



PROJECT MANUAL

**Whatcom County Library System
Birch Bay Vogt Library Express Renovation**

April 15, 2026

BID SET DOCUMENTS



Division 00 Specifications

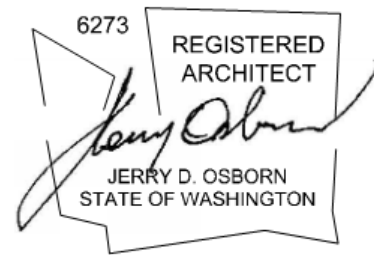
Whatcom County Library System
Birch Bay Vogt Library Express

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SEALS PAGE

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I hereby certify that the following project specifications were prepared by me or under my direct supervision and that I am a duly registered Architect under the laws of the State of Washington.



02 41 00 Demolition
03 30 00 Cast-In-Place Concrete
04 01 00 Maintenance of Masonry
04 20 00 Unit Masonry
05 52 00 Aluminum Railings
06 10 00 Rough Carpentry
06 20 00 Finish Carpentry
06 41 00 Architectural Wood Casework
06 65 00 Plastic Simulated Wood Trim
06 73 00 Composite Decking
07 18 00 Traffic Coatings-
07 21 00 Insulation
07 25 00 Weather Barriers
07 26 00 Vapor Retarders
07 46 46 Fiber-Cement Siding
07 62 00 Sheet Metal Flashing and Trim
07 92 00 Joint Sealants
08 14 00 Wood Doors
08 16 13 Fiberglass Doors
08 41 13 Aluminum Framed Entrances
08 52 13 Aluminum Clad Wood Windows
08 71 00 Door Hardware
08 81 00 Glazing
08 91 00 Louvers
09 01 20 Maintenance of Plaster Finishes
09 21 16 Gypsum Board Assemblies
09 30 00 Tiling
09 65 00 Resilient Flooring
09 68 00 Carpeting
09 72 00 Wall Coverings
09 91 00 Painting
09 96 00 High Performance Coatings
10 14 00 Signage
10 20 00 Interior Specialties
10 28 00 Toilet Room Accessories
32 35 00 Site Screening Devices

Joe Muller, AIA

Osborn Architects Inc, PS

Division 00 Specifications

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SEALS PAGE

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The Mechanical Engineer's seal and signature affixed hereon indicates this Engineer's review and participation in the preparation of the Project Manual. Participation is limited to the following specification sections:

22 05 00	Common Work Results for Plumbing
22 05 23	General Duty Valves for Piping
22 05 29	Hangers & Supports for Piping Equipment
22 07 00	Plumbing Insulation
22 11 16	Water Distribution Piping
22 11 19	Water Distribution Piping Specialties
22 11 23	Plumbing Pumps
22 13 16	Drain & Vent Piping
22 13 19	Drainage Piping Specialties
22 33 00	Domestic Water Heaters
22 40 00	Plumbing Fixtures
23 05 00	Common Work Results for HVAC
23 05 93	Testing, Adjusting, & Balancing
23 07 19	Duct Insulation for Mechanical Systems
23 31 13	Metal Ducts
23 33 00	Air Duct Accessories
23 34 00	Fans
23 37 13	Diffusers, Registers and Grilles
23 72 00	Air-to-Air Energy Recovery Equipment
23 81 26	Split-System Air Conditioners
23 82 39.19	Wall & Ceiling Unit Heaters



Brian Bode, PE

Bogard Engineers

Division 00 Specifications

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The Electrical Engineer's seal and signature affixed hereon indicates this Engineer's review and participation in the preparation of the Project Manual. Participation is limited to the following specification sections:

26 00 00	Basic Electrical Requirements
26 05 00	Common Work Results
26 05 26	Grounding and Bonding for Electrical Systems
26 07 00	Thermal & Moisture Protections
26 20 00	Electrical Transmission
26 50 00	Lighting
27 05 00	Common Work Results for Communