed Wood Members:
 - a. One coat stain. Penetrating alkyd oil, wiping type, color selected by Architect
 - b. One coat: Wood Classics Sanding Sealer, applied according to manufacturer's requirements.
 - c. Two coats Wood Classics Polyurethane Varnish, applied according to manufacturer's requirements.
- D. Colors – Reference Finish Schedule and Finish Materials Designations.

END OF SECTION 09 91 00

SECTION 10 14 00 – SIGNAGE & GRAPHICS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Panel signs and sign assemblies
 - a. Room identification signs
 - b. Code required signage
 - c. Exterior Signage

1.2 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for signs.
 - 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 2. Provide message list, typestyles, graphic elements including tactile characters and Braille, and layout for each sign.
- C. Samples: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
 - 1. Aluminum: For each form, finish, and color, on 6-inch- long sections of extrusions and squares of sheet at least 4 by 4 inches.
 - 2. Acrylic Sheet: 8 by 10 inches for each color required.
 - 3. Polycarbonate Sheet: 8 by 10 inches for each color required.
 - 4. Panel Signs: Not less than 12 inches square including border.
 - 5. Accessories: Manufacturer's full-size unit.
- D. Sign Schedule: Use same designations indicated on Drawings.
- E. Qualification Data: For fabricator.
- F. Maintenance Data: For signs to include in maintenance manuals.
- G. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- D. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
 - 1. All disabled accessibility symbols shall be white on a blue background.
- E. Mock-up
 - 1. Submit one (1) sample of each Sign Types and one (1) of all mounting systems to be used. The Owner reserves the right to disassemble any item and to subject items to any test necessary to determine its strength or character without being responsible for any damage to the item caused thereby. Samples will not be returned
 - 2. Provide full scale mock-up of each sign type, including all anchorage and fastening methods for review and approval of the Architect. Coordinate full installation to include lighting, and related trades. When accepted the mock-up may remain in place, and will serve as the standard of acceptable quality for all other installations

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metal and polymer finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image colors and sign lamination.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
- B. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:
 - 1. Impact Resistance: 16 ft-lbf/in. per ASTM D 256, Method A.
 - 2. Tensile Strength: 9000 lbf/sq. in. per ASTM D 638.
 - 3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D 790.
 - 4. Heat Deflection: 265 deg F at 264 lbf/sq. in. per ASTM D 648.
 - 5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.
- C. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils with pressure-sensitive adhesive backing, suitable for exterior applications.

2.2 PANEL SIGNS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide signage system as manufactured by:
 - 1. Standard Room Identification Signs: Best; sign type as defined in sub-section "B" below:
 - 2. Subject to substitution request as provided in Division 01, alternate suppliers for these sign types are:
 - a. Advance Corporation; Braille-Tac Division.
 - b. Allen Industries Architectural Signage
 - c. APCO Graphics, Inc.
 - d. ASI-Modulex, Inc.
 - e. Best Sign Systems Inc.
 - f. Fossil Industries, Inc.
 - g. Gemini Incorporated.
 - h. Grimco, Inc.
 - i. InPro Corporation
 - j. Mohawk Sign Systems.
 - k. Nelson-Harkins Industries.
 - l. Seton Identification Products.
 - m. Signature Signs, Incorporated.
 - n. Meyer Sign Co.

- B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:
 - 1. Acrylic Sheet: 1/32 inch thick.
 - 2. Laminated Sheet: 1/8 inch phenolic with contrasting color laminated to acrylic face as selected by Architect from manufacturer's full range.
 - 3. Provide complete with 1" tall by width of the sign clear "window" insert slot (where noted)
 - 4. Edge Condition: Square cut.
 - 5. Corner Condition: Rounded to radius indicated.
 - 6. Mounting: Unframed.
 - a. Wall mounted with exposed stainless steel anchors
 - b. Manufacturer's standard anchors for substrates encountered.
 - c. Reference interior detail sheets for additional mounting requirements.
 - 7. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting colors.
- C. Brackets: Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit panel sign construction and mounting conditions indicated. Factory paint brackets in color matching background color of panel sign.
- D. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
 - 1. Panel Material: Opaque acrylic sheet.
 - 2. Raised-Copy Thickness: Not less than 1/32 inch.
- E. Engraved Copy: Machine engrave letters, numbers, symbols, and other graphic devices into panel sign on face indicated to produce precisely formed copy.

2.3 DIMENSIONAL CHARACTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advance Corporation; Braille-Tac Division.
 - 2. A. R. K. Ramos.
 - 3. ASI-Modulex, Inc.
 - 4. Bunting Graphics, Inc.
 - 5. Gemini Incorporated.
 - 6. Grimco, Inc.
 - 7. Metal Arts; Div. of L&H Mfg. Co.
 - 8. Mills Manufacturing Company.
 - 9. Mohawk Sign Systems.
 - 10. Nelson-Harkins Industries.
 - 11. Signature Signs, Incorporated.
 - 12. Southwell Company (The).
- B. Cutout Characters: Provide characters with square-cut, smooth edges free from abrasive elements.
 - 1. Character Material: Aluminum
 - 2. Letter Thickness: 3/8" Thick plate
 - 3. Height: Varies – 36" tall letters.
 - 4. Typestyle: Reference Drawings – Arial Font.
 - 5. Graphics: Reference Exterior Elevations.
 - 6. Color: Provide full range of color options to choose from.
 - 7. Mounting: CMU/masonry, with rust-proof, stand-off hardware.

2.4 ACCESSORIES

- A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.5 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.
 - 1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
 - 2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
 - 3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
 - 4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ACRYLIC SHEET FINISHES

- A. Colored Coatings for Acrylic Sheet: For copy and background and frame colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: Manufacturer's standard Class 1 clear anodic coating, 0.018 mm or thicker, over a satin (directionally textured) mechanical finish, complying with AAMA 611.

2.9 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items, including anchor inserts are sized and located to accommodate signs.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent

walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
 - 1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
 - 2. Magnetic Tape: Mount signs to smooth, nonporous surfaces.
 - 3. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.
 - 4. Shim Plate Mounting: Provide 1/8-inch- thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.
 - 5. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
- C. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
 - 1. Projected Mounting: Mount characters at projection distance from wall surface indicated.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 10 14 00

SECTION 10 28 00 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Washroom accessories.
- B. Owner-Furnished Material: Reference individual items below.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated on Drawings.
 - 2. Identify products using designations indicated on Drawings.
- C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.
- C. Furnish exact counts of Owner-Furnished, Contractor-Installed items 60 days in advance of when the materials is needed for the orderly execution of the work. Coordinate in advance with the owner to determine the necessary backing and blocking to allow installation of the specified accessories.

1.5 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 WASHROOM ACCESSORIES

- A. Provide wash room accessories as specified below, and as shown on the drawings. Not all accessories are shown in the drawings, the work consists of the items and installations defined below. Verify final locations with Owner and Architect prior to installation.
- B. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. Bobrick Washroom Equipment, Inc.
 - 2. Bradley Corporation.
 - 3. Or approved substitution in accordance with Division 01 requirements
 - 4. Gamco Accessories
- C. Toilet Tissue (Roll) Dispenser (O.F.C.I.):
 - 1. Mounting: Surface mounted, contractor shall coordinate and provide adequate wall backing for installation, install at each water closet location.
- D. Paper Towel Dispenser (O.F.C.I.):
 - 1. Mounting: Recessed mounted, contractor shall coordinate and provide adequate wall backing for installation, install at each lavatory location as indicated in the drawings.
 - 2. Provide one in each restroom.
- E. Soap Dispenser (O.F.C.I.):
 - 1. Mounting: Surface mounted, contractor shall coordinate and provide adequate wall backing for installation, install at each lavatory location
 - 2. Locations include, as noted in the drawings and the following:
 - a. Restroom hand wash sink locations
 - b. Uni-sex and staff restroom sink locations
 - c. Classroom sink locations
 - d. Kitchen food service hand-wash sink locations
- F. Grab Bar (C.F.C.I.):
 - 1. Basis-of-Design Product: Bobrick No. B-5806x36, 5806x48, and B-5806x24 at all disabled accessible water closet locations.
 - 2. Mounting: Surface mounted, contractor shall coordinate and provide adequate wall backing for installation.
- G. Sanitary-Napkin Disposal Units (O.F.C.I.):
 - 1. Mounting: Surface mounted, contractor shall coordinate and provide adequate wall backing for installation, install at each water closet location in female and uni-sex restrooms.
 - 2. Provide one at each water closet in female and uni-sex restrooms.
- H. Sanitary-Napkin Dispensers Units (O.F.C.I.):
 - 1. Mounting: Surface mounted, contractor shall coordinate and provide adequate wall backing for installation.
 - 2. Locations: at every female water closet and unisex restrooms.
- I. Mirror Unit (C.F.C.I.):
 - 1. Basis-of-Design Product: Bobrick B-290 with tempered glass, width indicated in drawings by 48" tall. Other sizes and locations as indicated. Include integral shelf.
 - 2. Mounting: Surface mounted, contractor shall coordinate and provide adequate wall backing for installation
 - 3. Locations as indicated in the drawings
- J. Robe Hook (C.F.C.I.):
 - 1. Basis-of-Design Product: Bobrick B-672,
 - a. Provide one on inside face of door at restroom.

2. Mounting: Surface mounted, contractor shall coordinate and provide adequate wall backing for installation. Mount at 54" above finish floor.

2.3 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Coordinate details with other work supporting, adjoining, or otherwise contacting items as required to ensure proper installation.
- D. Verify that surfaces and above ceiling supports/backing are installed by the general contractor and are ready to receive work.
- E. Verify exposed finishes have been applied, and setting conditions are dry, clean, and otherwise proper for installation

3.2 PREPARATION

- A. Coordinate size and location of equipment indicated to be attached to or recessed into the building construction, and furnish anchoring devices with templates, diagrams, and instructions for their installation.

3.3 INSTALLATION

- A. General: Install equipment, as required for a complete installation.
- B. Follow all manufacturer's recommendations and requirements for installation of the equipment.
- C. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- D. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.4 ADJUSTING AND CLEANING

- A. Provide systems demonstration under provisions of Division 01. Demonstrate equipment operation.
- B. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- C. Remove temporary labels and protective coatings.
- D. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10 28 00

SECTION 22 00 00 - PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

- A. Refer to BIDDING REQUIREMENTS, CONDITIONS OF THE CONTRACT, SUPPLEMENTARY CONDITIONS and DIVISION 01 of these specifications, which govern work under DIVISION 22. Refer to other sections of these specifications for additional related requirements.
- B. Codes, Permits and Fees
 - 1. Plumbing work shall be in accordance with the most recent publication of the following:
 - a. International Building Code
 - b. International Mechanical Code
 - c. Uniform Plumbing Code
 - d. International Fire Code
 - e. National Electric Code
 - f. American Disability Act
 - g. State and Local Codes and Ordinances.
 - 2. The Contractor at his expense shall obtain permits and inspections required for the mechanical work on this project. Deliver all inspection certificates to the Owner's Representative prior to final acceptance of the work.
 - 3. Contractor shall pay all costs levied by utility companies and/or governing agencies associated with water, sanitary and storm sewer connections and include these costs within his bid. This shall include but not be limited to tap fees, service mains, meters and vault charges.

1.2 DESCRIPTION OF WORK

- A. The work covered by the contract documents (specifications and construction drawings), shall include but not be limited to:
 - 1. Furnishing all materials and supplying all labor, equipment and services to install the complete plumbing system as shown in the contract documents.
 - 2. All products and materials installed on the project shall be new and in first class condition. Used or resold materials will not be allowed. If requested to verify authenticity of materials the Contractor shall be prepared to produce bill-of-sale invoices.
- B. This project has been designed to meet or exceed the minimum requirements of the governing Codes. The Contractor must notify the Owner's Representative in writing of any items in conflict with the Codes prior to signing his contract, or he shall thereafter make any minor adjustments necessary to meet the Codes at no cost to the Owner.
- C. The Contractor shall comply with the project close-out requirements as detailed in Division 01, "Closeout Procedures."
- D. Safety Measures:
 - 1. The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement applies continuously and is not limited to normal working hours.
 - 2. Provide all required safety measures and consult with the State or Federal safety inspector for interpretation whenever in doubt as to whether safe conditions do or do not exist.
 - 3. Head protection: Where pipe hangers, equipment support angles, etc., are exposed in access ways for any maintenance, cover all such potentially injurious protrusions less than 7'-0" above the floor with padding; secure and permanently fasten, and finish to match adjacent finishes.

1.3 REFERENCES

- A. Definitions
 - 1. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.

2. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
3. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
4. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
5. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 QUALITY ASSURANCE

- A. Materials used under this Contract, unless specifically noted otherwise, shall be new and of the latest and most current model line produced by the manufacturer. Each item of equipment shall conform to the latest applicable standards and codes.
- B. Motor and equipment name plates as well as applicable UL and AGA labels shall be in place when the Project is turned over to the Owner.
- C. All electrically driven or connected equipment shall be provided with UL or equivalent label and/or listing in accordance with the requirements of the NEC.
- D. Equipment shall be listed as an assembly where listing/labeling program is available for that type of equipment.
- E. All control panels shall be provided with UL or equivalent Label and/or listing in accordance with the requirements of the NEC and applicable local codes.
- F. Fuel fired equipment shall be listed by a nationally recognized testing laboratory for use with the particular fuel type.
- G. All pressure vessels and relief valves shall be furnished in accordance with applicable State Boiler and Unfired Pressure Vessel Laws.
- H. Drawings:
 1. All required pipe offsets are not indicated on the drawings.
 2. Architectural and structural drawings take precedence over mechanical drawings if any dimensional discrepancies exist.
 3. Scaled and figured dimensions are approximate and are for estimating purposes only.
 4. The plans are diagrammatic and show generally the locations of the fixtures, equipment, and pipe. Drawings are not to be scaled, all dimensions shall be checked at the building. Before proceeding with work check and verify all dimensions.
 5. Assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.
 6. Make adjustments that may be necessary or requested in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
 7. Mechanical drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
- I. Record Drawings: Refer to Division 01, "Closeout Submittals."
 1. Keep on site, an extra set of drawings and specifications recording changes and deviations daily. Return these drawings to the Owner's Representative at the completion of the Project. These drawings shall not be used for any other purposes.

1.5 COORDINATION

- A. Consider architectural and structural drawings part of this work insofar as these drawings furnish information relating to design and construction of the building and shall take precedence over mechanical drawings if any dimensional discrepancies exist.
- B. The Contractor shall refer to the architectural and structural details, plans, elevations, and other Contract Drawings and shall coordinate his work with that of the other trades to avoid interference.
- C. Piping Coordination:
 1. Prior to installation of the new systems, the Contractor shall coordinate the proposed installation with the Architectural and Structural requirements, and all other trades

- (including HVAC, Plumbing, Fire Protection, Electrical, Ceiling Suspension and Tile systems), and provide reasonable maintenance access requirements.
2. Provide means of access to all valves, dampers, controllers, operable devices and other apparatus which may require adjustment or servicing.
 3. Verify in field exact size, location, invert, and clearances regarding all existing material, equipment and apparatus, and advise the Owners Representative of any discrepancies between that indicated on the Drawings and that existing in the field prior to any installation. Contractor shall be responsible for all costs associated with the removal or relocation of installed systems that have been installed without prior notification of the Owners Representative.
- 1.6 SUBMITTALS
- A. Plumbing Cost Breakdown:
 1. The Contractor shall furnish the Owner's Representative an itemized breakdown of the mechanical construction cost within 30 days of notice to proceed. This breakdown shall be utilized for pay applications.
 2. At a minimum, the cost breakdown shall be as follows:
 - a. Plumbing Material
 - b. Plumbing Labor
 - c. Insulation
 - B. Payment Requests:
 1. Refer to Division 01, "Payment Procedures."
 2. Payment requests for materials and equipment will not be reviewed or approved until shop drawings have been received and approved.
 - C. Submittal Log: Contractor shall prepare a master submittal log tracking spreadsheet for all Division 22 items, to be filled in, updated and furnished with each submittal package. Submittal log shall indicate specification section and sub-paragraph of each item included in the submittal, along with a general description of the item/equipment, manufacturer name, date submitted and a column for returned date, A/E review action (i.e. approved, approved as noted, revise and resubmit or rejected) and re-submittal action required (if any).
 - D. Submittals:
 1. Electronic Submittal Option: At the contractor's option, the product submittals may be furnished in electronic (Adobe PDF or Skire Unifier) format. If electronic files are furnished, they must be organized in a similar manner to hard copy binders, with electronic indexing (bookmarks) and/or portfolio format for individual PDF files for ease of organizing and navigating for A/E review and comment purposes. **SUBMITTALS NOT PROVIDED IN THIS FORMAT WILL BE REJECTED.**
 2. Refer to Division 01 for Submittal procedures and general requirements. See individual Division 22 specification sections for specific submittal requirements.
 3. Submittals shall be bound in a black 3-ring binder with the project name on the cover & spine. Binder containing resubmitted Product Data shall also include a "Re-submittal" label in bold letters on the cover and spine. Data within this binder shall be arranged as follows:
 4. Provide index tabs for each specification section in the same order and using the same name as appears in the Specifications.
 5. Data shall be black and white on 8 ½" x 11" or 11" x 17" single one-sided sheets suitable for copying. Diagrams and drawings larger than 11" x 17" shall be submitted in reproducible form (translucent bond paper).
 6. Drawings and catalog data must be clean and neat copies. Fax material or other poor quality copies will not be acceptable.
 7. Submittal shall include all materials specified in the project in one binder. If multiple binders are required, additional binders shall be numbered sequentially, and all binders shall be submitted at the same time. If material or equipment is not as specified or submittal is not complete, it will be rejected. Only completed submittals including all applicable specification sections will be reviewed.

8. Re-submittals shall include all materials being resubmitted in one binder. If multiple binders are required, additional binders shall be numbered sequentially, and all binders shall be submitted at the same time. Only completed re-submittals including all applicable specification sections will be reviewed.
9. Review comments shall not relieve Contractor from responsibility for deviations from Contract Documents or Basis-of-Design equipment performance, unless attention has been called to such deviations in writing at time of submission, nor shall they relieve this Contractor from responsibility for errors in items submitted.
10. Shop Drawings:
 - a. Shop drawings, catalog information and material schedules shall be submitted for approval on all materials and equipment prior to ordering. This applies to all specified material and equipment in Division 22.
 - b. Shop drawings shall be reviewed, approved and stamped by Contractor prior to submitting to Owner's Representative for approval. Submittals without such approval will be returned without review.
 - c. Allow for sufficient time for developing shop drawings, processing and review time so that the installation will not be delayed.
 - d. Indicate manufacturer, trade name and model number. HIGHLIGHT, ENCIRCLE OR OTHERWISE INDICATE ALL DEVIATIONS FROM THE SPECIFIED PRODUCTS OR BASIS-OR-DESIGN EQUIPMENT. Include copies of applicable brochure or catalogue materials. Indicate sizes, types, model numbers, ratings and capacities being proposed. Only those items being used on the project shall be included in the submittal.
 - e. Where choices of options and accessories are available or specified, provide written description of what is to be furnished. If necessary, list page numbers where submitted items are described.
 - f. Include dimensional data for roughing in and installation and technical data sufficient to confirm that equipment meets requirements of drawings and specifications.
 - g. Include wiring, piping and service connection data, motor sizes complete with voltage ratings and schedules. Upon approval, copies of these diagrams shall be forwarded to pertinent contractors.

1.7 CLOSEOUT SUBMITTALS

- A. General: Submit documents to the Owner/Owners Representative for approval [prior to the building being turned over to the Owner] [within 90 days of the date of receipt of the Certificate of Occupancy].
- B. Record Documents: Construction documents shall be updated to convey a record of the alterations to the original design. Such updates shall include updated mechanical, electrical and control drawings red-lined, or redrawn if specified, that show all changes to size, type and locations of components, equipment and assemblies.
- C. Mechanical Operating and Maintenance (O&M) Manuals
 1. Refer to Division 01 for additional Closeout Submittal and Operation and Maintenance Data requirements.
 2. Contents for the Mechanical O&M Manual are to include the following:
 - a. Title Page: Project Name, Project Number, building name, Architect, Mechanical Engineer, Electrical Engineer and General Contractor.
 - b. Table of Contents: Complete listing of contents of this O&M Manual. Where multiple volumes are required, provide Master Table of Contents covering all Volumes and place in the front of each volume.
 - c. Part 1: Listing of all Contractors, subcontractors and suppliers/vendors for all tiers. Information to include: names, addresses, phone numbers, fax numbers and area of work. Also include a copy of the emergency service information required in Division 1.
 - d. Part 2: Copies of all signed general, mechanical and plumbing permits, and inspection reports.

- e. Part 3: Copies of all manufacturer's warranty and guarantee forms, and any specified special guarantees, fully executed.
- f. Part 4: Provide a separate sub divider for each applicable Section in Divisions 22 & 23. Tabs are to be identified by specification section title (i.e. Plumbing Fixtures) and not just specification section number (i.e. Section 224000). For every Section provide the following:
 - 1) Index listing materials and equipment used.
 - 2) List of suppliers with address, phone number and fax number.
 - 3) Catalog cuts, data sheets, engineering calculations, schedules, wiring diagrams and complete parts lists for all products and equipment incorporated into the Project. Literature shall be clearly marked to indicate each specific item. Include copies of approved submittal data as part of this information.
 - 4) Approved submittal drawings (Option to submit Product Data Submittals as separate Volume(s) if contents are large).
 - 5) Manufacturer's printed operating instructions for all equipment including:
 - a) Initial startup procedures and break-in routine.
 - b) Normal operating instructions.
 - c) Regulation, control, stopping and shutdown.
 - d) Troubleshooting and emergency instructions.
 - e) Seasonal operating instructions.
 - 6) Cleaning, lubrication and preventative maintenance instructions.
 - 7) Disassembly, repair and reassembly instructions, including alignment and adjustment instructions.
 - 8) Sequence of operation for each system.
- g. Part 9: Testing, Adjusting and Balancing Report.
- h. Part 10: Final Commissioning Report (Option to submit as separate Volume(s) if contents are large).
- i. Part 11: Spare parts and maintenance materials list. Provide summarized list of spare parts that are to be furnished to the Owner.
- j. Part 12: Owner training sign-off sheets. Notebook sleeves with DVD;s of training.

1.8 MAINTENANCE MATERIAL SUBMITTALS:

A. Spare Parts and Maintenance

- 1. Provide summarized list of spare parts that are to be furnished. Incorporate into O&M Manual.
- 2. Refer to individual specification sections for spare parts to be furnished under this contract.
- 3. Operate, drain and flush bearings and refill with change of lubricant before final acceptance.
- 4. Protect bearings and shafts during installation. Grease shafts and sheaves to prevent corrosion. Provide extended nipples for lubrication.
- 5. Ensure that existing equipment is carefully dismantled and not damaged or lost. Do not re-use existing materials and equipment unless specifically indicated.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. See Division 01, Section "Product Requirements," for additional requirements.
- B. Follow manufacturer's directions in delivery, storage, protection, and installation of equipment and materials.
- C. Promptly notify Owner's Representative in writing of conflicts between requirements of Contract Documents and Manufacturer's directions and obtain written instructions from Owner's Representative before proceeding with work. Contractor shall bear expenses of correcting deficiencies of work that does not comply with manufacturer's directions or such written instructions from Owner's Representative.
- D. Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or mechanical injury but have readily accessible for inspection. Store items subject to moisture damage in a dry, heated space.

- E. Special Storage Requirements:
 - 1. Equipment and products to be stored on the project site either outside or inside but unheated spaces, shall be provided with shrink-wrapped coverings and shall be additionally provided with chemical dessicant packs to control any stray moisture that may enter the protective wrapping.
 - F. Notify Owner of equipment delivery dates, 24 hours in advance of delivery.
 - G. Equipment Protection:
 - 1. The Contractor shall be responsible for protection of equipment furnished in this Division from vandalism and weather during all phases of construction. Damaged equipment shall be restored to like new condition or replaced at the Contractor's expense.
 - 2. Protect equipment and materials in storage on site, during and after installation until final acceptance. Leave factory covers in place and take special precautions to prevent entry of foreign material into working parts of piping and duct systems.
 - H. Any factory painted equipment scratched or marred during shipment or construction shall be restored to original "new" condition. This includes complete repainting if necessary to provide exact paint match.
- 1.10 FIELD CONDITIONS
- A. Existing Utilities and Piping:
 - 1. The locations of existing concealed lines and connection points have been indicated as closely as possible from available information. The Contractor shall assume that such connection points are within a Ten foot (10') radius of the indicated location. Where connection points are not within this radius, the Contractor shall contact the Owner's Representative for a decision before proceeding or may proceed at his own expense.
 - 2. Connection points to existing work shall be located and verified prior to starting new work.
 - 3. Prior to commencing any excavation or ditching activity, the Contractor shall verify the exact location and inverts of all existing utilities and connection points in the area of his proposed excavation. Notify Owner's representative for further direction if actual inverts will not allow the proper installation of new work.
 - 4. The Contractor shall be responsible for damages, which might be caused by his failure to exactly locate and preserve underground utilities.
- 1.11 WARRANTY
- A. The Plumbing equipment and installation shall be warranted for a period of one (1) year from the date of building acceptance unless an individual item or specification is otherwise noted as longer. The Contractor shall make-good at his own expense all defects in his work, and/or equipment furnished by him, which shall develop at any time during the one year guarantee period and shall bear any expense of cutting, patching and repairing made necessary by his corrections of unsatisfactory work or equipment operation.
 - B. Provide specific equipment/material warranties that extend beyond 1 project warranty period. Refer to individual specification sections for required extended warranties. See Division 01 Section "Closeout Submittals."

PART 2 - PRODUCTS

- 2.1 SUBSTITUTIONS
- A. Refer to Division 01 Section –"Substitution Procedures" for product prior approval and substitution requirements.
 - B. Throughout these specifications and drawings, various materials, equipment, apparatus, etc., are specified or scheduled by manufacturer, brand name, type or catalog number. Such designation is to establish standards of desired quality and construction and shall be the basis of design and the bid.
 - C. Equipment manufacturers listed in individual sections are approved alternatives for this project and are subject to requirements of drawings and specifications. Revisions required to adapt alternatives shall be the responsibility of the Contractor.

- D. Where two or more manufacturer designations are listed in these specifications, choice will be optional with the Contractor.
 - 1. Exception: Where more than one manufacturer is listed, and only one manufacturer's catalog number is specified or only one manufacturer is scheduled on the drawings (basis of design), that standard of quality, dimensional characteristics, capacities, and construction shall be maintained by materials or equipment supplied by the other manufacture(s).
- E. If the Contractor uses manufactures other than the basis of design, the Contractor shall be responsible for:
 - 1. Insuring the substituted item will fit in the available space while allowing proper maintenance access. In the event other than specified equipment is used and will not fit job site conditions, this Contractor assumes responsibility for replacement with items indicated as the basis of design.
 - 2. Any changes required by other Contractors caused by the substituted equipment.
 - 3. Changes in structural design due to weight differences.
- F. Products furnished other than the basis of design shall have similar electrical characteristics as the scheduled or specified equipment. Contractor shall be responsible for any electrical changes caused by products not in accordance with this requirement.
- G. Substitutions will not be permitted without written approval.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine premises and understand the condition which may affect performance of work of this Division before submitting proposals for this work.
- B. No subsequent allowance for time or money will be considered for any consequence related to failure to examine existing site conditions.

3.2 INTERFACE WITH OTHER WORK – COORDINATION

- A. Coordination of Division 22 equipment and systems to the available space, with other trades. The access routes through the construction shall be the Contractor's responsibility.
- B. Drawings are diagrammatic. Make offsets, transitions, and changes in direction of pipes and ducts, as required to maintain proper headroom and pitch of sloping lines and avoid structural, electrical, pipe and duct interference's whether or not indicated on Drawings. Furnish fittings, etc., as required to make these offsets, transitions and changes in direction at no additional cost to the Owner.

3.3 INSTALLATION

- A. Piping:
 - 1. Determine exact route and location of each pipe and duct and coordinate and obtain approval for changes from the layout indicated on the drawings with the Owner's Representative prior to fabrication.
 - 2. Locations of equipment and devices, as shown on the drawings, are approximate unless dimensioned. Verify the physical dimensions of each item of plumbing equipment to fit the available space and promptly notify the Owner's Representative prior to roughing-in if conflicts appear.
 - 3. All piping, wiring, equipment, ductwork, tubing, etc., shall be concealed within building construction unless otherwise noted, or in mechanical rooms.
 - 4. Arrange pipes, ducts, and equipment to permit ready access to valves, unions, traps, trap primers, starters, motors, control components, and to clear openings of doors and access panels.
- B. Cutting and Patching
 - 1. Perform all cutting and patching of new and existing construction required for the installation of systems and equipment specified in Division 22. It is the contractors responsibility to determine location and amount of saw-cutting required. unless noted

otherwise on the drawings. All cutting shall be accomplished with masonry saws, drills or similar equipment to provide neat uniform openings.

2. Patch and repair walls, floors, ceilings and roof with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials. All patching shall meet the approval of the Owner's Representative.
3. All cutting and patching necessary to repair defective equipment, defective workmanship or neglect of this Contractor to properly anticipate his requirements shall be included.
4. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses or other structural members without the Owner Representative's written approval.
5. Cutting, patching, repairing, and replacing pavement, sidewalks, roads, and curbs to permit installation of work specified or indicated under this Division is included.

3.4 TESTING

- A. Equipment Tests: Equipment shall be subject to tests as specified below. A record shall be kept to record each test and copies shall be sent to the Owner's Representative after each test is complete:
- B. Provide all test equipment, including test pumps, gauges, instruments, and other equipment required. Upon completion of testing, certify in writing that the specified tests have been performed and that the installation complies with the specified requirements.
- C. Demonstrate that the systems are performing to provide conditions through all possible modes of operation as outlined below. The verification testing procedures shall address all operating characteristics of all mechanical equipment and systems, including:
- D. Piping systems shall be subject to tests as specified below. No piping shall be covered or concealed until it has been tested, inspected and approved by the Owner's Representative, Mechanical Engineer and any local inspector having jurisdiction. Isolate systems during testing and flushing. Equipment items with maximum working pressure of less than the test pressure shall be removed or bypassed during test.
- E. Piping: Remove from the system during testing, all equipment which would be damaged by test pressure. Replace removed equipment when testing has been accomplished. The systems may be tested in sections as the work progresses; however, any previously tested portion shall become a part of any latter test of a composite system. Correct leaks by remaking joints with new material.
- F. A record similar to the following shall be kept to record each test and copies shall be sent to the Owner's Representative, Mechanical Engineer after each test is complete.

SYSTEM TESTED	TESTED BY	INSPECTOR	OWNER REP.	DATE
All Domestic Water Piping	_____	_____	_____	_____
All Waste/Vent	_____	_____	_____	_____

- G. Test time will be accrued only while full test pressure in on the system, unless indicated otherwise. Tolerance shall be no pressure drop, except that due to temperature change in a 24-hour period. Inspect and test all work prior to burying or concealing.

System	Test Medium	Test Pressure	Tolerance	Test Period
All Domestic Water	Water	175 psig	None	8 Hours
All Waste	Water	10 feet head, 5 psi	No Leaks	8 Hours
All Vent	Water	10 feet headheat, 5 psi	No Leaks	8 Hours

- H. Valves: Test all valve bonnets for tightness. Operate all valves at least once from closed-to-open-to-closed position while valve is under test pressure. Test all automatic valves, including solenoid valves, and temperature and pressure relief valves, safety valves, and temperature and pressure relief valves not less than three (3) times.

- I. Piping Specialties: Test all thermometers, pressure gauges, and water meters for accurate indication; automatic water feeders, air vents, trap primers, and vacuum breakers for proper performance. Test all air vent points to ensure that all air has been vented.
- J. Backflow Preventers: Each testable backflow prevention device shall be tested and approved by certified testers after installation. Submit test results to owner representative and City of Cheney.

3.5 SYSTEM CLEANING AND FLUSHING

- A. The following piping systems shall be flushed, cleaned, disinfected, etc. by a recognized professional firm engaged in the business of pipe cleaning and water treatment after the completion of each construction phase. Work shall be accomplished in accordance with the following requirements. Work shall be fully documented by means of certificates stating work accomplished, methods used and date work was done. System cleaning and flushing shall be done by Inland Aqua Tech, King Total Systems, or approved equal.
 - 1. Domestic Water (Inside Foundation Perimeter)
 - a. Disinfect water mains and water service piping, in accordance with AWWA C 601.
 - b. Domestic water lines shall be chlorinated by injecting chlorine at the entrance main (where new waterline connects to existing main outside the building) and maintaining 100 PPM concentration at every plumbing fixture for a 24-hour period. Flush until chlorine level is same as incoming water. Water samples shall be submitted and approved by the County health authority prior to acceptance and occupancy by the District. Approval by the District Representative is conditional on receipt of documentation. Note: water samples shall be taken at appropriate locations throughout the building to assure complete sampling of all domestic water systems.
 - c. Domestic water heater shall be chlorinated in the same manner as the domestic water piping, and maintaining 100 PPM concentration for a 24-hour period. Flush until chlorine level is same as incoming water. Water samples shall be submitted and approved by the County health authority prior to acceptance and occupancy by the District. Approval by the District Representative is conditional on receipt of documentation.
- B. Clean up all equipment, materials, cartons, and other debris that is a direct result of the installation of equipment under this contract.
- C. Clean exposed piping, ductwork, equipment, and fixtures. Repair damaged finishes and leave everything in working order.
- D. Remove stickers from fixtures and adjust flush valves.

3.6 PROJECT FINALIZATION & STARTUP

- A. Upon completion of the equipment and systems installation and connections, at the end of each Construction Phase, the Contractor shall assemble all major equipment factory representatives (Water Heaters, Plumbing Fixtures, Pumps) and subcontractors together for system start-up and Owner instructional period.
- B. These individuals shall assist in start-up and check out of their systems and shall remain at the site until the system operation is acceptable and understood to the Owner's maintenance and/or operation personnel.
- C. To provide acceptance of operation and instruction by the Owner's representative, the Contractor shall prepare a written statement of acceptance explaining same for the Owner's signature.
- D. The statement should read as follows:

"I, the Contractor, associated factory representative and subcontractor, have started each system and the total system and have proved their normal operation to the Owner's representative and have instructed him in the operation and maintenance thereof."

Owner's Representative

Contractor

- E. Copies of this acceptance shall be sent to the Engineer and the Architect, and one copy shall be placed in each maintenance manual.

3.7 CLOSEOUT ACTIVITIES

A. Demonstration and Owner Training:

1. Instruct the designated Owners representative(s) in operation and maintenance of mechanical systems utilizing the information and material available in the Operation and Maintenance Manual.
2. Individuals present shall include Contractors, subcontractors and equipment factory representatives. These individuals shall assist in instruction and start-up.
3. Instruction period shall occur after final inspection when systems are properly working.
4. Prepare statement and check list to be included in the Operation and Maintenance Manual. This Statement shall read as follows:

“The Contractor, associated factory representatives and subcontractors, have started each system and the total system and have proved their normal operation to the Owner’s representative and have instructed him in the operation and maintenance thereof.”

Owner’s Representative

Contractor

B. Punch List Procedures

1. Refer to Division 01 Section “Closeout Procedures,” for general punch list procedures.
2. The project shall be fully cleaned and in all respects ready to turn over to the Owner for occupancy before the Punch List Inspection is requested. This shall include but not be limited to:
 - a. Cleaning up all equipment, materials, cartons, and other debris that is a direct result of the installation of equipment under this contract.
 - b. Cleaning exposed piping, equipment, and fixtures.
 - c. Repairing damaged finishes.
3. The Contractor shall notify the Owner’s Representative in writing when the project or phase is ready for punch lists. After punch lists are complete, written notice must be forwarded to the Owner’s Representative requesting final checkout.
4. At the time of final observation, the contractor shall accompany the observation party and shall remove access panels as required, to allow complete observation of the entire mechanical system.

END OF SECTION 22 00 00

SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Dielectric fittings.
 - 3. Sleeves.
 - 4. Escutcheons.
 - 5. Plumbing demolition.
 - 6. Equipment installation requirements common to equipment sections.
 - 7. Supports and anchorages.
 - 8. Access doors.

1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, space above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

- A. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
- C. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.
- D. Brazing Filler Metals: AWS A5.8, BCuP-5 Series or BAg1, minimum 15% silver filling, unless otherwise indicated.
- E. Welding Filler Metals: Comply with AWS D10.12.

2.3 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.4 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.5 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- N. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. All required fire stopping re-

quired for Division 22 systems shall be provided and installed under this Section. Refer to Division 07 Section "Firestopping" for materials and methods.

- O. Verify final equipment locations for roughing-in.
- P. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using a filler containing 15% silver. Silver brazing shall be done by persons capable of obtaining "Medical Gas License" as determined by the State of Washington.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified. Care shall be taken to lessen the amount of thread compound and or tape introduced into the piping system during pipe fitting and joint construction.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.7 ACCESS DOORS

- A. Access doors to match surrounding surface, provided with recess to accept matching finish. Provide UL rated doors in fire rated construction.
- B. Provide 12"x12" access doors for maintenance or adjustments purposes for all mechanical system components including valves, volume dampers, fire dampers, fire/smoke dampers, clean outs, traps and controls.
- C. Refer to Division 8 Section "Access Doors and Panels".

END OF SECTION 22 05 00

SECTION 22 05 19 - METERS AND GAGES FOR PLUMBING

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. Section Includes:
 - 1. Thermometers.
 - 2. Gages.
- 1.2 SUBMITTALS
 - A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

- 2.1 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS
 - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Palmer - Wahl Instruments Inc.
 - 2. Trerice, H. O. Co.
 - 3. Tel-Tru Manufacturing Co.
 - 4. Weiss Instruments, Inc.
 - 5. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
 - B. Case: Chrome-plated brass, 7 inches (178 mm) long.
 - C. Tube: Red or blue reading, mercury or organic-liquid filled, with magnifying lens.
 - D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.
 - E. Window: Glass.
 - F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.
 - G. Stem: Copper-plated steel, aluminum, or brass for thermowell installation and of length to suit installation.
 - H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.
- 2.2 BIMETALLIC-ACTUATED DIAL THERMOMETERS
 - A. Manufacturers: Subject to compliance with requirements, by one of the following:
 - 1. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
 - 2. Ernst Gage Co.
 - 3. Eugene Ernst Products Co.
 - 4. Marsh Bellofram.
 - 5. Miljoco Corp.
 - 6. NANMAC Corporation.
 - 7. Noshok, Inc.
 - 8. Palmer - Wahl Instruments Inc.
 - 9. REO TEMP Instrument Corporation.
 - 10. Tel-Tru Manufacturing Company.
 - 11. Trerice, H. O. Co.
 - 12. Weiss Instruments, Inc.
 - 13. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
 - 14. WIKA Instrument Corporation.
 - 15. Winters Instruments.
 - B. Description: Direct-mounting, bimetallic-actuated dial thermometers complying with ASME B40.3.
 - C. Case: Liquid-filled type, stainless steel with 5-inch (127-mm) diameter.
 - D. Element: Bimetal coil.

- E. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
- F. Pointer: Red metal.
- G. Window: Glass.
- H. Ring: Stainless steel.
- I. Connector: Adjustable angle type.
- J. Stem: Metal, for thermowell installation and of length to suit installation.
- K. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.3 THERMOWELLS

- A. Manufacturers: Same as manufacturer of thermometer being used.
- B. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

2.4 PRESSURE GAGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AMETEK, Inc.; U.S. Gauge Div.
 2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
 3. Ernst Gage Co.
 4. Tel Tru Manufacturing Co.
 5. Eugene Ernst Products Co.
 6. KOBOLD Instruments, Inc.
 7. Marsh Bellofram.
 8. Miljoco Corp.
 9. Noshok, Inc.
 10. Palmer - Wahl Instruments Inc.
 11. REO TEMP Instrument Corporation.
 12. Trerice, H. O. Co.
 13. Weiss Instruments, Inc.
 14. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
 15. WIKA Instrument Corporation.
 16. Winters Instruments.
- B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.
 1. Case: Liquid-filled type, drawn steel or metal type, 6-inch (152-mm) diameter.
 2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
 3. Pressure Connection: Brass, NPS 1/4 (DN 8), bottom-outlet type unless back-outlet type is indicated.
 4. Movement: Mechanical, with link to pressure element and connection to pointer.
 5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
 6. Pointer: Red metal.
 7. Window: Glass.
 8. Ring: Stainless steel.
 9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
 10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure (100 kPa of vacuum to 103 kPa of pressure).
 11. Range for Fluids under Pressure: Two times operating pressure.
- C. Pressure-Gage Fittings:
 1. Valves: NPS 1/4 (DN 8) brass or stainless-steel needle type.
 2. Snubbers: ASME B40.5, NPS 1/4 (DN 8) brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

PART 3 - EXECUTION

3.1 THERMOMETER APPLICATIONS

- A. Install liquid-in-glass thermometers in the outlet of each domestic, hot-water storage tank.
 - B. Install liquid-filled-case-type, bimetallic-actuated dial thermometers at suction and discharge of each pump.
 - C. Provide the following temperature ranges for thermometers:
 - 1. Domestic Hot Water: 30 to 180 deg F, with 2-degree scale divisions (Minus 1 to plus 82 deg C, with 1-degree scale divisions)
 - 2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions (Minus 18 to plus 38 deg C, with 1-degree scale divisions)
- 3.2 GAGE APPLICATIONS
- A. Install dry-case-type pressure gages for discharge of each pressure-reducing valve.
 - B. Install liquid-filled-case-type pressure gages at suction and discharge of each pump.
- 3.3 INSTALLATIONS
- A. Install direct-mounting thermometers and adjust vertical and tilted positions.
 - B. Install thermowells with socket extending to center of pipe and in vertical position in piping tees where thermometers are indicated.
 - C. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.
 - D. Install needle-valve and snubber fitting in piping for each pressure gage.
 - E. Install thermometers and gages adjacent to machines and equipment to allow service and maintenance for thermometers, gages, machines, and equipment.
 - F. Adjust faces of thermometers and gages to proper angle for best visibility.

END OF SECTION 22 05 19

SECTION 22 05 23 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Bronze butterfly valves.
3. Check Valves
4. Pressure Reducing Valves
5. Hot Water Recirculation Valves

B. Related Sections:

1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections Only.
2. Section 22 05 53 - Identification for Plumbing Piping and Equipment for valve tags and schedules.

1.2 SUBMITTALS

- ##### A. Product Data:
- For each type of valve indicated.

1.3 QUALITY ASSURANCE

- ##### A. ASME Compliance:
- ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
-
- ##### B. NSF Compliance:
- NSF 61 for valve materials for potable-water service.
-
- ##### C. All General Duty Valves,
- associated fittings and trim shall comply with ANSI/NSF 61-8, Annex G and US Senate Bill S.3874 for the wetted surface of all potable water plumbing components as it relates to LEAD-FREE construction.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- ##### A.
- Refer to valve schedule articles for applications of valves.
-
- ##### B.
- Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
-
- ##### C.
- Valve Sizes: Same as upstream piping unless otherwise indicated.
-
- ##### D.
- Valve Actuator Types:
1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
 2. Handwheel: For valves other than quarter-turn types.
 3. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.
- ##### E.
- Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 2. Butterfly Valves: With extended neck.
- ##### F.
- Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves.
 2. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Grinnell.

- d. Hammond Valve.
 - e. Milwaukee.
 - f. Mueller.
 - g. Nibco.
 - h. Stockham.
 - i. Watts.
 - j. Red White Valve
 - k. Apollo
2. Description:
- a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig WOG.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Stainless Steel.
 - i. Ball: Stainless Steel.
 - j. Port: Full.

2.3 BUTTERFLY VALVES

A. Class 150:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Grinnell.
 - d. Hammond Valve.
 - e. Milwaukee.
 - f. Mueller.
 - g. Nibco.
 - h. Stockham.
 - i. Watts.
 - j. Red White Valve
 - k. Apollo
- 2. Description:
 - a. Standard: MSS SP-67.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A126 CL B, Cast Iron.
 - d. Ends: Flanged.
 - e. Stem: Stainless.
 - f. Disc: Aluminum Bronze ASTM B148.
 - g. Liner: EPDM
 - h. Seal: EPDM
 - i. Operator: Lever Handle

2.4 CHECK VALVES

A. Class 125:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Grinnell.
 - d. Hammond Valve.
 - e. Milwaukee.
 - f. Mueller.

- g. Nibco.
 - h. Stockham.
 - i. Watts.
 - j. Red White Valve
 - k. Apollo
 - 2. Description:
 - a. Standard: MSS SP-80, ASTM B62 and ASTM B16 cast bronze body for 2" and smaller Screwed ends. Teflon Bronze Disc.
 - b. Standard: MSS SP-71, ASTM A126 class B cast iron body for 2-1/2" and Larger. Flanged ends. Cast Iron Disc.
- 2.5 RELIEF VALVES
- A. Relief Valve: Watts vacuum relief valve, bronze body, silicone disc, threaded ends, installed on cold water supply line only, refer to Hot Water Heater Detail on drawings.
 - 1. Temperature and pressure Relief Valve: Watts, bronze body construction, thermostat and test lever, temperature relief set at 210 degrees F, and pressure relief set at 150 psig.
- 2.6 BACKFLOW PREVENTION VALVES
- A. Reduced Pressure Zone Backflow Preventer for High Hazard Applications:
 - 1. 2" and Smaller: Assembly shall consist of shutoff ball valves in inlet and outlet, and strainer on inlet. Assemblies shall include test cocks and pressure-differential relief valve located between two positive seating check valves and shall comply with requirements of ASSE Standard 1013 and AWWA C506. Bronze construction, threaded ends, stainless steel internal parts and air gap fitting. Route pipe from air gap fitting to approved waste receptor.
 - 2. 2-1/2" and Larger: Assembly shall consist of shutoff OS&Y gate valves in inlet and outlet with strainer on inlet. Assemblies shall include test cocks and pressure-differential relief valve located between two positive seating check valves and shall comply with requirements of ASSE Standard 1015 and AWWA C506. Epoxy coated cast iron body construction, flanged ends, stainless steel internal parts, bronze seats, and air gap fitting. Route pipe from air gap fitting to approved waste receptor.
 - B. Double Check Valve for Low Hazard Applications:
 - 1. 2" and Smaller: Assembly shall consist of shutoff ball valves in inlet and outlet, and strainer on inlet. Assemblies shall include test cocks and two positive seating check valves and shall comply with requirements of ASSE Standard 1015 and AWWA C506. Bronze construction, threaded ends, and stainless-steel internal parts.
 - 2. 2-1/2" and Larger: Assembly shall consist of shutoff OS&Y gate valves in inlet and outlet with strainer on inlet. Assemblies shall include test cocks and two positive seating check valves and shall comply with requirements of ASSE Standard 1015 and AWWA C506. Epoxy coated cast iron body construction, flanged ends, stainless steel internal parts.
 - 3. Atmospheric Vacuum Breaker: Assembly shall consist of a bronze vacuum breaker body with silicone disc, and full size orifice. Device shall be IAPMO listed, meet ASSE standard 1001, and ANSI standard A113.1.1. Chrome plated in finish areas.
 - 4. Pressure Vacuum Breaker: Assembly shall consist of a one piece bronze or stainless steel body, with stainless steel spring loaded check, rubber diaphragm, and atmospheric vent, breakaway set screw. Chrome plated in finish areas.
- 2.7 PRESSURE-REDUCING VALVES
- A. Provide as indicated on the drawings.
 - B. Point of use pressure reducing valves at equipment shall be single seated, direct operated type; high capacity, having bronze body with strainer, by-pass feature, pressure gauge tapping and complying with the requirements of ASSE Standard 1003 for.
 - C. Domestic water service pressure reducing valves shall be hydraulically operated and pilot controlled. Valve shall contain integral low flow by-pass PRV for low conditions.

2.8 HOT WATER RECIRCULATION BALANCING VALVES

A. Pressure Independent Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Delta
 - b. Hays
 - c. Griswold Controls.
2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless steel, tamper proof, self cleaning, and removable.
4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
8. Minimum CWP Rating: 175 psig.
9. Maximum Operating Temperature: 250 deg F.

B. Pressure Dependent, Bronze, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump; a division of ITT Industries.
 - c. Flow Design Inc.
 - d. Gerand Engineering Co.
 - e. Griswold Controls.
 - f. Taco.
 - g. Tour & Andersson; available through Victaulic Company of America
 - h. Hays.
2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

C. Pressure Dependent, Cast-Iron or Steel, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump; a division of ITT Industries.
 - c. Flow Design Inc.
 - d. Gerand Engineering Co.
 - e. Griswold Controls.
 - f. Taco.
 - g. Hays.
2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.

11. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball or butterfly valves.
 - 2. Throttling Service: ball valves.
 - 3. Balancing: Calibrated
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends.
 - 2. For Copper Tubing, NPS 2 1/2 and Larger: Threaded or flanged ends.

3.4 DOMESTIC, HOT, COLD AND TEMPERED WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze Ball Valves: Provide with threaded ends.
- B. Pipe NPS 2 1/2 and Larger:
 - 1. Cast Iron Butterfly Valves: Provide with threaded or flanged ends.

3.5 NON-POTABLE, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze Ball Valves: Provide with threaded ends.
- B. Pipe NPS 2 1/2 and Larger:
 - 1. Cast Iron Butterfly Valves: Provide with threaded or flanged ends.

3.6 DOMESTIC, NON-POTABLE AND TEMPERED HOT WATER RECIRCULATION SYSTEM

- A. Balance complete domestic hot water system per Section 23 05 93 – Testing, Adjusting and Balancing.

END OF SECTION 22 05 23

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Thermal-hanger shield inserts.
 - 5. Fastener systems.
 - 6. Equipment supports.
- B. See Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze pipe hangers. Include Product Data for components.
 - 2. Metal framing systems. Include Product Data for components.
 - 3. Equipment supports.
- C. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. ERICO/Michigan Hanger Co.
 - 3. Grinnell Corp.

4. National Pipe Hanger Corporation.
 5. PHD Manufacturing, Inc.
 6. Piping Technology & Products, Inc.
 - C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.
 - D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.
- 2.3 TRAPEZE PIPE HANGERS
- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.
- 2.4 METAL FRAMING SYSTEMS
- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
 - B. Manufacturers:
 1. B-Line Systems, Inc.; a division of Cooper Industries.
 2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
 3. Power-Strut Div.; Tyco International, Ltd.
 4. Thomas & Betts Corporation.
 5. Unistrut Corp.; Tyco International, Ltd.
 - C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.
 - D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- 2.5 THERMAL-HANGER SHIELD INSERTS
- A. Description: 100-psig-minimum, compressive-strength insulation insert encased in sheet metal shield.
 - B. Manufacturers:
 1. Carpenter & Paterson, Inc.
 2. ERICO/Michigan Hanger Co.
 3. PHS Industries, Inc.
 4. Pipe Shields, Inc.
 5. Rilco Manufacturing Company, Inc.
 6. Value Engineered Products, Inc.
 - C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C533, Type I calcium silicate or ASTM C552, Type II cellular glass with vapor barrier.
 - D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C533, Type I calcium silicate or ASTM C552, Type II cellular glass.
 - E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
 - F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
 - G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.
- 2.6 FASTENER SYSTEMS
- A. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened port-land cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 1. Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. Empire Industries, Inc.
 - c. Hilti, Inc.
 - d. ITW Ramset/Red Head.
 - e. MKT Fastening, LLC.
 - f. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A36, steel plates, shapes, and bars; black and galvanized.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
 - 6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
 - 7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
 - 8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- L. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 2. Field fabricate from ASTM A36, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
 1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping.
- K. See details on plans or structural drawings for limitations on building attachments to metal bar joists and metal roof decks. Generally speaking, eccentric beam clamps may not be used on bar joists, and hangers may not be anchored to bare metal decks (without concrete topping). In limited cases, small duct run-outs to diffusers and small branch piping may be supported from bare metal deck, but only up to the load capacity of the deck (15-25 lb typical, to be validated by deck manufacturer).

- L. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.
- N. Insulated Piping: Comply with the following:
 - 1. Attach clamps and spacers to piping.
 - g. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - h. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - i. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 - 5. Pipes NPS 8 and Larger: Include wood inserts.
 - 6. Insert Material: Length at least as long as protective shield.
 - 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedure for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

END OF SECTION 22 05 29

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.

1.2 SUBMITTAL

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

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: Stainless steel, 0.025-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 4. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
 - 1. Material and Thickness: Acrylic, plastic labels for mechanical engraving, 1/4-inch-thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: Engraved White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Red.
- C. Background Color: White.

- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets **or** self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pre-tensioned Pipe Labels: Pre-coiled, semi rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Painting and Coating."
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior or exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above, removable acoustical ceilings. Omit intermediately spaced labels.
- C. Pipe Label Color Schedule:
 - 1. Compressed-Air Piping:
 - a. Background Color: Light Gray
 - b. Letter Color: White
 - 2. Natural Gas Piping:

- a. Background Color: Black
 - b. Letter Color: White
- 3. Domestic Water Piping - Cold:
 - a. Background Color: Light Blue
 - b. Letter Color: White.
- 4. Domestic Water Piping - Hot:
 - a. Background Color: Dark Blue
 - b. Letter Color: White.
- 5. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: Brown.
 - b. Letter Color: White.

END OF SECTION 22 05 53

SECTION 22 07 00 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes insulation requirements for plumbing piping as associated tanks, vessels and equipment.

1.2 SUBMITTALS

- A. Product Data: Provide product data for each type of insulation product indicated.
- B. Shop Drawings: Show details for the following:
 - 1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 3. Removable insulation at piping specialties, valves, equipment connections, and access panels.
 - 4. Application of field-applied jackets.
- C. Insulation Schedule: Provide a schedule indicating insulation type and thickness and equivalent R-value for each mechanical system to be insulated. Indicate jacketing type to be utilized.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar services for not less than 10 years.
- B. Installer's Qualifications: Firms with at least 5 years successful installation experience on projects with mechanical insulation systems similar to that required for this project.
- C. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E84 (NFPA 255) method.

1.4 CODES

- A. Insulation values shall conform with the latest edition of the Washington State Energy Code and ASHRAE recommendations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products of one of the following:
 - 1. Armacell LLC
 - 2. CertainTeed Corp.
 - 3. Foster Products Corp.
 - 4. IMCOA
 - 5. Johns Manville Products Corp.
 - 6. Knauf Fiber Glass GmbH.
 - 7. Owens-Corning Fiberglas Corp.
 - 8. Pittsburgh Corning Corp.

2.2 PIPING INSULATION MATERIALS

- A. Fiberglass Piping Insulation: ASTM C411, ASTM C547, ASTM C585, ASTM C1136, K = 0.24 @ 100° F mean temperature. Equal to Johns Manville Micro-Lok. HP All Service (White ASJ) vapor retarder jacket with self sealing longitudinal closure LAP.
- B. Elastomeric Piping Insulation: ASTM C534, Type 1, ASTM E84, NFPA 255, UL 723, K = 0.27 @ 75° F Mean temperature. Equal to AP Armaflex pipe insulation.
- C. Pipe Fittings:

1. Fitting Insulation: Fittings, elbows, tees, unions, etc. shall be molded fiberglass fabricated specifically for pipe size, type, and adjacent insulation thickness. Only molded products are acceptable. Equal to Johns Manville Hi-Lo temperature fiber glass insulation inserts.
 2. Pipe fitting covers shall be one-piece premolded 0.020" thick PVC fitting covers (equal to Johns Manville Zeston 2000 or Speedline Smoke-Safe), fastened as per manufacturer's recommendations with fiberglass inserts. Color: White.
- 2.3 PIPE INSULATION JACKETS
- A. PVC pipe jackets for interior applications shall be premolded 0.020" thick PVC wrap covers (equal to Johns Manville Zeston 2000 or Speedline Smoke-Safe), fastened as per manufacturer's recommendations.
 - B. Aluminum jacket pipe insulation shall be 0.016" thick, stucco embossed finish, with a one mil polyethylene film/forty pound kraft paper integral vapor barrier affixed to the interior of the cover in conformance with ASTM B209. Elbows and fittings shall be jacketed with pre-formed 0.024" thick aluminum covers, with moisture retarder film.
- 2.4 PIPE INSULATION REMOVABLE VALVE AND FITTING COVERS
- A. Valves and devices subject to service or operational needs shall be insulated with removable type covers. These include: Shut-off valves, balance valves (manual and automatic), control valves, venturis and strainers.
 - B. Valves sets at terminal unit and air handling unit coil connections shall be covered with pre-insulated valve wraps equal to "No-Sweat" reusable and removable covers. Valve wraps shall consist of 1" thick insulation with a durable vapor barrier jacket material and Velcro closures.
 - C. Larger body valves, strainers, etc. shall be covered with custom made or pre-manufactured removable covers utilizing either PTFE Fiberglass Composite Jacketing, 16.5 oz/sq. yd minimum density, inside and outside face, or Silicone-coated F.G. cloth with S.S. mesh inner lining, both with fiberglass insulation fill. Assembly shall be double sewn lock stitch with minimum 4 to 6 stitches per inch. Jackets shall be fasteners using hook and loop (Velcro) straps and 1" slide buckles or S.S. lacing hooks with Teflon-coated F.G. drawstrings.
 - D. Flex hose connections on the chilled water coil connections to terminal units shall be covered with ½" thick elastomeric foam, pre-molded pipe sections, for condensation control.
- 2.5 EQUIPMENT INSULATION MATERIALS
- A. Rigid fiberglass equipment insulation shall conform ASTM C612, Class 2, 6.0 CF density, K = 0.23 @ 75° F mean temperature. Cover insulation with pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard. Provide a trowl or glove grade water based purpose mastic (white or light gray) suitable for interior or exterior applications. Install per manufacturer's written installation instructions.
 - B. Elastomeric Insulation: ASTM C534, Type 1, ASTM E84, NFPA 255, UL 723, K = 0.27 @ 75° F mean temperature, equal to Armaflex.
- 2.6 FASTENERS, MASTICS, SEALANTS, TAPES, ADHESIVES AND ACCESSORIES
- A. The insulation installer shall utilize accessory materials and devices for the complete and proper application of all insulation systems, in accordance with manufacturer's directions and established good industry standards for materials and workmanship. All accessory products shall be compatible with the insulation materials being utilized.

PART 3 - EXECUTION

3.1 PLUMBING PIPING INSULATION

- A. Provide insulation for the following piping:

Pipe Insulation Systems			
Pipe Service	Location	Insulation Type	Insulation Cover ¹
Potable & Non-Potable	Building	Fiberglass	ASJ

Hot, Cold, Tempered & Recirc. Hot Water	Exterior	Elastomeric	Metal Jacket
Make-up Water	Building	Fiberglass	ASJ
	Exterior	Elastomeric	Metal Jacket
Condensate Drains	Building	None	N/A
PVC Piping Run in Ceiling Plenums	Building	Fiberglass	ASJ
Roof /Over flow Drain Leaders & Drain Bodies	Building	Fiberglass	ASJ
	Exterior	None	N/A

Pipe Insulation System Notes:

1. All insulated piping located in mechanical equipment rooms, platforms or other accessible spaces, located below the 10 ft level, shall be covered with PVC jacketing.

B. Provide minimum pipe insulation as listed in following table:

Fluid Design Operating Temp. Range, °F	Insulation Conductivity		Nominal Pipe Diameter (in.)					
	Conductivity Range BTUx in/(hxft ² x°F)	Mean Rating Temp. °F	Runouts ² up to 1.5	1 and less	>1 to 1.5	>1.5 to 4	>4 to 8	>8
Heating Systems (Steam, Steam Condensate and Heating water)			Nominal Insulation Thickness					
Above 350	0.32-0.34	250	3.5	4.5	5.0	5.0	5.0	5.0
251-350	0.29-0.31	200	2.0	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	1.5	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.0	1.5	2.0	2.0	2.0	2.0
105-140	0.24-0.28	100	0.5	1.0	1.0	1.5	1.5	1.5
Domestic and Service Hot Water Systems								
105 and Greater	0.24-0.28	100	0.5	1.0	1.0	1.5	1.5	1.5
Chilled and Cold Systems (Domestic Cold Water, Chilled Water, Make-up Water and Refrigerant)								
40-60	0.23-0.27	75	0.5	0.5	1.0	1.0	1.0	1.5

1. The following temperatures shall be used for determining the insulation thickness required for each piping system:

- a. Domestic Hot Water Supply and Recirc. Piping = 130oF
- b. Domestic Cold Water Piping = 50°F
- c. Make-up Water Piping = 50°F
- d. Roof Drain Piping = 50°F
- e. Refrigerant Piping = 40°F

- C. Plumbing piping system insulation omitted on chrome plated exposed piping (except for handicapped fixtures), air chamber, unions, etc.
 1. Special Application Requirements: Insulate interior above-ground horizontal storm water piping, 1" thickness.
 2. Insulate all exposed piping under ADA compliant lavatories with a white, fitted anti-microbial pipe cover. Cover shall be designed to allow access to the stop valves. Lav Guard; Truebro, Inc.

3.2 EQUIPMENT INSULATION

- A. Application Requirements: Insulate the following cold (below ambient) equipment:
 1. Cold water storage tanks.
 2. Cold and chilled water pump impeller housings .
 3. Pneumatic water tanks.
 4. Roof drain bodies..

- B. Application Requirements: Insulate with 2" thick rigid fiberglass the following hot (above ambient temperature) equipment:
 - 1. Hot water storage tanks.
 - 2. Heat exchangers.
 - 3. Hot water pumps impeller housings.

3.3 COMMON INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation with tightly butted joints free of voids and gaps. Vapor barriers shall be continuous. Before installing jacket material, install vapor-barrier system.
- C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- E. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- F. Install multiple layers of insulation with longitudinal and end seams staggered.
- G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- H. Keep insulation materials dry during application and finishing.
- I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- J. Install insulation with least number of joints practical.
- K. Hangers and Anchors: Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- M. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - f. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

- P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- Q. For above ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Handholes.
 - 6. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Below-Grade Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
 - 1. Firestopping and fire-resistive joint sealers are specified in Division 07 Section "Firestopping."
- F. Insulation Installation at Floor Penetrations:
 - 1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 - 2. Pipe: Install insulation continuously through floor penetrations.
 - 3. Seal penetrations through fire-rated assemblies according to Division 07 Section "Firestopping."

3.5 INSTALLATION OF HOT PIPING INSULATION

- A. After installation of heat tracing, painting, testing, and acceptance of tests, install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

- B. Maintain integrity of vapor barrier jacket on pipe insulation, and protect to prevent puncture or other damage.
- C. Cover valves, fittings, and similar items in each piping system $\leq 2"$ with equivalent thickness and composition of insulation as applied to adjoining pipe run. PVC Pipe fittings shall be utilized at all fittings.
- D. Install removable covers on all valves, flow balance devices, strainers, etc.
- E. Extend Piping insulation without interruption through walls, floors and similar piping penetrations, except where penetrations go through fire rated construction.
- F. Cover exposed ends of fiberglass with a vapor retardant mastic.
- G. Butt pipe insulation against pipe hanger insulation inserts. Apply 3" wide vapor barrier tape or band over the butt joints.
- H. Fasten aluminum jacket to insulation using strapping and wing seals of the same material as the cover. In exterior applications, insure that all seams are watertight. Follow manufacturer's written installation guidelines.
- I. For hot water heating, install a polyurethane insulation insert at hangers on all piping 2" and larger. Insert material shall be at least as long as the protective shield.
- J. For steam piping, Install inserts and metal shield.

3.6 INSTALLATION OF COLD PIPING INSULATION

- A. After painting, testing, and acceptance of tests, install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices in ensure that insulation serves its intended purpose. Insulation must be applied so there are no voids between the inner insulation face and cold piping system. The insulation system must be installed in such a manner that the piping system will not condense.
- B. Maintain integrity of vapor barrier jackets on pipe insulation, and protect to prevent puncture or other damage. Special care must be made to maintain the vapor barrier at PVC fittings and with pipe covered with aluminum jackets.
- C. Cover valves, fitting and similar items in each piping system with insulation as applied to adjoining pipe run. Extra care must be taken on piping appurtenances to insure a tight fit to the adjoining fiberglass system insulation. Pump impeller housings, air separators, etc. must be totally encapsulated with insulation.
 - 1. Install fabricated molded insulation inserts at the pipe fittings under the PVC fitting.
- D. Install removable covers on all valves, flow balance devices, strainers, etc.
- E. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where penetrations go through fire rated construction. At fire rated construction, stop insulation at each side of the penetration, fill the interstitial space between the fire caulk with mineral wall (or other approved material), and seal penetration to maintain fire rating.
- F. Cover exposed ends of fiberglass with a vapor retardant mastic.
- G. Elastomeric Insulation:
 - 1. Glue the butt ends of insulation to each other to form a homogenous membrane maintaining the vapor barrier.
 - 2. Exterior elastomeric insulation shall be installed with the longitudinal seam on the bottom of the pipe and shall be protected with an ultra violet resistive paint.
- H. Butt pipe insulation against pipe hanger insulation inserts. Apply wet coat of vapor barrier lap cement on butt joints and over staples and seal joints with 3" wide vapor barrier tape or band.
- I. Fasten aluminum jacket to insulation using strapping and wing seals of the same material as the cover. In exterior applications, insure that all seams are watertight. Follow manufacturer's written installation guidelines.
- J. Install a polyurethane insulation insert at hangers on all piping 2" and larger. Insert material shall be at least as long as the protective shield.

3.7 INSTALLATION OF EQUIPMENT INSULATION

- A. Install equipment thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves the intended purpose.

- B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship
- C. Maintain integrity of vapor barrier on equipment insulation and protect it to prevent puncture or other damage.
- D. Do not apply insulation to equipment while hot.
- E. Apply insulation using the staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.
- F. Coat insulated surfaces with layer of insulating cement, troweled in workmanlike manner, leaving a smooth continuous surface. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.
- G. Cover fiberglass insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2". Apply over vapor barrier where applicable.
- H. Do not insulate handholes, cleanouts, ASME stamp, and manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.
- I. Provide removable insulation sections to cover parts of equipment that must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames, and accessories.
- J. Protect outdoor insulation from weather by installation of weather-barrier mastic protective finish or jacketing, as recommended by the manufacturer.

END OF SECTION 22 07 00

SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes domestic water piping inside the building.
- B. See Section 22 05 19 - Meters and Gages for Plumbing, for thermometers, pressure gages, and fittings.
- C. See Section 22 11 19 – Domestic Water Piping Specialties, for water distribution piping specialties.

1.2 SUBMITTALS

- A. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.
- B. All domestic water piping associated fittings and trim shall comply with ANSI/NSF 61-8, Annex G and US Senate Bill S.3874 for the wetted surface of all potable water plumbing components as it relates to LEAD-FREE construction.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- C. Hard Copper Tube: ASTM B88, Types L water tube, drawn temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
 - 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- D. Uponor Cross-linked polyethylene pipe: ISO 15875 and DIN EN 13501-1 dimensional standards. Listed by NSF International to NSF standards 14 and 61 for use in potable water systems and listed by NSF to be compliant with the Uniform Plumbing Code.
- E. Press-Fit pipe and fitting equal to Pro-Press systems.
 - 1. Joints: All fittings to be lead free brass with brass or poly alloy crimp rings.
 - 2. Fittings: All fittings to be lead free brass with either ductile copper crimp rings or stainless steel cinch clamps.
 - 3. All system components that are contacted by consumable water to meet the Lead Free requirements.

2.2 VALVES

- A. Bronze and cast-iron, general-duty valves are specified in Section 22 05 23 – General-Duty Valves for Plumbing Piping.
- B. Balancing and drain valves are specified in Section 22 11 19 – Domestic Water Piping Specialties.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Excavation and Fill."

3.2 PIPE AND FITTING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. All piping routed inside of exterior wall, shall be Installed on the warm side of building insulation.
- D. Below ground Domestic Water Piping: Use the following piping materials for each size range:
 - 1. NPS 1 and Smaller: Annealed copper tube, Type K; no joints.
 - 2. NPS 1-1/4 and NPS 1-1/2: Annealed copper tube, Type K; copper pressure fittings and silver brazed joints.
 - 3. NPS 2: Annealed copper tube, Type K; copper pressure fittings and silver brazed joints.
 - 4. NPS 2-1/2 to NPS 3-1/2: Annealed copper tube, Type K; copper pressure fittings and silver brazed joints.
 - 5. NPS 4 to NPS 6: Steel pipe; gray-iron, threaded fittings; and threaded joints.
 - 6. NPS 4 to NPS 6: Annealed copper tube, Type K; copper pressure fittings and silver brazed joints.
 - 7. Trap primer piping: P-Xa Tubing as manufactured by uponor commercial systems.
- E. Aboveground Domestic Water Piping: Use the following piping materials for each size range:
 - 1. NPS 1 and Smaller: Drawn copper tube, Type L; copper pressure fittings; and soldered joints.
 - 2. NPS 1-1/4 and NPS 1-1/2: Drawn copper tube, Type L; copper pressure fittings; and soldered joints.
 - 3. NPS 2: Drawn copper tube, Type L; copper pressure fittings and silver brazed joints.
 - 4. NPS 2-1/2 to NPS 4: Drawn copper tube, Type L; copper pressure fittings; and silver brazed joints.
 - 5. NPS 3/4" and smaller for individual run outs and connections to fixtures: Uponor

PE-Xa polyethylene pipe: ISO 15875 and DIN EN 13501-1 dimensional standards. Listed by NSF International to NSF standards 14 and 61 for use in potable water systems and listed by NSF to be compliant with the Uniform Plumbing Code. Joints: All fittings to be lead free brass with brass or poly alloy crimp rings. Fittings: All fittings to be lead free brass with either ductile copper crimp rings or stainless steel cinch clamps. All system components that are contacted by consumable water to meet the Lead-Free requirements.

- 6. NPS 1" and smaller. NPS 1-1/4 to NPS 4": Drawn copper tube, Type L; copper press fit pipe and fittings.

3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use bronze full port ball valves with threaded ends for piping NPS 2 and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
 - 2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
 - 3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
 - 4. Drain Duty: Hose-end drain valves.
- B. Install shutoff valve close to water main on each branch and riser serving equipment, on each water supply to equipment. Use full port threaded ball valves for piping NPS 2 and smaller. Use butterfly valves for piping NPS 2-1/2 and larger.
- C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

1. Install hose-end drain valves at low points in water mains, risers, and branches.
 2. Install stop-and-waste drain valves where indicated.
 - D. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Calibrated balancing valves are specified in Section 22 11 19 – Domestic Water Piping Specialties.
- 3.4 PIPING INSTALLATION
- A. Basic piping installation requirements are specified in Section 22 05 00 – Common Work Results for Plumbing.
 - B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Pressure gages are specified in Section 22 05 19 - Meters and Gages, and drain valves and strainers are specified in Section 22 11 19 – Domestic Water Piping Specialties.
 - C. Install domestic water piping level without pitch and plumb.
- 3.5 JOINT CONSTRUCTION
- A. Basic piping joint construction requirements are specified in Section 22 05 00 – Common Work Results for Plumbing.
 - B. Soldered Joints: Use ASTM B813, water-flushable, lead-free flux; ASTM B32, lead-free-alloy solder; and ASTM B828 procedure, unless otherwise indicated.
 - C. Silver Brazed Joints on piping 2" and above.
- 3.6 HANGER AND SUPPORT INSTALLATION
- A. Pipe hanger and support devices are specified in Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment. Install the following:
 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet: MSS Type 49, spring cushion rolls, if indicated.
 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 4. Base of Vertical Piping: MSS Type 52, spring hangers.
 - B. Install supports according to Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
 - C. Support vertical piping and tubing at base and at each floor.
 - D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
 - E. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
 3. NPS 2: 10 feet with 3/8-inch rod.
 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
 5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
 7. NPS 6: 12 feet with 3/4-inch rod.
 - F. Install supports for vertical steel piping every 15 feet.
 - G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 6. NPS 6: 10 feet with 5/8-inch rod.

- H. Install supports for vertical copper tubing every 10 feet.
- I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Install piping adjacent to equipment and machines to allow service and maintenance.
- B. Connect new domestic water piping to existing domestic water piping. Use transition fitting to join dissimilar piping materials.
- C. Connect domestic water piping to water-service piping with shutoff valve, and extend and connect to the following:
 - 1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - 2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - 3. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
 - 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test domestic water piping as follows:
 - 1. See Section 22 00 00 - Plumbing General Provisions for additional requirements.
 - 2. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - 3. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 4. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 5. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - 6. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 - 7. Prepare reports for tests and required corrective action.

3.9 CLEANING

- A. Clean and disinfect potable domestic water piping using purging and disinfecting procedures as described in Section 22 00 00 - Plumbing General Provisions.
- B. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities.

END OF SECTION 22 11 16

SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following domestic water piping specialties:
 - 1. Vacuum breakers.
 - 2. Strainers.
 - 3. Hose bibbs.
 - 4. Drain valves.
 - 5. Potable Water Bladder Expansion Tanks.
 - 6. Trap Primers.
 - 7. Water Hammer Arresters.

1.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. NSF Compliance:
 - 1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."
- B. All domestic water piping specialties indicated above and associated fittings and trim shall comply with ANSI/NSF 61-8, Annex G and US Senate Bill S.3874 for the wetted surface of all potable water plumbing components as it relates to LEAD-FREE construction.

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

- A. Hose-Connection Vacuum Breakers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith
 - b. Watts Industries, Inc.; Water Products Div.
 - c. Woodford Manufacturing Company.
 - d. Zurn Plumbing Products Group
 - 2. Standard: ASSE 1001.
 - 3. Body: Bronze, non-removable, with manual drain.
 - 4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 - 5. Finish: Chrome or nickel plated.

2.2 STRAINERS FOR DOMESTIC WATER PIPING

- A. Y-Pattern Strainers:
 - 1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
 - 2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
 - 3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 - 4. Screen: Stainless steel with round perforations, unless otherwise indicated.
 - 5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.020 inch

- b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
- c. Strainers NPS 5 and Larger: 0.10 inch.
- 6. Drain: Factory-installed, hose-end drain valve.

2.3 HOSE BIBBS

A. Hose Bibbs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith
 - b. Woodford Manufacturing Company. (for indoor hose bibs only)
 - c. Zurn Plumbing Products Group
2. Standard: ASME A112.18.1 for sediment faucets.
3. Body Material: Bronze.
4. Seat: Bronze, replaceable.
5. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
6. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
7. Pressure Rating: 125 psig.
8. Vacuum Breaker: Integral, non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
9. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
10. Finish for Service Areas: Rough bronze.
11. Finish for Finished Rooms: Chrome or nickel plated.
12. Operation for Equipment Rooms: Wheel handle or operating key.
13. Operation for Service Areas: Wheel handle.
14. Operation for Finished Rooms: Operating key.
15. Operation for building exterior: Operating key.
16. Include operating key with each operating-key hose bibb.
17. Include integral wall flange with each chrome- or nickel-plated hose bibb.
18. Valve shall be freeze proof type. Chamber length shall be sized to accommodate wall thickness at bibb locations indicated on the drawings.

2.4 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.5 POTABLE WATER BLADDER EXPANSION TANKS

A. Bladder Expansion Tanks

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Wessels.
 - b. Amtrol.
 - c. Armstrong.
 - d. Taco.
2. The pressurization system shall include a bladder-type expansion tank which will accommodate the expanded water of the system generated within the normal operating temperature range, limiting this pressure increase at all components in the system to the maximum allowable pressure of those components.

3. The expansion tank shall be welded steel, constructed, tested and stamped in accordance with Section VIII of the ASME Code for a working pressure of 125 psig and pre-charge to the minimum operating pressure.
4. Diaphragm: Sealed into tank, flexible.
5. Tank shall be ASME rated.
6. Accessories: Pressure gauge and air-charging fitting, tank drain.
7. All wetted components shall be of FDA approved materials.

2.6 TRAP PRIMERS

- A. Mechanical Type Primer – Flush valve actuated with vacuum breaker and associated chrome plated primer tubing, fittings and escutcheon.
- B. Electronic Type Primer – Cast bronze construction with integral vacuum breaker, distribution header and electronic timer within surface or recessed mounted cabinet. Interlock with building EMS.
- C. Mechanical trap primer assemblies installed in small diameter water lines serving often used fixtures may be used where serving a remote single floor drain where electronic or flush valve mechanical type trap primers are not indicated.

2.7 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Sloan. (flush valve actuated)
 2. Precision Plumbing Products. (Electronic)
 3. Precision Plumbing Products. (Mechanical)
- B. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
- C. Body: Bronze or cast iron.
- D. Inlet: Opening in top of body.
- E. Outlet: Larger than inlet.
- F. Size: Same as connected water piping and with outlet large enough for associated trap primer piping.

2.8 WATER HAMMER ARRESTERS

- A. Water Hammer Arresters:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. PPP Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 2. Standard: ASSE 1010 or PDI-WH 201.
 3. Type: Bellows with threaded ends.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Section 22 05 00 – Common Work Results for Plumbing, for piping joining materials, joint construction, and basic installation requirements.
- B. Install balancing valves in locations where they can easily be adjusted.
- C. All piping routed inside of exterior wall, shall be Installed on the warm side of building insulation.
- D. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.
- E. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- F. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identi-

fyng unit. Nameplates and signs are specified in Section 22 05 53 – Identification for Plumbing Piping and Equipment.

3.2 FIELD QUALITY CONTROL

- A. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

END OF SECTION 22 11 19

SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following soil and waste, sanitary drainage and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.3 SUBMITTALS

- A. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Sanitary Waste and Vent Piping (Above Grade)
 - 1. Pipe: ASTM A888, no hub, cast iron. CISPI Standard 301, twice bituminous coated. Pipe showing rust or cracks in coating shall be removed and replaced. Tyler or Charlotte.
 - a. Fittings:
 - 1) Above-Grade No-Hub Joints: Manufactured by Clamp-All, Tyler or Charlotte. Stainless steel shield with 4 or 6 bands and neoprene gasket conforming to ASTM C564, CISPI 301. Hubless Cast-Iron Pipe and Fittings: ASTM A888 or CISPI 301.
- A. Acid Resistant Sanitary Waste and Vent Piping (Above Grade)
 - 1. Pipe: ASTM Cell Class 23447, CPVC Schedule 40 NFS-cw, ASTM F 2618. Manufactured by Charlotte.
 - b. Fittings:
 - 1) CPVC Schedule 40 drainage pattern, ASTM F 2618 and ASTM F 493 with solvent welded fittings and joints: Manufactured by Charlotte.
- B. Note: CPVC piping located in plenum spaces shall either meet the requirements of the flame spread/ smoke developed rating for plenum spaces or be completely wrapped by insulating system meeting the requirements of the flame spread/ smoke developed rating for installation within plenum spaces.
- C. Note: Acid Resistant Waste and Vent piping shall serve all plumbing fixtures located within the Science Class rooms. Acid Resistant piping shall route minimum 5'-0" after last fixture served before connecting to Non-Acid resistant waste piping. Acid resistant Vent piping shall serve only the fixtures indicated above and shall terminate at the roof separately from Non-Acid Resistant Vent piping.
- D. Sanitary Vent Piping (Above Grade: from above cast-iron waste fitting on fixture served and thru the roof)
 - 1. ABS Pipe: ASTM D3965 and ASTM F628, Schedule 40 drain, waste and vent. Charlotte.
 - a. Fittings:
 - 1) ASTM D2661 ABS socket type fittings made to ASTM D3311 drain, waste and vent patterns. Solvent-cement joints.

- E. Sanitary Waste and Vent Piping (Below Grade)
 - 1. Pipe: ASTM A888, no hub, cast iron. CISPI Standard 301, twice bituminous coated. Pipe showing rust or cracks in coating shall be removed and replaced. Tyler or Charlotte.
 - a. Fittings:
 - 1) No-Hub Joints (Heavy Duty, Manufactured by Clamp-All, Tyler or Charlotte. Conforming to ASTM C564, CISPI 301 and FM 1680 standards. Stainless steel shield with 4 or 6 band neoprene gasket.
 - 2. PVC Pipe: ASTM D2665, Schedule 40 Solid-wall drain, waste and vent (Below grade only up to no-hub coupling transition to cast-iron at grade or slab level):
 - a. Fittings:
 - 1) ASTM D2665 PVC socket type fittings, made to ASTM D3311, drain, waste and vent patterns. Solvent-cement joints.
- F. Acid Resistant Sanitary Waste and Vent Piping (Below Grade)
 - 1. Pipe: ASTM Cell Class 23447, CPVC Schedule 40 NFS-cw, ASTM F 2618 and ASTM D 2321 and ASTM F 1668. Manufactured by Charlotte.
 - a. Fittings:
 - 1) CPVC Schedule 40 drainage pattern, ASTM F 2618 and ASTM F 493 with solvent welded fittings and joints: Manufactured by Charlotte.
- G. Note: Acid Resistant Waste and Vent piping shall serve all plumbing fixtures located within the Science Class rooms Acid Resistant piping shall route minimum 5'-0" after last fixture served before connecting to Non-Acid resistant waste piping. Acid resistant Vent piping shall serve only the fixtures indicated above and shall terminate at the roof separately from Non-Acid Resistant Vent piping.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Special pipe fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

3.2 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Section 22 05 00 – Common Work Results for Plumbing.
- B. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- C. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- D. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- E. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

- F. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- G. Install PVC soil and waste drainage and vent piping according to ASTM D2665.
- H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Section 22 05 00 – Common Work Results for Plumbing.
- B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
 - 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- C. Soldered Joints: Use ASTM B813, water-flushable, lead-free flux; ASTM B32, lead-free-alloy solder; and ASTM B828 procedure, unless otherwise indicated.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Seismic-restraint devices are specified in Section 22 05 50 – Plumbing Seismic Controls.
- B. Pipe hangers and supports are specified in Section 22 05 29 - Hangers and Supports for Plumbing Piping. Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install supports according to Section 22 05 29 - Hangers and Supports for Plumbing Piping.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 - 4. NPS 6: 60 inches with 3/4-inch rod.
 - 5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 84 inches with 3/8-inch rod.
 - 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
 - 3. NPS 2: 10 feet with 3/8-inch rod.
 - 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
 - 5. NPS 3: 12 feet with 1/2-inch rod.
 - 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
 - 7. NPS 6: 12 feet with 3/4-inch rod.
- I. Install supports for vertical steel piping every 15 feet.
- J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

- 5. NPS 6: 10 feet with 5/8-inch rod.
 - K. Install supports for vertical copper tubing every 10 feet.
 - L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.
- 3.5 CONNECTIONS
- A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
 - B. Connect drainage and vent piping to the following:
 - 1. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Section 22 13 19 – Sanitary Waste and Vent Piping Specialties.
 - 2. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection.
- 3.6 FIELD QUALITY CONTROL
- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
 - C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 - D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.
 - 1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 2. Prepare reports for tests and required corrective action.
- 3.7 CLEANING
- A. Clean interior of piping. Remove dirt and debris as work progresses.
 - B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
 - C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 22 13 16

SECTION 22 13 19 - SANITARY WASTE AND VENT PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following drainage piping specialties:
 - 1. Floor drains/Floor sink.
 - 2. Miscellaneous drainage piping specialties.
 - 3. Cleanouts.
 - 4. Air-gap Fittings.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories.

1.3 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 FLOOR DRAINS/FLOOR SINKS

- A. Cast-Iron Floor Drains:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - b. Zurn Plumbing Products Group.
 - c. MIFAB
 - d. Sioux Chief
 - 2. Standard: ASME A112.6.3.
 - 3. Body Material: Gray iron.
 - 4. Seepage Flange: Required.
 - 5. Clamping Device: Required.
 - 6. Outlet: Bottom.
 - 7. Top or Strainer Material: Nickel bronze.
 - 8. Top of Body and Strainer Finish: Polished bronze or Rough bronze as indicated.
 - 9. Top Shape: Round or Square.
 - 10. Funnel: See Drawing Schedule.
 - 11. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
 - 12. Floor sinks shall be square with grate as specified, see schedule.

2.2 MISCELLANEOUS DRAINAGE PIPING SPECIALTIES

- A. Air-Gap Fittings:
 - 1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
 - 2. Body: Bronze or cast iron.
 - 3. Inlet: Opening in top of body.
 - 4. Outlet: Larger than inlet.
 - 5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

2.3 CLEANOUTS

- A. General: Cleanouts shall be heavy iron bodies with taper thread-bronze plugs. They shall be full size of the pipe to 4" and not less than 4" for larger pipe. Cleanout extension shall have

flush frames and brass removable cover plates. Extension to floor shall be made by using 1/8 bends.

B. Floor Cleanouts

1. Coated cast iron body, heavy duty nickel bronze top, fully adjustable and secured to body. Gasket sealed iron closure plug.
2. Cleanouts installed above grade shall have flange and flashing clamp.
3. Cleanouts in tiled terrazzo or similar paved floors: J.R. Smith #4180.
4. Cleanouts installed in ceramic tile floors: J.R. Smith #4040.
5. Cleanouts installed in floors with asphalt, vinyl or linoleum: J.R. Smith #4140.
6. Cleanouts in carpeted areas shall be furnished with carpet marker: J.R. Smith #4160.
7. Cleanouts in unfinished areas shall have heavy-duty cast-iron covers.
8. All cleanouts shall have vandal-proof screws.
9. Cleanouts in other finished areas shall have round tops.

C. Wall Cleanouts

1. Coated cast iron cleanout tee. Gasket sealed iron plug. Shallow type, round, stainless steel wall cover with center vandal-proof screw.

D. Manufacturers

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. J.R. Smith.
 - b. Sloan.
 - c. Zurn.
 - d. Precision Plumbing Products.
 - e. MIFAB.
 - f. Sioux Chief

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Section 22 05 00 – Common Work Results for Plumbing, for piping joining materials, joint construction, and basic installation requirements.
- B. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 1. Position floor drains for easy access and maintenance.
 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- C. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 2. Size: Same as floor drain inlet.
- D. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- E. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- F. Install vent caps on each vent pipe passing through roof.

- G. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
 - H. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.
 - I. Install cleanouts in above round piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 - 4. Locate at base of each vertical soil and waste stack.
 - J. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
 - K. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- 3.2 CONNECTIONS
- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
 - B. Install piping adjacent to equipment to allow service and maintenance.
- 3.3 PROTECTION
- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
 - B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the plumbing fixtures indicated on the drawings.

1.2 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- C. FRP: Fiberglass-reinforced plastic.
- D. PMMA: Polymethyl methacrylate (acrylic) plastic.
- E. PVC: Polyvinyl chloride plastic.
- F. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.
- C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- F. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.
- G. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants" for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.
- H. All Plumbing fixtures, associated fittings and trim shall comply with ANSI/NSF 61-8, Annex G and US Senate Bill S.3874 for the wetted surface of all potable water plumbing components as it relates to LEAD-FREE construction.
- I. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
 - 2. Plastic Shower Enclosures: ANSI Z124.2.
 - 3. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
 - 4. Slip-Resistant Bathing Surfaces: ASTM F462.
 - 5. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
 - 6. Stainless-Steel Residential Sinks: ASME A112.19.3.
 - 7. Vitreous-China Fixtures: ASME A112.19.2M.
 - 8. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
- J. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
 4. Faucets: ASME A112.18.1.
 5. Hose-Connection Vacuum Breakers: ASSE 1011.
 6. Hose-Coupling Threads: ASME B1.20.7.
 7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 8. NSF Potable-Water Materials: NSF 61.
 9. Pipe Threads: ASME B1.20.1.
 10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 11. Supply Fittings: ASME A112.18.1.
 12. Brass Waste Fittings: ASME A112.18.2.
- K. Comply with the following applicable standards and other requirements specified for bathtub and/or shower faucets:
1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
 2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
 3. Faucets: ASME A112.18.1.
 4. Hand-Held Showers: ASSE 1014.
 5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F445.
 6. Hose-Coupling Threads: ASME B1.20.7.
 7. Manual-Control Antiscald Faucets: ASTM F444.
 8. Pipe Threads: ASME B1.20.1.
 9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F444 and ASSE 1016.
 10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 11. Thermostatic-Control Antiscald Faucets: ASTM F444 and ASSE 1016.
- L. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001.
 2. Brass and Copper Supplies: ASME A112.18.1.
 3. Manual-Operation Flushometers: ASSE 1037.
 4. Plastic Tubular Fittings: ASTM F409.
 5. Brass Waste Fittings: ASME A112.18.2.
 6. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
- M. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Flexible Water Connectors: ASME A112.18.6.
 2. Grab Bars: ASTM F446.
 3. Hose-Coupling Threads: ASME B1.20.7.
 4. Off-Floor Fixture Supports: ASME A112.6.1M.
 5. Pipe Threads: ASME B1.20.1.
 6. Plastic Toilet Seats: ANSI Z124.5.
 7. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

- A. Faucets:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Chicago Faucets.
 - b. T&S Brass
 - c. Sloan

2. Description: Faucets shall be chrome plated solid brass construction. Metering type as scheduled on the drawings. Faucets for lavatories shall have a maximum flow rate of 0.5 GPM.

2.2 SINK FAUCETS

A. Faucets:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Chicago Faucets.
 - b. T & S Brass and Bronze Works, Inc.
2. Description: Faucets shall be chrome plated solid brass construction. Type as scheduled on the drawings. Faucets for sinks shall have a maximum flow rate of 2.2 GPM.

2.3 FLUSHOMETERS

A. Flushometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Sloan Valve Company.
2. Description: Side mounted Flushometer for urinals and water-closet type fixtures. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts with dual filtered by pass and trap primer connection.
3. Flushometers for water closets to have a consumption rate of 1.28 gallons per flush.
4. Flushometers for urinals to have a consumption rate of .125 gallons per flush.

2.4 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard Companies, Inc.
 - b. Bemis Manufacturing Company.
 - c. Church Seats.
 - d. Kohler Co.
 - e. Olsonite Corp.
2. Description: Toilet seat for water-closet-type fixture.
 - a. Material: Molded, solid plastic with antimicrobial agent.
 - b. Configuration: Open front with without cover.
 - c. Size: Elongated.
 - d. Class: Standard commercial.
 - e. Color: White.
 - f. Check hinge

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McGuire Manufacturing Co., Inc.
 - b. TRUEBRO, Inc.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

2.6 FIXTURE SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Jay R. Smith Mfg. Co.

2. Zurn Plumbing Products Group
 3. Watts
 - B. Water-Closet Supports:
 1. Description: Combination carrier designed for accessible and standard mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
 - C. Urinal Supports:
 1. Description: Urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture for wall-mounting, urinal-type fixture. Include steel uprights with feet.
 2. Accessible-Fixture Support: Include rectangular steel uprights.
 - D. Lavatory Supports:
 1. Description: Type lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
 2. Accessible-Fixture Support: Include rectangular steel uprights.
- 2.7 WATER CLOSETS
- A. Water Closets:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard
 - b. Kohler
 2. Description: Accessible, Floor or wall-mounting, back-outlet or wall outlet, vitreous-china fixture designed for operation.
 3. Style:
 - a. Design Consumption: 1.28 gal./flush .
 - b. Bowl type: Elongated, include bolt caps matching fixture.
 - c. Color: White.
- 2.8 URINALS
- A. Urinals:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard Companies, Inc.
 - b. Kohler
 2. Description: Accessible, wall-mounting, back-outlet, vitreous-china fixture designed for flushometer valve operation.
 - a. Design Consumption: .125 gal./flush
 - b. Color: White.
- 2.9 LAVATORIES
- A. Lavatories:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard Companies, Inc.
 - b. Kohler Co.
 2. Description: Accessible, wall-mounting, vitreous-china fixture.
- 2.10 SINKS
- A. Sinks:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard
 - b. Elkay Manufacturing Co.

- c. Just Manufacturing Company.
- 2. Description: One or Two-bowl, residential, counter-mounting, stainless-steel sink.

2.11 SERVICE SINKS

A. Service Sinks:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard Companies, Inc.
 - b. Kohler Co.
 - c. Acorn Engineering Company
 - d. Stern Williams
- 2. Description: Trap-standard- and floor-mounting, enameled, cast-iron fixture with roll-rim with back and rim guard on front and sides.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
 - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 - 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install wall-mounting fixtures with tubular waste piping attached to supports.
- F. Install fixtures level and plumb according to roughing-in drawings.
- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
- H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system. Lavatory and sink traps shall have cleanout.
- I. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- J. Install toilet seats on water closets.
- K. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- L. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- M. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- N. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- O. Install traps on all fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- P. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Section 22 05 00 – Common Work Results for Plumbing.
- Q. Set showers in leveling bed of cement grout. Grout is specified in Division 09, Section "Tiling."
- R. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07, Section "Joint Sealants."

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- C. Ground equipment according to Division 26, Section "Grounding and Bonding."
- D. Connect wiring according to Division 26 Section "Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.4 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 40 00

SECTION 22 47 00 - DRINKING FOUNTAINS AND WATER COOLERS

PART 2 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Commercial grade, wall-mounting refrigerated bottle fillers.
 - 2. Fixture supports.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for fixtures for people with disabilities.
- C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- D. ARI Standard: Comply with ARI's "Directory of Certified Drinking Water Coolers" for style classifications.
- E. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.
- F. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants" for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.

PART 2 - PRODUCTS

2.1 REFRIGERATED BOTTLE FILLERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Elkay Manufacturing Co.
 - 2. Haws Corporation.
- B. Description: Accessible, refrigerated surface mounts bottle filling station with antimicrobial, filtered, hands free, laminar flow, real drain, and visual monitor.
 - 1. Cabinet: Wall mount, stainless steel
 - 2. Bubbler: None.
 - 3. Control: Electronic Bottle Filler Sensor with visual filter monitor
 - 4. Flow: 1.1 gpm laminar flow
 - 5. Supply: NPS 3/8 with ball, gate, or globe valve.
 - 6. Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
 - 7. Drain(s): Grid with NPS 1-1/4 minimum horizontal waste and trap complying with ASME A112.18.1.
 - 8. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.
 - a. Capacity: 8 gph of 50 deg F cooled water from 80 deg F inlet water and 90 deg F ambient air temperature.

- b. Electrical Characteristics: 15 Watt; 120-V ac; single phase; 60 Hz.
- 9. Support: Type II, water cooler carrier. Refer to "Fixture Supports" Article.

2.2 FIXTURE SUPPORTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Smith, Jay R. Mfg. Co.
 - 2. Tyler Pipe; Wade Div.
 - 3. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
 - 4. Zurn Plumbing Products Group; Specification Drainage Operation.
- C. Description: ASME A112.6.1M, water cooler carriers. Include vertical, steel uprights with feet and tie rods and bearing plates with mounting studs matching fixture to be supported.
 - 1. Type II: Bilevel, hanger-type carrier with three vertical uprights.
 - 2. Supports for Accessible Fixtures: Include rectangular, vertical, steel uprights instead of steel pipe uprights.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Use carrier off-floor supports for wall-mounting fixtures, unless otherwise indicated.
- B. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view.

3.2 INSTALLATION

- A. Install off-floor supports affixed to building substrate and attach wall-mounting fixtures, unless otherwise indicated.
- B. Install fixtures level and plumb. For fixtures indicated for children, install at height required by authorities having jurisdiction.
- C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 22 05 23 - General-Duty Valves for Plumbing Piping.
- D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- E. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Escutcheons are specified in Section 22 05 00 - Common Work Results for Plumbing.
- F. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07, Section "Joint Sealants."

3.3 CONNECTIONS

- A. Connect fixtures with water supplies, traps, and risers, and with soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Ground equipment according to Division 26, Section "Grounding and Bonding."
- C. Connect wiring according to Division 26, Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Water Cooler Testing: After electrical circuitry has been energized, test for compliance with requirements. Test and adjust controls and safeties.
 - 1. Remove and replace malfunctioning units and retest as specified above.
 - 2. Report test results in writing.

3.5 ADJUSTING

- A. Adjust fixture flow regulators for proper flow and stream height.
- B. Adjust water cooler temperature settings.

END OF SECTION 22 47 00

SECTION 23 00 00 – HVAC GENERAL PROVISIONS

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

- A. Refer to BIDDING REQUIREMENTS, CONDITIONS OF THE CONTRACT, SUPPLEMENTARY CONDITIONS and DIVISION 1 of these specifications which govern work under DIVISION 23. Refer to other sections of these specifications for additional related requirements.
- B. Codes, Permits and Fees:
 - 1. Mechanical work shall be in accordance with the most recent adopted publication of the following:
 - a. International Building Code
 - b. International Mechanical Code
 - c. International Fire Code
 - d. National Electric Code
 - e. American Disability Act
 - f. International Energy Conservation Code
 - g. All applicable State and Local Codes and Ordinances.
 - 2. The Contractor shall obtain permits and inspections required for the mechanical work on this project at his expense. Deliver all inspection certificates to the Owner's Representative prior to final acceptance of the work.
 - 3. Contractor(s) shall pay all costs levied by utility companies and/or governing agencies associated with water, gas, sanitary and storm sewer connections and include these costs within his bid. This shall include but not be limited to tap fees, service mains, meters, and vault charges.

1.2 DESCRIPTION OF WORK

- A. The work covered by the contract documents (specifications and construction drawings), shall include but not be limited to:
 - 1. Furnishing all materials and supplying all labor, equipment, and services to install the complete mechanical system as shown on the contract documents and specified herein.
 - 2. All products and materials installed on the project shall be new and in first class condition. Used or resold materials will not be allowed. If requested to verify authenticity of materials the Contractor shall be prepared to produce bill-of-sale invoices.
- B. This project has been designed to meet or exceed the minimum requirements of the governing Codes. The Contractor must notify the Owner's Representative in writing of any items in conflict with the Codes prior to signing the contract, or he shall thereafter make any minor adjustments necessary to meet the Codes at no cost to the Owner.
- C. The Contractor shall comply with the project close-out requirements as detailed in Division 01, "Closeout Procedures."
- D. Safety Measures:
 - 1. The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement applies continuously and is not limited to normal working hours.
 - 2. Provide all required safety measures and consult with the State or Federal safety inspector for interpretation whenever in doubt as to whether safe conditions do or do not exist.
 - 3. Head protection: Where pipe hangers, equipment support angles, etc., are exposed in access ways for any maintenance, cover all such potentially injurious protrusions less than 7'-0" above the floor with padding; secure and permanently fasten, and finish to match adjacent finishes.

1.3 REFERENCES

- A. Definitions

1. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
2. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
3. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
4. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
5. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 QUALITY ASSURANCE

- A. Materials used under this Contract, unless specifically noted otherwise, shall be new and of the latest and most current model line produced by the manufacturer. Each item of equipment shall conform to the latest Standard Specifications of the American Society for Testing Materials and shall conform to any applicable standards of the United States Department of Commerce.
- B. Electrically Driven or Connected Mechanical Equipment:
 1. All electrically driven or connected equipment and associated control panels shall be provided with UL or equivalent label and/or listing in accordance with the requirements of the NEC. Equipment shall be listed as an assembly where listing/labeling program is available for that type of equipment.
 2. Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
 3. All HVAC equipment provided in Division 23 requiring compliance with NEC Article 440 "Air-Conditioning and Refrigerating Equipment" shall be listed for a minimum short-circuit current (AIC) rating of 10,000 Amperes RMS. This equipment shall be listed under UL 1995 for both circuit breakers and fuses as the upstream overcurrent protective device. The nameplate shall read "Maximum overcurrent protective device" not "Maximum Fuse" or "Maximum Circuit Breaker."
 4. All Division 23 equipment other than that provided in 2 above shall be listed or rated for a minimum of 10,000 AIC at 240, 208 or 120 volts and 14,000 AIC at 480 or 277 volts unless a higher value is specifically indicated on the drawings or in the specific equipment specifications.
- C. AWS states that welding qualifications remain in effect indefinitely unless welding personnel have not welded for more than six months or there is a specific reason to question their ability.
- D. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

1.5 COORDINATION

- A. Consider architectural and structural drawings part of this work insofar as these drawings furnish information relating to design and construction of the building and shall take precedence over mechanical drawings if any dimensional discrepancies exist.
- B. The Contractor shall refer to the architectural and structural details, plans, elevations, and other Contract Drawings and shall coordinate his work with that of the other trades to avoid interference.
- C. Dimensions are approximate and are for estimating purposes only, unless noted otherwise.
- D. The mechanical drawings are diagrammatic and show general locations of fixtures, equipment, and pipe. Drawings are not to be scaled. Field verify exact size, location, invert, and clearances of existing material and equipment, and advise the Owners Representative of any discrepancies between the field conditions and the Drawings prior to any installation. Contractor shall be responsible for all costs associated with the removal or relocation of systems that have been installed without prior notification of the Owners Representative.

- E. Assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.
- F. Prior to installation of the new Division 23 systems, the Contractor shall coordinate the proposed installation with the Architectural and Structural requirements and all other trades (including HVAC, Plumbing, Fire Protection, Electrical, Ceiling Suspension and Tile systems), and provide reasonable maintenance access requirements. Changes required in work specified in Division 23 caused by neglect to do so shall be made at no cost to Owner.
- G. The Contractor shall be responsible for installation of systems according to the Contract Documents. Anything not clear or in conflict will be explained by making application to Owner's Representative. Should conditions arise where certain changes would be advisable, secure approval from Owner's Representative for those changes before proceeding.
- H. Furnish sleeves, inserts, supports, and equipment that are to be integrated into other Divisions of the Work to those involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne under Division 23.
- I. Electrical Coordination
 - 1. The electrical characteristics of all mechanical equipment to be furnished on the project shall be cross-checked with the Electrical Drawings, prior to ordering equipment, to confirm correct power supply; horsepower, kW, amps, voltage and phase. Where proposed equipment characteristics do not agree with the Electrical Drawings, the engineer shall be contacted for direction before proceeding.
 - 2. Electrical connection sizes: coordinate with the Electrical Drawings for proper electrical lug size and quantity on large capacity devices such as chillers, electric heaters, etc. and determine if the connections will accept either copper or aluminum conductors. Make necessary adjustments to equipment connections to accommodate electrical power feeder sizes and types.
 - 3. Disconnect Switches: Where disconnect switches are furnished integral with the equipment, mounting height shall not exceed 7 ft. (to top) above floor or roof level, including allowance for bases on roof curbs.

1.6 SUBMITTALS

- A. Mechanical Cost Breakdown:
 - 1. The Contractor shall furnish the Owner's Representative an itemized breakdown of the mechanical construction cost within 30 days of notice to proceed. This breakdown shall be utilized for pay applications.
 - 2. At a minimum, the cost breakdown shall be as follows:
 - a. Mobilization
 - b. HVAC Material
 - c. HVAC Labor
 - d. Test and Balance
- B. Payment Requests:
 - 1. Refer to Division 01 for Payment Procedures.
 - 2. Payment requests for the following will not be reviewed or approved until shop drawings have been received:
 - a. Materials.
 - b. Equipment.
- C. Submittal Log: Contractor shall prepare a master submittal log tracking spreadsheet for all Division 23 items, to be filled in, updated and furnished with each submittal package. Submittal log shall indicate specification section and sub-paragraph of each item included in the submittal, along with a general description of the item/equipment, manufacturer name, date submitted and a column for returned date, A/E review action (i.e. approved, approved as noted, revise and resubmit or rejected) and re-submittal action required (if any).
- D. Submit Shop Drawings and Product Data per the requirements of Division 01 Section, "Submittal Procedures." See individual Division 23 specification sections for additional submittal requirements.

1. Electronic Submittal: Organize electronic files in a similar manner to hard copy binders, with electronic indexing (bookmarks) and/or portfolio format for ease of organizing and navigating for A/E review and comment purposes. Electronic submittals shall be digitally searchable (Ctrl F) – photocopies are not acceptable. SUBMITTALS NOT PROVIDED IN THIS FORMAT WILL BE REJECTED.
 - E. Shop Drawings: Refer to Section 013300 for specific information regarding the preparation, submittal, and approval of Shop Drawings.
 1. Shop drawings, catalog information and material schedules shall be submitted for approval on all materials and equipment prior to ordering. This applies to all specified material and equipment in Division 23.
 2. Shop drawings shall be reviewed, approved, and stamped by Contractor prior to submitting to Owner's Representative for approval. Submittals without such approval will be returned without review.
 3. Allow for sufficient time for developing shop drawings, processing, and review time so that the installation will not be delayed.
 4. Indicate manufacturer, trade name and model number. HIGHLIGHT, ENCIRCLE OR OTHERWISE INDICATE ALL DEVIATIONS FROM THE SPECIFIED PRODUCTS OR BASIS-OR-DESIGN EQUIPMENT. Include copies of applicable brochure or catalogue materials. Indicate sizes, types, model numbers, ratings and capacities being proposed. Only those items being used on the project shall be included in the submittal.
 5. Where choices of options and accessories are available or specified, provide written description of what is to be furnished. If necessary, list page numbers where submitted items are described.
 6. Include dimensional data for roughing in and installation and technical data sufficient to confirm that equipment meets requirements of drawings and specifications.
 7. Include wiring, piping and service connection data, motor sizes complete with voltage ratings and schedules. Upon approval, copies of these diagrams shall be forwarded to pertinent contractors.
 8. Upon approval, copies of these diagrams shall be forwarded to pertinent contractors
 - F. Product Data: Refer to Section 013300 for specific information regarding preparation, collation, labeling and submittal of Product Data.
 1. Clearly identify product data submittal with the project name. Submittals containing resubmitted data shall also include a "Re-submittal" label in bold letters on the cover.
 2. Indicate manufacturer, trade name and model number. Include copies of applicable brochure or catalogue material. Indicate sizes, types, model numbers, ratings, capacities and options actually being proposed.
 3. Include dimensional data for roughing in and installation, and technical data sufficient to confirm that equipment meets requirements of drawings and specifications.
 4. Include wiring, piping and service connection data, motor sizes complete with voltage ratings and schedules.
 5. Submit all materials specified in this Division in one pdf binder.
 6. Re-submittals shall include all materials being re-submitted in one binder. Only completed re-submittal including all applicable specification sections will be reviewed.
 - G. If material or equipment is not as specified or submittal is not complete, it will be rejected. Only completed submittal including all applicable specification sections will be reviewed.
 - H. Review comments shall not relieve Contractor from responsibility for deviations from Contract Documents unless attention has been called to such deviations in writing at time of submission, nor shall they relieve this Contractor from responsibility for errors in items submitted.
- 1.7 CLOSEOUT SUBMITTALS
- A. General: Submit documents to the Owner/Owners Representative for approval prior to the building being turned over to the Owner.
 - B. Record Documents: Construction documents shall be updated to convey a record of the alterations to the original design. Such updates shall include updated mechanical, electrical and control drawings red-lined, or redrawn if specified, that show all changes to size, type and locations of components, equipment, and assemblies.

- C. Mechanical Operating and Maintenance (O&M) Manuals
1. Refer to Division 01 for additional Closeout Submittal and Operation and Maintenance Data requirements.
 2. Contents for the Mechanical O&M Manual are to include the following:
 - a. Title Page: Project Name, Project Number, building name, Architect, Mechanical Engineer, Electrical Engineer, and General Contractor.
 - b. Table of Contents: Complete listing of contents of this O&M Manual. Where multiple volumes are required, provide Master Table of Contents covering all Volumes and place in the front of each volume.
 - c. Part 1: Listing of all Contractors, subcontractors, and suppliers/vendors for all tiers. Information to include: names, addresses, phone numbers, fax numbers and area of work. Also include a copy of the emergency service information required in Division 1.
 - d. Part 2: Copies of all signed general, mechanical and plumbing permits, and inspection reports.
 - e. Part 3: Copies of all manufacturer's warranty and guarantee forms, and any specified special guarantees, fully executed.
 - f. Part 4: Provide a separate sub divider for each applicable Section in Divisions 22 & 23. Tabs are to be identified by specification section title (i.e. Valves for HVAC Piping) and not just specification section number (i.e. Section 23 05 23). For every Section provide the following:
 - 1) Index listing materials and equipment used.
 - 2) List of suppliers with address, phone number and fax number.
 - 3) Catalog cuts, data sheets, engineering calculations, schedules, wiring diagrams and complete parts lists for all products and equipment incorporated into the Project. Literature shall be clearly marked to indicate each specific item. Include copies of approved submittal data as part of this information.
 - 4) Approved submittal drawings (Option to submit Product Data Submittals as separate Volume(s) if contents are large).
 - 5) Manufacturer's printed operating instructions for all equipment including:
 - a) Initial startup procedures and break-in routine.
 - b) Normal operating instructions.
 - c) Regulation, control, stopping and shutdown.
 - d) Troubleshooting and emergency instructions.
 - e) Seasonal operating instructions.
 - 6) Cleaning, lubrication and preventative maintenance instructions.
 - 7) Disassembly, repair and reassembly instructions, including alignment and adjustment instructions.
 - 8) Sequence of operation for each system.
 - g. Part 5: Valve schedule, including location, system and function for each scheduled valve.
 - h. Part 6: Filter schedule, including equipment item, filter type and size for each filter used on the Project.
 - i. Part 7: Controls system manufacturer and calibration information, including wiring diagrams, shop drawings, schematics, record documents, and control sequence descriptions. Desired or field determined set-points shall be permanently recorded on control drawings at control devices or, for digital control systems, in system programming instructions.
 - j. Part 8: Equipment startup records, test records and certifications. Include certification and test results for the disinfection of domestic water piping, and testing of backflow prevention assemblies, pipe pressure testing, duct leak testing and hydronic water treatment flushing and cleaning witness sheets.
 - k. Part 9: Testing, Adjusting and Balancing Report.
 - l. Part 10: Final Commissioning Report (Option to submit as separate Volume(s) if contents are large).

- m. Part 11: Spare parts and maintenance materials list. Provide summarized list of spare parts that are to be furnished to the Owner.
- n. Part 12: Owner training sign-off sheets.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Refer to Division 01 for Product Storage and Handling Requirements".
- B. Follow manufacturer's directions in delivery, storage, protection, and installation of equipment and materials.
- C. Promptly notify Owner's Representative in writing of conflicts between requirements of Contract Documents and Manufacturer's directions and obtain written instructions from Owner's Representative before proceeding with work. Contractor shall bear expenses of correcting deficiencies of work that does not comply with manufacturer's directions or such written instructions from Owner's Representative.
- D. Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or mechanical injury but have readily accessible for inspection. Store items subject to moisture damage in a dry, heated space.
- E. Special Storage Requirements:
 - 1. Equipment and products to be stored on the project site either outside or inside but unheated spaces shall be provided with shrink-wrapped coverings and shall be additionally provided with chemical desiccant packs to control any stray moisture that may enter the protective wrapping.
 - 2. Ductwork shall be stored on pallets on grade. Ductwork and air handling equipment shall be kept dry. Air handling equipment that has been allowed to become wet may be rejected.
- F. New Equipment and Ductwork Protection:
 - 1. Protect equipment and materials in storage on site, during and after installation until final acceptance. Leave factory covers in place and take special precautions to prevent entry of foreign material into working parts of piping and duct systems.
 - 2. Protect equipment with polyethylene covers and crates.
 - 3. Operate, drain and flush bearings and refill with change of lubricant before final acceptance.
 - 4. Protect bearings and shafts during installation. Grease shafts and sheaves to prevent corrosion. Provide extended nipples for lubrication.
 - 5. During construction, provide temporary closures of metal or taped polyethylene at all openings in new ductwork to prevent construction dust from entering existing ductwork system.
 - 6. RA Grille Filters: Prior to the completion of all dirt and dust producing activities, cover all return intake grilles and openings with temporary MERV 8 filter media. Replace filters at Substantial Completion.
- G. Notify Owner of equipment delivery dates 24 hours in advance of delivery.
- H. The Contractor shall be responsible for protection of equipment furnished in this Division from vandalism and weather during all phases of construction. Damaged equipment shall be restored to like new condition or replaced at the Contractor's expense.
- I. Any factory painted equipment scratched or marred during shipment or construction shall be restored to original "new" condition. This includes complete repainting if necessary to provide exact paint match.

1.9 FIELD CONDITIONS

- A. Existing Utilities and Piping:
 - 1. The locations of existing concealed lines and connection points have been indicated as closely as possible from available information. The Contractor shall assume that such connection points are within a Ten foot (10') radius of the indicated location. Where connection points are not within this radius, the Contractor shall contact the Owner's Representative for a decision before proceeding or may proceed at his own expense.
 - 2. Connection points to existing work shall be located and verified prior to starting new work.

3. Prior to commencing any excavation or ditching activity, the Contractor shall verify the exact location and inverts of all existing utilities and connection points in the area of his proposed excavation. Notify Owner's representative for further direction if actual inverts will not allow the proper installation of new work.
 4. The Contractor shall be responsible for damages, which might be caused by his failure to exactly locate and preserve underground utilities.
 - B. Existing Hazardous Materials: Refer to Division 00 for information, instructions, and requirements regarding existing potentially hazardous materials including, but no limited to, asbestos and lead.
 1. Specific attention is directed to the potential existence of asbestos bearing compounds and materials on remodel and demolition projects. Careful coordination with other Contractors and reasonable care shall be exercised.
 - a. Extent of Asbestos:
 - 1) It can be assumed that the Owner will have removed all asbestos from the construction area of this project prior to this contract.
 - 2) An asbestos survey of the building has been performed and reports the extent of asbestos located throughout the building.
 - 3) A copy of the Asbestos Survey is located in the project manual.
 - b. If asbestos bearing or other hazardous compounds are encountered during the course of construction that are not identified in the Asbestos Survey, the Contractor shall immediately notify the Owners Representative.
- 1.10 WARRANTY
- A. The Mechanical equipment and installation shall be warranted for a period of one (1) year from the date of acceptance unless an individual item or specification is otherwise noted as longer. The Contractor shall make good, at his own expense, all defects in work and/or furnished equipment which develop at any time during the warranty period and shall bare all expenses including that of cutting and patching.
 - B. Refer to individual Division 23 specification sections for warranties required to extend beyond the 1-year project warranty period.
- 1.11 TEMPORARY HEATING, COOLING OR VENTILATION
- A. Temporary heating, cooling or ventilation for the facility during the construction phase shall not be supplied by the permanent system installed under Division 23.
 - B. Exceptions:
 1. Contractor shall obtain letter of approval from the Owner stating that they understand equipment expected life may be shortened due to severe usage.
 2. Product warranties shall be extended to account for construction use. Contractor shall furnish certified document stating such extended warranties.
 3. Contractor shall be responsible for pressure cleaning all coils and vacuum cleaning all ductwork prior to occupancy.
 4. If Contractor is given permission to use permanent systems for space heating, cooling or ventilation filters shall be installed equal to Farr 30/30. Check and change filters at intervals sufficient to protect the mechanical system. Units shall not be operated without filters in place. New filters shall be installed prior to system balancing.
 5. Prior to the completion of all dirt and dust producing activities, cover all return intake grilles and openings with temporary filter media. Replace filters at Substantial Completion.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Refer to Division 01 Substitution Procedures regarding product prior approval and substitution requirements.
- B. Throughout these specifications and drawings, various materials, equipment, apparatus, etc., are specified or scheduled by manufacturer, brand name, type or catalog number. Such

designation is to establish standards of desired quality and construction and shall be the basis of design and the bid.

- C. Substitutions will not be permitted without written approval.
- D. Where two or more manufacturer designations are listed in these specifications, choice will be Contractors option.
 - 1. Exception: Where more than one manufacturer is listed, and only one manufacturer's catalog number is specified or only one manufacturer is scheduled on the drawings (basis of design), that standard of quality, dimensional characteristics, capacities, and construction shall be maintained by materials or equipment supplied by the other manufacturer(s).
- E. If the Contractor uses manufacturers other than the basis of design, the Contractor shall be responsible for:
 - 1. Ensuring the substituted item will perform identical to the basis-of-design equipment, fit in the available space while allowing proper maintenance access. In the event other than specified equipment is used and will not fit job site conditions, the Contractor assumes responsibility for replacement with items indicated as the basis of design.
 - 2. Any changes required by other Contractors caused by the substituted equipment, such as different electrical characteristics, control point requirements, etc.
 - 3. Changes in structural design and/or construction due to weight differences.
- F. Products furnished other than the basis of design shall have similar electrical characteristics as the scheduled or specified equipment. Contractor shall be responsible for any electrical changes caused by products not in accordance with this requirement.

2.2 ELECTRICAL MOTORS

- A. All electrical motors furnished on the project, whether provided with factory packaged equipment such as pumps, fans, air handlers, fan coil units, etc., or provided separately for field mounting, shall meet or exceed the minimum energy efficiency requirements of Washington State Energy Code, 2012 - Table 10.8, or ASHRAE 90.1 - 2010, Tables 10.8A/B/C, whichever is more stringent.
- B. Motors used with Variable Frequency Drives (VFDs): Motors shall be Premium efficiency type NEMA MG 1 Part 31 compliant, Class F insulation, rated as "Inverter Duty".
- C. ECM (Electrically Commutated Motor) type single-phase motors utilized on direct drive applications, shall be ultra-high efficiency type with programmable brushless DC motor, utilizing a permanent magnet rotor and built-in inverter. Permanently lubricated ball bearing design. Provide with integral microprocessor controller for variable speed control (constant torque or external input variable speed control) as indicated.

2.3 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water-stop, unless otherwise noted.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped and smooth-outer surface with nailing flange for attaching to wooden forms.

2.4 MECHANICAL SLEEVE SEALS

- A. Acceptable Products: Subject to compliance with requirements, provide the following products or approved equal:
 - 1. Link seal by GPT Industries.

- B. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
- C. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe and fiberglass duct. Include type and number required for pipe material and size of pipe.
- D. Pressure Plates: Stainless steel. Include two for each sealing element.
- E. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.

2.6 GROUT

- A. Description: ASTM C1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.7 ACCESS DOORS

- A. Access doors to match surrounding surface, provided with recess to accept matching finish in accordance with the requirements of Division 08. Provide UL rated doors in fire rated construction.
- B. Provide flush type steel framed panel with concealed hinges, size minimum 24 x 25 inch for man access and minimum 18 x 18 inch for inspection and hand access.
- C. Provide cam type locking device with hand or key lock when located in public corridors and washrooms complete with master keys.
- D. Provide access doors for maintenance or adjustments purposes for all mechanical system components including valves, volume dampers, fire dampers, fire/smoke dampers, clean outs, traps and controls.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine premises and understand the conditions which may affect the execution of work of this Division before submitting proposals for this work.
- B. No allowance for time or money will be considered for any consequence related to failure to examine existing site conditions.

3.2 INTERFACE WITH OTHER WORK – COORDINATION

- A. It is understood that anything not clear or in conflict will be explained by making application to Owner's Representative. Should conditions arise where certain changes would be advisable, secure approval from Owner's Representative for those changes before proceeding with work.
- B. Coordinate with the work of various trades when installing interrelated work. Before installation of mechanical items, make proper provision to avoid interference's. Changes required in work specified in Division 23 caused by neglect to do so shall be made at no cost to Owner.
- C. Furnish and install inserts and supports required by Division 23 unless otherwise noted. Furnish sleeves, inserts, supports, and equipment that are an integral part of other Divisions of the Work to those involved in sufficient time to be built into construction as the Work proceeds.

Locate these items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne under Division 23.

3.3 INSTALLATION

- A. Coordinate Division 23 equipment and systems to the available space, with other trades. The access routes through the construction shall be the Contractor's responsibility.
- B. Drawings are diagrammatic. Make offsets, transitions, and changes in direction of pipes and ducts, as required to maintain proper headroom and pitch of sloping lines and avoid structural, electrical, pipe and duct interference's whether or not indicated on Drawings. Furnish fittings, etc., as required to make these offsets, transitions and changes in direction at no additional cost to the Owner.
- C. Determine exact route and location of each pipe and duct and coordinate and obtain approval for changes from the layout indicated on the drawings with the Owner's Representative prior to fabrication.
- D. Locations of equipment and devices, as shown on the drawings, are approximate unless dimensioned. Verify the physical dimensions of each item of mechanical equipment to fit the available space and promptly notify the Owner's Representative prior to roughing-in if conflicts appear.
- E. All piping, wiring, equipment, ductwork, tubing, etc., shall be concealed within building construction unless otherwise noted, or in mechanical rooms.
- F. Arrange pipes, ducts, and equipment to permit ready access to valves, unions, traps, trap primers, starters, motors, control components, and to clear openings of doors and access panels.
- G. Prior to installation of the new Division 23 systems, the Contractor shall coordinate the proposed installation with the Architectural and Structural requirements, and all other trades (including HVAC, Plumbing, Fire Protection, Electrical, Ceiling Suspension and Tile systems), and provide reasonable maintenance access requirements.
- H. Provide means of access to all valves, dampers, controllers, operable devices and other apparatus which may require adjustment or servicing.
- I. Verify in field exact size, location, invert, and clearances regarding all existing material, equipment and apparatus, and advise the Owners Representative of any discrepancies between that indicated on the Drawings and that existing in the field prior to any installation. Contractor shall be responsible for all costs associated with the removal or relocation of installed systems that have been installed without prior notification of the Owners Representative.
- J. Equipment Installation – Common Requirements:
 - 1. Install equipment in accordance with the manufacturer's instructions. Where the construction documents appear to conflict with the manufacturer's instructions, contact the A/E for direction before proceeding with installation. Rework caused as a result of failing to resolve conflicting information beforehand shall be done at no additional cost to the Owner.
 - 2. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.
 - 3. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
 - 4. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting with minimum interference to other installations. Extend grease fittings to accessible locations.
 - 5. Install equipment to allow for piping to be installed at required slope.
 - 6. Motor and equipment name plates as well as applicable UL and AGA labels shall be in place when the Project is turned over to the Owner.
- K. Erection of Metal Supports and Anchorages:
 - 1. Refer to Division 05 Section "Metal Fabrications" for structural steel fabrication requirements.

2. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
 3. Field Welding: Comply with AWS D1.1.
- L. Grouting:
1. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
 2. Clean surfaces that will come into contact with grout.
 3. Provide forms as required for placement of grout.
 4. Avoid air entrapment during placement of grout.
 5. Place grout, completely filling equipment bases.
 6. Place grout on concrete bases and provide smooth bearing surface for equipment.
 7. Place grout around anchors.
 8. Cure placed grout.
- M. Access Openings for Valves, Dampers, Etc.
1. Provide access doors wherever required to service valves, dampers, fire dampers, motors or any other concealed items requiring access, unless specifically indicated on the drawings to be furnished under other Divisions (i.e., architectural). Access doors for fire dampers shall be installed in duct adjacent to fire damper. Equipment which is accessible by means of removable ceiling panels or tile does not require access doors or panels. Access doors and panels for service and maintenance of items shall be sized and located to allow adequate access for required service.
- N. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 for penetration fire-stopping for materials.
- O. Switchgear/Electrical Equipment Drip Protection:
1. Every effort shall be made to eliminate the installation of pipe above electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum amount of joints.
 2. Installation of piping, ductwork, leak protection apparatus or other installations foreign to the electrical installation shall be located in the space equal to the width and depth of the equipment and extending to a height of 1.8 m (6 ft.) above the equipment to ceiling structure, whichever is lower (NFPA 70).
- P. Inaccessible Equipment:
1. Where the A/E determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Owner.
 2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.
- Q. Cutting and Patching:
1. Perform all cutting and patching of new and existing construction required for the installation of systems and equipment specified in Division 23. All cutting shall be accomplished with masonry saws, drills or similar equipment to provide neat uniform openings. Field verify locations for new openings to avoid conflict with new or existing structure, architectural elements or other utilities. Coordinate penetration locations.
 2. Patch and repair walls, floors, ceilings and roof with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials. All patching shall meet the approval of the Owner's Representative. Where existing mechanical systems are removed and roof or wall openings are not to be reused for new systems, the Division 23 Contractor shall be responsible for in-filling the abandoned opening per above.
 3. All cutting and patching made necessary by defective equipment, defective workmanship or failure of this Contractor to properly anticipate his requirements shall be included.
 4. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses or other structural members without the Owner Representative's written approval.

5. Cutting, patching, repairing, and replacing pavement, sidewalks, roads, and curbs to permit installation of work specified or indicated under this Division is included.
- R. Demolition and Salvage:
 1. Refer to Division 01 for cutting, patching, waste management and disposal, recycling, reuse and documentation requirements.
 2. Comply with all Local, State and EPA requirements for glycol antifreeze and/or refrigerant disposal and/or reclaim.
 - a. Where existing refrigeration systems are disturbed by the demolition or new work, the existing refrigerant gas charge shall not be vented to the atmosphere but shall be captured and reclaimed/reused (if in good condition) or disposed of in a safe and legal manner.
 - b. Where existing glycol anti-freeze hydronic systems are impacted by the work, the existing anti-freeze glycol-water solutions shall be either captured and stored for reuse, or disposed of in a safe and legal manner. Refill systems with same level of glycol protection as original (or as specified new).
 3. Demolition of mechanical systems and equipment in remodeled areas shall be provided under Division 23.
 4. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.
 - a. Ducts to be removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - b. Equipment to be removed: Disconnect and cap services and remove equipment.
 - c. Equipment to be removed and reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - d. Equipment to be removed and salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 5. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.
 6. Where the plans are not clear on what existing systems are to remain and be reused or retained for later upgrades, the Contractor shall contact the Owner's Representative for direction before proceeding with demolition work.
 7. Systems, materials and equipment designated for demolition, shall be salvaged to the Contractor and removed from the site unless otherwise noted.
 8. Equipment and materials salvaged to the Owner shall be delivered to an owner approved on-site location.
 9. Contractor shall repair any existing equipment damaged as a result of his work.
 10. Verify and document condition of existing systems to be connected to prior to construction.
 - a. Submit to A/E a list of required equipment repairs due to existing conditions.
 - b. Required repairs not documented will be made by the Contractor at his own expense.
 11. Contractor's bid shall include re-claim and disposal of refrigerant from existing systems indicated to be removed.

3.4 EQUIPMENT TESTING

- A. Equipment Tests: Equipment shall be subject to tests as specified in individual Division 23 specification sections.
- B. Demonstrate that the mechanical equipment and systems are performing to provide conditions through all possible modes of operation as outlined below. The verification testing procedures shall address all operating characteristics of all mechanical equipment and systems. Equipment and systems shall be tested in accordance with the manufacturer's requirements and the Commissioning testing requirements.
- C. Provide all test equipment, including test pumps, gauges, instruments, and other equipment required. Test all rotational equipment for proper direction of rotation. Upon completion of

testing, certify to the Owner's Representative in writing, or as witnessed by the Commissioning Authority, that the specified tests have been performed and that the installation complies with the specified requirements.

1. Provide equipment start-up test reports on forms provided by the manufacturers, filled-in, dated and signed by the authorized start-up agent or technician. Include copies of start-up reports in the O&M manuals.
- D. A record shall be kept to record each test and copies shall be sent to the Owner's Representative after each test is complete:

3.5 CLOSEOUT ACTIVITIES

- A. Demonstration and Owner Training: Instruct the designated Owners representative(s) in operation and maintenance of mechanical systems utilizing the information and material available in the Operation and Maintenance Manual.
- B. Owner Acceptance, Hand-off, Operational & Maintenance Responsibilities & Warranty:
1. Refer to the General Conditions and Division 01 for the definitions or and additional requirements associated with "Prior Occupancy", "Substantial Completion", "Correction on Nonconforming Work", "Final Completion" and "Warranty of Construction", and other project close-out, substantial completion and warranty requirements.
- C. Punch List Procedures:
1. Refer to Division 01 Closeout Procedures for general punch list procedures.
 2. The project shall be fully cleaned and, in all respects, ready to turn over to the Owner for occupancy before the Punch List Inspection is requested. This shall include but not be limited to:
 - a. Cleaning up all equipment, materials, cartons, and other debris that is a direct result of the installation of equipment under this contract.
 - b. Cleaning exposed piping, ductwork, equipment, and fixtures.
 - c. Repairing damaged finishes.
 3. The Contractor shall notify the Owner's Representative in writing when the project or phase is ready for punch lists. After punch lists are complete, written notice must be forwarded to the Owner's Representative requesting final checkout.
 4. At the time of final observation, the contractor shall accompany the observation party and shall remove access panels as required, to allow complete observation of the entire mechanical system.

END OF SECTION 23 00 00

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY:

- A. This Section includes the following:
 - 1. Metal framing systems and cross-supports.
 - 2. Fastener systems.
 - 3. Equipment supports.
- B. See Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
- C. See Section 23 05 48 - Mechanical Vibration Controls, and Section 23 05 50 – Mechanical Seismic Controls, for vibration isolation devices.
- D. See Section 23 31 00 - HVAC Ducts for duct hangers and supports.

1.2 REFERENCES

- A. Definitions:
 - 1. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."
- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A36 – Standard Specification for Carbon Structural Steel.
 - b. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - c. ASTM C552 – Standard Specification for Cellular Glass Thermal Insulation.
 - 2. American Welding Society (AWS) D1.1 – Structural Welding Code – Steel.

1.3 SUBMITTALS:

- A. Product Data: For the following:
 - 1. Metal framing systems and cross-supports.
 - 2. Fastener systems.
 - 3. Equipment supports.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Metal framing systems and cross-supports.
 - 2. Fastener systems.
 - 3. Equipment supports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS:

- A. Contractor shall be responsible for determining the weights of the supported piping, equipment and/or ductwork, based on sizes, hanger support spacing and operating loads. All hangers, rods, clevises, cross-support members, etc. shall be sized and located by the Contractor based on these loads and the recommendations of the support product manufacturers or equivalent structural design practices. Adequacy of building structural elements to bare all upper equipment support anchors points shall be the Contractor's responsibility through the information provided on the Architectural and Structural Drawings.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

2.2 METAL FRAMING SYSTEMS:

- A. Description: MFMA-3, shop- or field-fabricated support assembly made of steel channels and other components.
- B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
 2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
 3. GS Metals Corp.
 4. Power-Strut Div.; Tyco International, Ltd.
 5. Thomas & Betts Corporation.
 6. Tolco Inc.
 7. Unistrut Corp.; Tyco International, Ltd.
 - C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
 - D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- 2.3 FASTENER SYSTEMS:
- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 1. Manufacturers:
 - a. Aerofix
 - b. Hilti, Inc.
 - c. ITW Ramset/Red Head.
 - d. Masterset Fastening Systems, Inc.
 - e. MKT Fastening, LLC.
 - f. Powers Fasteners.
 - B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 1. Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. Empire Industries, Inc.
 - c. Hilti, Inc.
 - d. ITW Ramset/Red Head.
 - e. MKT Fastening, LLC.
 - f. Powers Fasteners.
- 2.4 EQUIPMENT SUPPORTS:
- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.
- 2.5 MISCELLANEOUS MATERIALS:
- A. Structural Steel for Cross-Supports and Support Stands: ASTM A36, steel plates, shapes, and bars; black and galvanized.
 - B. Grout: ASTM C1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
 1. Properties: Non-staining, noncorrosive, and nongaseous.
 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

- 3.1 HANGER AND SUPPORT APPLICATIONS:
- A. Contractor shall be responsible for determining the weights of the supported piping, equipment and/or ductwork, based on sizes, hanger support spacing and operating loads. All hangers, rods, clevises, cross-support members, etc. shall be sized and located by the Contractor based on these loads and the recommendations of the support product manufacturers or equivalent structural design practices. Adequacy of building structural elements to bare all upper equipment support anchors points shall be the Contractor's responsibility through the information provided on the Architectural and Structural Drawings.

- 3.2 HANGER AND SUPPORT INSTALLATION:
- A. Fastener System Installation:
 - 1. Install powder-actuated fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
 - B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
 - C. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- 3.3 EQUIPMENT SUPPORTS:
- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
 - B. Provide lateral bracing, to prevent swaying, for equipment supports.
- 3.4 METAL FABRICATIONS:
- A. Cut, drill, and fit miscellaneous metal fabrications for hanger cross-support members, and equipment supports.
 - B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
 - C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.
- 3.5 ADJUSTING:
- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments.
- 3.6 PAINTING:
- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
 - B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 23 05 29

SECTION 23 05 53 – IDENTIFICATION FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following mechanical identification materials and their installation:
 - 1. Equipment markers.
 - 2. Duct Labels.

1.2 REFERENCES

- A. American Society of Mechanical Engineers (ASME):
 - 1. ASME A13.1 – Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Approved label manufacturers.
 - 1. Seton.
 - 2. W. H. Brady.
 - 3. Marking Services Inc.
 - 4. Brimar Industries.

2.2 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Markers: 1/16" thick, engraved, color-coded plastic, phenolic or aluminum.
 - 1. Data: Name and equipment tag # listed on schedule.
 - 2. Size: 4 by 6 inches for large equipment, 2 by 3 inches for terminal units. Lettering size proportional.
 - 3. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.



- B.
- C.

- 1. Tag Colors:
 - a. All heating & cooling devices, Fans, AHUs: Black with White Letters.
- D. Access Panel and Door Markers: Same as equipment markers. Label items or equipment that is access through the door or panel.

2.3 DUCTWORK LABELS

- A. Self-Adhesive vinyl markers with air flow directional arrows. Label to identify air handling unit/system and type of air flow, e.g. "HRU-1 Supply Air", "EF-1 Exhaust Air", etc.
- B. Label Color Scheme:
 - 1. Supply Air (Tempered Air): Red label with white lettering.
 - 2. Return Air: Yellow label with black lettering.
 - 3. Exhaust Air: Green label with white lettering.
 - 4. Outside Air: Blue label with white lettering.



C.

PART 3 - EXECUTION

3.1 EQUIPMENT IDENTIFICATION

- A. Install equipment markers with permanent adhesive or screws on or near each major item of mechanical equipment (all equipment scheduled and tagged on the drawings).
 - 1. Data: Name and equipment tag # listed on schedule.
 - 2. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
 - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
 - b. Fuel-burning units, including boilers, furnaces, etc.
 - c. Pumps, compressors, chillers, condensers, and similar motor-driven units.
 - d. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
 - e. Fans, blowers, air handlers, fan coils, heat pumps and terminal units.
 - f. Packaged HVAC central-station and zone-type units.
 - g. Tanks and pressure vessels.
 - h. Humidifiers, water-treatment systems, and similar equipment.

3.2 DUCT LABEL INSTALLATION

- A. Install self-adhesive duct labels on all duct systems, including ductwork above lay-in ceilings and inside accessible duct chases. Affix duct label with air flow direction arrows on most visible section of duct. Affix to bare or insulated ductwork as necessary. Clean surfaced before installing labels. Install in the following locations:
 - 1. Near connections to each piece of equipment, inlets and outlets.
 - 2. Near branch take-offs.
 - 3. At wall and floor penetrations. Locate on both sides of penetration.
 - 4. Spaced at a maximum of 25 feet along each duct run. Reduce to intervals of 10 feet in areas of congested ductwork, piping or equipment.

3.3 ADJUSTING AND CLEANING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.
- B. Clean faces of mechanical identification devices and frames of valve schedules.

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING (TAB)

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes TAB to produce design flows for exhaust systems
- B. Reporting results of activities and procedures specified in this Section.

1.2 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.
- C. Six weeks prior to starting TAB, submit the qualifications of the site technician for the project, including the name of the contractors and facility managers of recent projects the technician on which was lead.
- D. Communicate in writing all set-point and parameter changes made or problems and discrepancies identified during TAB that affect the control system setup and operation.
- E. Provide a draft TAB report within two weeks of completion. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings.
 - 1. Provide a list of all components and systems that perform out of specified parameters.
 - 2. Provide any requested data, gathered, but not shown on the draft reports.
- F. Provide a final TAB report for the Owner's Representative with details. Provide final information as requested in draft TAB report.

1.3 SUBMITTALS

- A. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

1.4 QUALITY ASSURANCE

- A. TAB Firm Qualifications: An independent testing, adjusting, and balancing agency certified by National Environmental Balancing Bureau (NEBB) in those testing and balancing disciplines specified for this project.
- B. Prequalified balancing contractors are:
 - 1. Air Commander
 - 2. TestComm
 - 3. Riley Engineering
- C. Report Certification: Certify TAB field data reports in accordance with NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems, 5.2.2 Report Certification." This certification includes the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.
- D. TAB Report Forms: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
- E. NEEB's Quality Assurance Program (QAP): TAB work shall be performed in accordance with NEBB standards. The certified TAB firm will make application to the NEBB Office for a Certificate of Conformance Certification.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine Project Record Documents described in Division 1 Section "Project Record Documents."
- D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.
- E. Examine system and equipment test reports.
- F. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- G. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- H. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls are ready for operation.
- I. Examine equipment for installation and for properly operating safety interlocks and controls.
- J. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.
- K. If conditions are discovered that prevent the Testing Agent from performing the test, the Testing Agent shall notify MSI Engineers (509-624-1050) prior to leaving the site.

3.2 PREPARATION

- A. Complete system readiness checks and prepare system readiness reports. Verify the following:
 - 1. Permanent electrical power wiring is complete.
 - 2. Automatic temperature-control systems are operational.
 - 3. Equipment and duct access doors are securely closed.
 - 4. Balance, combination fire & smoke, and fire dampers are open.
 - 5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
 - 1. Where conditions or situations arise that are not covered by the standards, or where system dynamics and performances are not as intended or expected, the Engineer reserves the right to modify the NEBB TAB procedures and standards for the benefit of the final system operation. The balancing agency shall seek guidance from the Engineer when such conditions develop.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to Specifications.
- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

- D. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
 - 1. Where conditions or situations arise that are not covered by the standards, or where system dynamics and performances are not as intended or expected, the Engineer reserves the right to modify the NEBB TAB procedures and standards for the benefit of the final system operation. The balancing agency shall seek guidance from the Engineer when such conditions develop.
 - E. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to Specifications.
 - F. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.
 - G. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
 - H. Prepare schematic diagrams of systems' "as-built" duct layouts.
 - I. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
 - J. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
 - K. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
 - L. Verify that motor starters are equipped with properly sized thermal protection.
 - M. Check dampers for proper position to achieve desired airflow path.
 - N. Check for airflow blockages.
 - O. Check condensate drains for proper connections and functioning.
 - P. Check for proper sealing of air-handling unit components.
 - Q. Check for proper sealing of air duct system.
 - R. Check all fans for proper fan rotation.
- 3.4 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS
- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure fan static pressures to determine actual static pressure as follows:
 - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
 - 3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
 - 4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
 - 5. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Make required pulley size changes or adjustments to pulley sizes, and electrical connections to accommodate fan-speed changes.

6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.
 - B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
 - C. Measure terminal outlets and inlets without making adjustments.
 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
 - D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than the dampers at air terminals.
 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.
 - E. Where applicable, adjust counterbalanced relief dampers to maintain a maximum room pressure of .05"w.g. in the economizer mode.
- 3.5 TEMPERATURE-CONTROL VERIFICATION
- A. Verify wall heaters are actively controlled by their thermostats.
- 3.6 TOLERANCES
- A. Set HVAC system airflow and water flow rates within the following tolerances:
 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 2. Air Outlets and Inlets: Plus or minus 10 percent.
 3. Heating-Water Flow Rate: Plus or minus 10 percent.
 4. Cooling-Water Flow Rate: Plus or minus 5 percent.
- 3.7 FINAL REPORT
- A. General: Provide electronic pdf report tabulated and divided into sections by tested and balanced systems.
 - B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
 1. Include a list of instruments used for procedures, along with proof of calibration.
 - C. Final Report Contents: In addition to certified field report data, include the following:
 1. Pump curves.
 2. Fan curves.
 3. Manufacturers' test data.
 4. Field test reports prepared by system and equipment installers.
 5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.
 - D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
 1. Title page.
 2. Name and address of TAB firm.
 3. Project name.
 4. Project location.

5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report.
Number each page in the report.
11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outside-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Settings for supply-air, static-pressure controller.
 - g. Other system operating conditions that affect performance.

END OF SECTION 23 05 93

SECTION 23 31 00 - HVAC DUCTS

PART 2 - GENERAL

1.1 SUMMARY:

- A. This Section includes:
 - 1. Metal round, oval, and rectangular ducts and fittings for supply, return, outside, and exhaust air-distribution systems for 1" to 4" W.G. pressure classes.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM A36 – Standard Specification for Carbon Structural Steel.
 - 2. ASTM A653 – Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
 - 3. ASTM C916 – Standard Specification for Adhesives for Duct Thermal Insulation.
 - 4. ASTM C1071 – Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
 - 5. ASTM D737 – Standard Test Method for Air Permeability of Textile Fabrics.
 - 6. ASTM D3776 – Standard Test Methods for Mass Per Unit Area (Weight) of Fabric.
- B. North American Insulation Manufacturers Association (NAIMA):
 - 1. NAIMA Fibrous Glass Duct Liner Standard
- C. NFPA Compliance:
 - 1. NFPA 90A - "Installation of Air Conditioning and Ventilating Systems."
 - 2. NFPA 90B - "Installation of Warm Air Heating and Air Conditioning Systems."
- D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
 - 1. SMACNA "HVAC Duct Construction Standards – Metal and Flexible"
 - 2. SMACNA "Duct Cleanliness for New Construction"
- E. UL Standards:
 - 1. UL 181A-M – Closure Systems for Use with Rigid Air Ducts.

1.3 SUBMITTALS:

- A. Product Data: Provide product data on duct materials, sealants and pre-manufactured items, such as duct liner, duct flanges, etc., intended to be used for duct construction.
- B. Shop Drawings: Show fabrication and installation details for HVAC Ducts.
 - 1. Sheet Metal shop standards for duct construction, pressure classes, reinforcing, hanger sizes, flange construction, etc.
 - 2. Duct liner application and installation details.

1.4 DUCT PRESSURE AND SEALANT CLASS DEFINITIONS:

- A. General Sealing Requirements per WA NREC and IMC:
 - 1. Pressure Class up to 3" w.g. – SMACNA Sealant Class B.
 - 2. Pressure Class greater than 3" w.g. – SMACNA Sealant Class A.
- B. General Exhaust duct system serving Exhaust Fans:
 - 1. Pressure Class: 1" W.G.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A653 and having G60 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.
- 2.2 SEALANT MATERIALS:
- A. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 181A-M listed. Maximum Volatile Organic Content shall be 45 gpl (water excluded) or less. Product shall be equal to Hardcast Versa-Grip 181.
- 2.3 HANGERS AND SUPPORTS
- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - B. Hanger Materials: Galvanized sheet steel or threaded steel rod.
 - 1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
 - 2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
 - C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
 - D. Trapeze and Riser Supports: Galvanized-steel shapes and plates complying with ASTM A36.
- 2.4 DUCT FABRICATION:
- A. 1" to 2" W.G. Pressure Class:
 - 1. Material shall be galvanized steel with the following exception:
 - a. Exhaust systems serving kitchen range hood grease exhaust or dishwashers shall be as specified below.
 - 2. Duct sizes shown on drawings are outside nominal dimensions for sheet metal ductwork. Where ductwork is indicated on the drawings to be lined, an allowance for 1" or 2" thick insulation is included, and duct sizes do not need to be increased to compensate for the insulation.
 - 3. Round ducts and fittings: All round ductwork shall be spiral lock seams with spot welded sealed manufactured fittings, galvanized steel.
 - a. Manufacturers:
 - 1) United McGill
 - 2) Ventline.
 - 3) Accu Duct.
 - 4. Round or oval ductwork indicated to be lined shall have a perforated liner and shall be equal to United Sheet Metal Acousti-K27. Unless noted otherwise on the drawings, insulation shall be 1" thick.
 - 5. Rectangular to round branch duct connections shall use spin-in fittings: Spin-in fittings shall be DuroDyne or Air Control Products equal to Air Control Products Model S-SM-C with damper for unlined ductwork or Air Control Products Model S-DB-C with damper for lined ductwork.
 - 6. Rectangular to rectangular branch duct connections shall use 45-degree entry. Straight taps are not allowed.
 - 7. Rectangular Elbows: All 90-degree rectangular elbows shall contain turning vanes. See section 23 33 00 "Duct Accessories" for turning vane fabrication requirements.
 - 8. Round Elbows: All round elbows shall be pleated or segmented with a centerline radius of 1.5 times the cross-section diameter.
 - 9. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

- a. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
 - b. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
 - 10. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
 - a. Manufacturers:
 - 1) Ductmate Industries, Inc.
 - 11. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.
 - a. Manufacturers:
 - 1) Ductmate Industries, Inc.
 - 2) Lockformer.
 - 12. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359-inch-thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.
- 2.5 DUCT LINER
- A. Manufacturers:
 - 1. JM Permacote Linacoustic Mat Faced
 - 2. CertainTeed
 - B.
 - C. Products meeting ASTM C1071; K(ksi) value of 0.25 (R=4.0 per inch) at 75 degrees F, coated air side for maximum 5,000 ft/min air velocity, 1.5 psf density. Provide EPA registered, anti-microbial agent so that the liner will not support the growth of fungus or bacteria.
 - D. Adhesive: UL listed waterproof type.
 - E. Fasteners: Duct liner galvanized steel pins, welded or mechanically fastened.
 - F. Where ductwork is indicated on the drawings to be lined, an allowance for 1" or 2" thick insulation is included, and duct sizes do not need to be increased to compensate for the insulation.

PART 3 - EXECUTION

- 3.1 DUCT INSTALLATION
- A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated. Ductwork for kitchen grease exhaust duty shall be constructed and installed in accordance with the IMC and NFPA 96.
 - B. Install ducts with fewest possible joints.
 - C. Take due care to prevent piping, conduit or other building materials from touching ductwork.
 - D. Install fabricated fittings for changes in directions, size, and shape and for connections. Use spin-in fittings to connect rigid or flexible round ductwork to rectangular duct for pressure class construction of 2" W.G. or less.
 - E. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
 - F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
 - G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
 - H. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated. Ducts exposed to view in finished spaces shall be installed with special attention to workmanship and quality control. Symmetry, alignment and quality of fittings shall be judged by their final appearance and corrected if found to have poor workmanship. Sealant on exposed to view joints shall be applied internally to fittings and wiped clean on exterior of ductwork. Contractor's option on exposed ductwork to utilized gasketed fittings equal to McGill Uni-Gasket Fitting.

- I. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
 - J. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
 - K. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
 - L. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.
 - M. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 23 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Penetration Firestopping."
 - N. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."
- 3.2 SEAM AND JOINT SEALING:
- A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards-- Metal and Flexible" for duct pressure class indicated.
 - B. Seal ducts before external insulation is applied.
 - C. Sealant on ducts exposed to view in occupied spaces shall be applied internally to fittings and wiped clean on exterior of ductwork.
- 3.3 DUCT LINER INSTALLATION
- A. All duct liner shall be installed in accordance with the requirements of the NAIMA Fibrous Glass Duct Liner Standard, or SMACNA HVAC Duct Construction Standard and the project specifications.
 - B. The liner shall be cut and fitted to assure all joints are neatly and tightly butted with no interruptions or gaps. Where ductwork is indicated on the drawings to be lined, an allowance for 1" or 2" thick insulation is included, and duct sizes do not need to be increased to compensate for the insulation.
 - C. Where ducts are also specified to be thermally insulated, the duct liner shall be counted towards the total required insulation thickness (i.e. the internal liner thickness may be subtracted from the total duct system insulation thickness otherwise specified).
 - D. All duct liner products shall be adhered to the sheet metal ductwork using an adhesive meeting the requirements of ASTM C916. The adhesive film coverage shall be a minimum 90% of the metal surface.
 - E. Additionally, secure duct liner with mechanical fasteners at spacing in accordance with NAIMA or SMACNA standards.
 - F. All transverse joints shall be edge-coated. Metal nosing on leading or trailing edges is required where lined duct transitions to unlined metal duct.
- 3.4 DUCT SUPPORTS
- A. Duct Supports shall be in accordance with SMACNA's standards.
 - B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.
 - C. Support vertical ducts at maximum intervals of 16 feet and at each floor.
 - D. Install upper attachments to structural elements and joists. See structural plans and drawing details for additional limitations and criteria. Do not use eccentric beam clamps on joists. Do not attach duct hangers to bare metal decking (roof decks).
 - E. Install concrete inserts before placing concrete.
 - F. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

- 3.5 DUCTWORK PROTECTION:
- A. During construction provide temporary closures of metal or taped polyethylene at all openings in ductwork to prevent construction dust from entering ductwork system.
- 3.6 CONNECTIONS:
- A. Make connections to equipment with flexible connectors according to Section 23 33 00 - Air Duct Accessories.
 - B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

END OF SECTION 23 31 00

SECTION 23 34 23 - POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Ceiling exhaust fans.

1.2 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Field quality-control start-up test reports.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- C. UL Standard: Power ventilators shall comply with UL 705. Power ventilators for Type I kitchen hood exhaust duty shall comply with UL 762.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or equal by one of the following:
 - 1. Panasonic
 - 2. Loren Cook
 - 3. Acme Engineering & Mfg.
 - 4. Twin City Fan

2.2 EQUIPMENT SCHEDULES

- A. Refer to equipment schedules on the drawings for detailed information regarding unit designations, duty, manufacture, model number, performance, and accessories. Where the unit is specified with a defined manufacturer and model number, the characteristics and features of that specific cataloged unit shall take precedence over those indicated here. When accessories and optional features are listed both on the drawing schedules and in the specifications, they shall be assumed to be all required.

2.3 CEILING EXHUAST FANS

- A. Description: Centrifugal fans designed for installing in ceiling applications.
- B. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705). Fan shall bear the AMCA Certified Ratings Seal for Sound and Air Performance.
- C. Construction: The fan housing shall be minimum 20 gauge galvanized steel and acoustically insulated. Blower and motor assembly shall be mounted to a minimum 14 gauge reinforcing channel and shall be easily removable from the housing. Motor shall be mounted with vibration isolators. Unit shall be supplied with integral wiring box and disconnect receptacle. The outlet duct collar shall include a reinforced aluminum damper with continuous aluminum hinge rod and brass bushings.

- D. Fan Wheel: Wheel shall be centrifugal forward curve type, constructed of galvanized steel. Wheel shall be based balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.
- E. Motor: Motor shall be open drip proof type with permanently lubricated bearings, built-in thermal overload protection and disconnect plug or ECM motor as indicated on equipment schedule/model number designation.
- F. Grille for Ceiling Application: Painted metal, louvered grille with flange on intake and thumbscrew attachment to fan housing on ceiling and wall mounted fans.
- G. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- H. Accessories:
 - 1. Factory fan speed control switch for direct drive models.
 - 2. Wall or roof outlets with backdraft dampers as indicated in the details.

PART 2 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators and exhausters generally where indicated on the plans. Coordinate location with nearby equipment and building elements.
 - 1. Locate all exhaust outlets a minimum of 10 feet from air intakes or greater as indicated on the drawings.
- B. Install power ventilators level and plumb.
- C. Support suspended units from structure using threaded steel rods.
- D. Install units with adequate clearances for service and maintenance.
- E. Label units according to requirements specified in Division 23 Section on Identification.
- F. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Duct Accessories."
- G. Ducts installed adjacent to power ventilators shall be done in a manner that allows service and maintenance.

3.2 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Verify lubrication for bearings and other moving parts.
 - 5. Verify that manual and automatic volume control in connected ductwork systems are in fully open position.
 - 6. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls, safeties and backdraft dampers. Replace damaged and malfunctioning controls and equipment.
- C. Provide start-up and testing report for each power ventilator.
- D. Make any fan speed adjustments and replace pulleys and belts as directed by the Testing & Balancing Contractor.

END OF SECTION 23 34 23

SECTION 23 82 38 – ELECTRIC UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Electric Wall Heaters.

1.2 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 ELECTRIC WALL HEATERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Indeeco
 - 2. Berko
 - 3. Q-Mark
 - 4. Brasch
- B. Description: Wall mounted electric forced air heater with heavy gauge cabinet, sloped top and decorative grilles.
- C. Cabinet: 16-gauge cabinet with tamper-proof removable panels for maintenance access to controls. Sloped top design.
- D. Cabinet Finish: Manufacturer's standard baked enamel or powder coated finish. Color selected by Architect.
- E. Discharge Louver: Adjustable blade grille.
- F. Coils: Circular copper clad steel sheathed element with continuously brazed steel fins, or nickel-chromium wire elements enclosed in powder filled aluminum coated steel tubes with spiraled fins. Elements shall be resistant to thermal shock and vibration.
- G. Provide with auto reset over-heat limit controls.
- H. Fan: Multiple direct-drive scroll type fans on a common shaft.
- I. Motor: Permanently lubricated.
- J. Accessories:
 - 1. 4-Speed fan switch.
 - 2. Disconnect switch.
- K. Controls: Provide with control transformer and low voltage room thermostat.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install unit heaters to comply with NFPA 90A.
- B. Secure wall heaters to wall in accordance with manufacturer's requirements.

- C. Comply with safety requirements in UL 1995.
- D. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Division 26.

3.2 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Operate electric heating elements to verify proper operation and electrical connections.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 23 82 39

SECTION 26 05 05 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.1 SUBMITTALS

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.1 PREPARATION

- A. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- B. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from Owner at least 48 hours before partially or completely disabling system.
- C. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
- D. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

END OF SECTION 26 05 05

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- B. Wire Pulling Lubricant: Certification of compatibility with conductors/cables where used with the following insulation/jacket types:

1.2 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet (1.8 m).
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
 - 2. In addition to other applicable restrictions, may not be used:
 - a. Where not approved for use by the authority having jurisdiction.
 - b. Where exposed to damage.
 - c. For damp, wet, or corrosive locations.
- G. Metal-clad cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet (1.8 m).
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
 - 2. In addition to other applicable restrictions, may not be used:
 - a. Where not approved for use by the authority having jurisdiction.
 - b. Where exposed to damage.
 - c. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.
- H. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- I. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- J. Minimum Conductor Size: 12 AWG.
- K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- L. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 - 3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.
 - c. Isolated Ground, All Systems: Green with yellow stripe.
 - d. Travelers for 3-Way and 4-Way Switching: Pink.
 - e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
 - f. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

- a. Installed Underground: Type XHHW-2.

2.4 ARMORED CABLE

- A. Description: NFPA 70, Type AC cable listed and labeled as complying with UL 4, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN.
- E. Grounding: Combination of interlocking armor and integral bonding wire.
- F. Armor: Steel, interlocked tape.

2.5 METAL-CLAD CABLE

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Grounding: Full-size integral equipment grounding conductor.
- F. Armor: Steel, interlocked tape.
- G. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.6 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 - 4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 - 5. Aluminum Conductors: Use compression connectors for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.7 ACCESSORIES

- A. Electrical Tape:
 - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
- B. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- C. Wire Pulling Lubricant:
 - 1. Listed and labeled as complying with UL 267.
 - 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
 - 3. Suitable for use at installation temperature.
- D. Cable Ties: Material and tensile strength rating suitable for application.
- E. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Circuiting Requirements:
 - 1. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 2. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 3. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install armored cable (Type AC) in accordance with NECA 120.
- E. Install metal-clad cable (Type MC) in accordance with NECA 120.
- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
- G. Terminate cables using suitable fittings.
- H. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

- I. Make wiring connections using specified wiring connectors.
- J. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- K. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- L. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

1.2 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
- F. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Metal Underground Water Pipe(s):
 - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
 - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
 - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
 - 3. Metal In-Ground Support Structure:
 - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
 - 4. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.

- b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
 - 5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
 - 6. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
 - a. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
 - b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
 - c. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.
 - 7. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.
- G. Service-Supplied System Grounding:
 - 1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
 - 2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- H. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
 - 1. Provide grounding electrode system for each separate building or structure.
 - 2. Provide equipment grounding conductor routed with supply conductors.
 - 3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
 - 4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.
- I. Bonding and Equipment Grounding:
 - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 - 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 - 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 - 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 - 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
 - 7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:

- a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - J. Communications Systems Grounding and Bonding:
 - 1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
 - 2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
 - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
 - b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
 - c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
- 2.2 GROUNDING AND BONDING COMPONENTS
- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
 - B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
 - 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
 - C. Connectors for Grounding and Bonding:
 - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 - 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 - 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
 - D. Ground Bars:
 - 1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 - 2. Size: As indicated.
 - 3. Holes for Connections: As indicated or as required for connections to be made.
 - E. Ground Rod Electrodes:
 - 1. Comply with NEMA GR 1.
 - 2. Material: Copper-bonded (copper-clad) steel.
 - 3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.
 2. Indoor Installations: Unless otherwise indicated, install with 4 inches (100 mm) of top of rod exposed.
- D. Make grounding and bonding connections using specified connectors.
1. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

END OF SECTION 26 05 26

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Comply with the following. Where requirements differ, comply with most stringent.
 - a. NFPA 70.
 - b. Applicable building code.
 - c. Requirements of authorities having jurisdiction.
 - 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
 - 3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
 - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of 1.5. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- D. Metal Channel/Strut Framing Systems:
 - 1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
 - 2. Comply with MFMA-4.
- E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:
 - 1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1.
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Owner/Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Owner/Architect, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Equipment Support and Attachment:
 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 4 inches (100 mm) in height.
 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

END OF SECTION 26 05 29

SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 - 1. Under Slab on Grade: Use rigid PVC conduit.
 - 2. Exterior, Direct-Buried: Use rigid PVC conduit.
 - 3. Exterior, Embedded Within Concrete: Use rigid PVC conduit.
 - 4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.
 - 5. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows or PVC-coated galvanized steel rigid metal conduit (RMC) elbows for bends.
 - 6. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
 - 7. Where galvanized steel electrical metallic tubing (EMT) is installed in direct contact with earth, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
 - 8. Where aluminum rigid metal conduit (RMC) or aluminum electrical metallic tubing (EMT) is installed in direct contact with earth, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
 - 9. Where galvanized rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) emerges from concrete into soil, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches (100 mm) on either side of where conduit emerges.
- D. Embedded Within Concrete:

1. Within Slab on Grade: Use PVC-coated galvanized steel rigid metal conduit (RMC) or rigid PVC conduit. Embed within structural slabs only where approved by Structural Engineer.
 2. Within Slab Above Ground: Use PVC-coated galvanized steel rigid metal conduit (RMC) or rigid PVC conduit. Embed within structural slabs only where approved by Structural Engineer.
 3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) where emerging from concrete.
 4. Where galvanized steel electrical metallic tubing (EMT) emerges from concrete into salt air, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches (100 mm) on either side of where conduit emerges.
- E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
 - F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or aluminum electrical metallic tubing (EMT).
 - G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or aluminum electrical metallic tubing (EMT).
 - H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
 - I. Exposed, Interior, Not Subject to Physical Damage: Use aluminum rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or aluminum electrical metallic tubing (EMT).
 - J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
 - K. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
 - L. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).
 - M. Corrosive Locations Above Ground: Use PVC-coated galvanized steel rigid metal conduit (RMC).
 - N. Hazardous/Classified Locations: Use PVC-coated galvanized steel rigid metal conduit (RMC).
 - O. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
 - P. Flexible Connections to Vibrating Equipment:
 1. Dry Locations: Use flexible metal conduit (FMC).
 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 - Q. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC), galvanized steel electrical metallic tubing (EMT), or aluminum electrical metallic tubing (EMT).
- 2.2 CONDUIT - GENERAL REQUIREMENTS
- A. Comply with NFPA 70.

- B. Electrical Service Conduits: See Section 26 21 00 for additional requirements.
 - C. Fittings for Grounding and Bonding: See Section 26 05 26 for additional requirements.
 - D. Provide conduit, fittings, supports, and accessories required for complete raceway system.
 - E. Provide products listed, classified, and labeled as suitable for purpose intended.
 - F. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4-inch (21 mm) trade size.
 - 2. Underground, Interior: 1-inch (27 mm) trade size.
 - 3. Underground, Exterior: 1-inch (27 mm) trade size.
 - G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- 2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)
- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
 - B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
- 2.4 ALUMINUM RIGID METAL CONDUIT (RMC)
- A. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.
 - B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
 - 2. Material: Use aluminum.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
- 2.5 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)
- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
 - B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
 - 2. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
 - 3. Material: Use steel or malleable iron.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
- 2.6 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)
- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
 - B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch (1.02 mm).
 - C. PVC-Coated Boxes and Fittings:
 - 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.

2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
 3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
 4. Material: Use steel or malleable iron.
 5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch (1.02 mm).
 - D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch (0.38 mm).
- 2.7 FLEXIBLE METAL CONDUIT (FMC)
- A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.
 - B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.
- 2.8 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)
- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
 - B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.
- 2.9 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)
- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
 - B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.
 3. Connectors and Couplings: Use compression/gland or set-screw type.
 - a. Do not use indenter type connectors and couplings.
- 2.10 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)
- A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.
 - B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
 2. Material: Use aluminum.
 3. Connectors and Couplings: Use compression/gland or set-screw type.
 - a. Do not use indenter type connectors and couplings.
- 2.11 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT
- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.12 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- C. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).
- D. Sealing Systems for Concrete Penetrations:
 - 1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
 - 2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.
- E. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- F. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.
- E. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by manufacturer.
- G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- H. Conduit Routing:
 - 1. Conceal conduits unless specifically indicated to be exposed.
 - 2. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - 3. Unless otherwise approved, do not route exposed conduits:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
 - 4. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
 - 5. Arrange conduit to provide no more than 150 feet (46 m) between pull points.

6. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 7. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
- I. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
- J. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 5. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
- K. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 3. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 4. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
 5. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 84 00.
- L. Underground Installation:
1. Provide trenching and backfilling.
 2. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 18 inches (460 mm).
 - b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.
 3. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 26 05 53.
- M. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where conduits are subject to earth movement by settlement or frost.

- N. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
 - a. Where conduits enter building from outside.
 - b. Where service conduits enter building from underground distribution system.
 - c. Where conduits enter building from underground.
 - d. Where conduits may transport moisture to contact live parts.
 2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
 - a. Where conduits pass from outdoors into conditioned interior spaces.
 - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
 - c. Where conduits penetrate coolers or freezers.
 3. Where conduits cross boundaries of hazardous/classified locations, provide identified/listed sealing fittings or conduit mechanical seals as approved by authorities having jurisdiction; locate as indicated or in accordance with NFPA 70.
- O. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

END OF SECTION 26 05 33.13

SECTION 26 05 33.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

1.2 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
4. Use cast aluminum boxes where aluminum rigid metal conduit is used.
5. Use nonmetallic boxes where exposed rigid PVC conduit is used.
6. Use suitable concrete type boxes where flush-mounted in concrete.
7. Use suitable masonry type boxes where flush-mounted in masonry walls.
8. Use raised covers suitable for the type of wall construction and device configuration where required.
9. Use shallow boxes where required by the type of wall construction.
10. Do not use "through-wall" boxes designed for access from both sides of wall.
11. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
12. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
13. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
14. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

15. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 3. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
- D. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
 2. Locate boxes so that wall plates do not span different building finishes.
 3. Locate boxes so that wall plates do not cross masonry joints.
 4. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 5. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
 6. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
- I. Box Supports:
 1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide required seismic controls in accordance with Section 26 05 48.
 3. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 4. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
- J. Floor-Mounted Cabinets: Mount on properly sized 4 inch (100 mm) high concrete pad. Install boxes as required to preserve insulation integrity. END OF SECTION 26 05 33.16

SECTION 26 05 33.23 - SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.
 - 1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.

PART 2 PRODUCTS

2.1 RACEWAY REQUIREMENTS

- A. Provide all components, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.2 SURFACE RACEWAY SYSTEMS

- A. Surface Metal Raceways: Listed and labeled as complying with UL 5.

2.3 WIREWAYS

- A. Description: Lay-in wireways and wiring troughs with removable covers; listed and labeled as complying with UL 870.
- B. Wireway Type, Unless Otherwise Indicated:
 - 1. Indoor Clean, Dry Locations: NEMA 250, Type 1, painted steel with screw-cover.
 - 2. Outdoor Locations: NEMA 250, Type 3R, painted steel with screw-cover; include provision for padlocking.
- C. Finish for Painted Steel Wireways: Manufacturer's standard grey unless otherwise indicated.
- D. Minimum Wireway Size: 4 by 4 inches (100 by 100 mm) unless otherwise indicated.
- E. Where wireway size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install raceways plumb and level.
- D. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.
- E. Secure and support raceways in accordance with Section 26 05 29 at intervals complying with NFPA 70 and manufacturer's requirements.
- F. Close unused raceway openings.

END OF SECTION 26 05 33.23

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

1.2 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
 - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
3. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
 - a. Service equipment.
 - b. Panelboards.
4. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
 - a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).
 - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
 - c. Service Equipment: Include the following information in accordance with NFPA 70.

- 1) Nominal system voltage.
 - 2) Available fault current.
 - 3) Date label applied.
5. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
 6. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
 7. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
 8. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.
- B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- C. Identification for Devices:
1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
 2. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
 - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
 3. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.
- D. Identification for Luminaires:
1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.
- 2.2 IDENTIFICATION NAMEPLATES AND LABELS
- A. Identification Nameplates:
1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
- B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 2. Legend:
 - a. Equipment designation or other approved description.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height:
 - a. Equipment Designation: 1/2 inch (13 mm).
 5. Color:
 - a. Normal Power System: White text on black background.
- D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/4 inch (6 mm).
 5. Color: Black text on white background unless otherwise indicated.
- E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/2 inch (13 mm).
 5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 2. Legend: Power source and circuit number or other designation indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch (5 mm).
 5. Color: Black text on clear background.
- 2.3 UNDERGROUND WARNING TAPE
- A. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
 - B. Foil-backed Detectable Type Tape: 3 inches (76 mm) wide, with minimum thickness of 5 mil (0.1 mm), unless otherwise required for proper detection.
 - C. Legend: Type of service, continuously repeated over full length of tape.
 - D. Color:
 1. Tape for Buried Power Lines: Black text on red background.
- 2.4 WARNING SIGNS AND LABELS
- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
 - B. Warning Signs:
 1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.

2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- C. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- D. Secure rigid signs using stainless steel screws.

END OF SECTION 26 05 53

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SUBMITTALS

- A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1.2 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.2 OCCUPANCY SENSORS

- A. All Occupancy Sensors:
 - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
 - 2. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
 - 3. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, LED lighting, and fractional motor loads, with no minimum load requirements.
 - 4. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
- B. Wall Switch Occupancy Sensors:
 - 1. All Wall Switch Occupancy Sensors:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
 - b. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.
 - 2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
 - 3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet (37.2 sq m).
 - 4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
- C. Wall Dimmer Occupancy Sensors:
 - 1. General Requirements:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
 - b. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset

- memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
- c. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.
- 2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
- D. Ceiling Mounted Occupancy Sensors:
 - 1. All Ceiling Mounted Occupancy Sensors:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 - b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
 - 2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 square meters) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
 - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
 - 3. Ultrasonic Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet (46.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
 - b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet (92.9 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
 - c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet (185.8 sq m) at a mounting height of 9 feet (2.7 m).
 - 4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
 - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
- E. Power Packs for Low Voltage Occupancy Sensors:
 - 1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
 - 2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
 - 3. Input Supply Voltage: Dual rated for 120/277 V ac.
 - 4. Load Rating: As required to control the load indicated on drawings.
- 2.3 OUTDOOR PHOTO CONTROLS
 - A. Stem-Mounted Outdoor Photo Controls:
 - 1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
 - 2. Housing: Weatherproof, impact resistant polycarbonate.
 - 3. Photo Sensor: Cadmium sulfide.
 - 4. Provide external sliding shield for field adjustment of light level activation.
 - 5. Light Level Activation: 1 to 5 footcandles (10.8 to 53.8 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.

6. Voltage: As required to control the load indicated on the drawings.
7. Load Rating: As required to control the load indicated on the drawings.

2.4 DAYLIGHTING CONTROLS

- A. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.
- B. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
 1. Sensor Type: Filtered silicon photo diode.
 2. Sensor Range:
 - a. Indoor Photo Sensors: 5 to 100 footcandles (53.8 to 1,080 lx).
 - b. Outdoor Photo Sensors: 5 to 250 footcandles (53.8 to 2690 lx).
- C. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts/drivers, for direct continuous dimming of up to 50 ballasts/drivers.
- D. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
 1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
 2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
 3. Control Capability:
 - a. Single Zone Switching Modules: Capable of controlling one programmable channel.
- E. Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts/drivers, for both continuous dimming of compatible dimming ballasts/drivers and switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
 1. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts/drivers per channel.
 2. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
 3. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.
- F. Power Packs for Low Voltage Daylighting Control Modules:
 1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
 2. Input Supply Voltage: Dual rated for 120/277 V ac.
 3. Load Ratings: As required to control the load indicated on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

- B. Install lighting control relays furnished under Section 25 36 26
- C. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
- D. Install lighting control devices in accordance with manufacturer's instructions.
- E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.
- G. Provide required supports in accordance with Section 26 05 29.
- H. Occupancy Sensor Locations:
 - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
 - 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- I. Outdoor Photo Control Locations:
 - 1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
 - 2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.
- J. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.
- K. Daylighting Control Photo Sensor Locations:
 - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.
 - 2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
 - 3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.
- L. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- M. Where indicated or required, provide cabinet or enclosure in accordance with Section 26 05 33.16 for mounting of lighting control device system components.

END OF SECTION 26 09 23

SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.1 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1.2 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- C. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- D. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- E. Conductor Terminations: Suitable for use with the conductors to be installed.
- F. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - 2. Lockable Doors: All locks keyed alike unless otherwise indicated.
- G. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.2 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase and Neutral Bus Material: Aluminum.
 - 2. Ground Bus Material: Aluminum.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
 - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
 - 2. Provide clear plastic circuit directory holder mounted on inside of door.

2.3 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- H. Provide grounding and bonding in accordance with Section 26 05 26.
- I. Provide filler plates to cover unused spaces in panelboards.

END OF SECTION 26 24 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 SUBMITTALS

1.2 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.1 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide tamper resistant receptacles for receptacles installed in dwelling units.
- E. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- F. Provide GFCI protection for receptacles serving electric drinking fountains.
- G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.2 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
- C. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.
- D. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
- E. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

2.3 WALL SWITCHES

- A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
- B. Standard Wall Switches: Commercial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.4 RECEPTACLES

- A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
 - 1. NEMA configurations specified are according to NEMA WD 6.
- B. Convenience Receptacles:
 - 1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 - 2. Tamper Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
- C. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
2. Standard GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

2.5 WALL PLATES

- A. Wall Plates: Comply with UL 514D.
 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 2. Size: Standard.
 3. Screws: Metal with slotted heads finished to match wall plate finish.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- F. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

END OF SECTION 26 27 26

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.

1.2 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
- H. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- I. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
 - 1. LED Tape - General Requirements:
 - a. Listed.
 - b. Designed for field cutting in accordance with listing.

2.3 EMERGENCY LIGHTING UNITS

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Battery:
 - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

2.4 EXIT SIGNS

- A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
 - 1. Self-Powered Exit Signs:
 - a. Battery: Sealed, maintenance-free, nickel cadmium unless otherwise indicated.

2.5 BALLASTS AND DRIVERS

- A. Dimmable LED Drivers:
 - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
 - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Recessed Luminaires:
 - 1. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
 - 2. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- G. Bond products and metal accessories to branch circuit equipment grounding conductor.
- H. Emergency Lighting Units:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- I. Exit Signs:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- J. Install lamps in each luminaire.

END OF SECTION 26 51 0

SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.

1.2 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
- H. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.3 BALLASTS AND DRIVERS

- A. Dimmable LED Drivers:
 - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
 - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires in accordance with NECA/IESNA 501.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Bond products and metal accessories to branch circuit equipment grounding conductor.
- G. Install lamps in each luminaire.

END OF SECTION 26 56 00

SECTION 32 13 13 – CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes cement concrete pavement for the following applications:
 - 1. Curbs
 - 2. Sidewalks

1.2 SUBMITTALS

- A. Product Data: For each manufactured material and product indicated.
- B. Design Mixes: For each concrete mix indicated.
- C. Material certificates.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. Plain Steel Wire: ASTM A 82, as drawn.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening steel reinforcement. Manufacture bar supports according to CRSI's "Manual of Standard Practice."

2.2 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II.
 - 1. Fly Ash: ASTM C 618, Class F or C.
 - 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Aggregate: ASTM C 33, uniformly graded, from a single source.
- C. Water: ASTM C 94.
- D. Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, ½ to 1-1/2 inch (13 to 38 mm) long.
- E. Admixtures: Certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures, as follows:
 - 1. Air-Entraining Admixture: ASTM C 260.
 - 2. Water-Reducing Admixture: ASTM C 494, Type A.
 - 3. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 - 4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
 - 5. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- F. Curing Materials:
 - 1. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
 - 2. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
 - 3. Water: Potable.
 - 4. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

5. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
 6. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
 7. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.
- G. Related Materials:
1. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
 2. Coloring Agent: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
- 2.3 CONCRETE MIXES AND MIXING
- A. Concrete Mixes: Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, with the following properties:
1. Compressive Strength (28 Days): 4,500 psi.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit: 4 inches.
 4. Air Content: 6.0 to 8.0 percent.
- B. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. Yd. (0.60 kg/cu. M).
- C. Coloring Agent: Add coloring agent to mix according to manufacturer's written instructions.
- D. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
- E. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
- F. Project-Site Mixing: Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Surface Preparation: Proof-roll prepared subbase, and remove loose material from surface.
- B. Forms: Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations.
- C. Reinforcement: Accurately position and support reinforcement, and secure against displacement. Set wire ties with ends directed into concrete.
1. Install welded wire fabric in lengths as long as practicable; lap at least one full mesh, and lace splices with wire.
- D. Joints: Locate and install construction, isolation, contraction, and expansion joints as needed or shown on plans.
- E. Concrete Placement: Comply with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete. Place concrete in a continuous operation within planned joints or sections.
1. Moisten subbase to provide a uniform dampened condition at time concrete is placed.
 2. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping according to recommendations in ACI 309R.
 3. Screed and initial-float concrete surfaces with darby or bull float before excess moisture or bleed water appears on the surface.
 4. Protect concrete from cold or hot weather during mixing, placing, and curing.
- F. Evaporation Retarder: Apply to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- G. Pavement Tolerances: Comply with tolerances in ACI 330.1, "Specification for Plain Concrete Parking Lots."

3.2 FINISHES AND CURING

- A. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surfaces to true planes with gaps below 10-foot-long, unleveled straightedge not to exceed $\frac{1}{4}$ inch. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
 - 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface $\frac{1}{16}$ to $\frac{1}{8}$ inch deep with a stiff-bristled broom, perpendicular to line of traffic.
- B. Curing: Begin curing after finishing concrete, but not before free water has disappeared from concrete surface. Cure concrete by one or a combination of the following methods:
 - 1. Moisture cure concrete by water, continuous fog spray, continuously wet absorptive cover, or by moisture-retaining-cover curing. Keep surfaces continuously moist for not less than seven days.
 - 2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.3 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.
- C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13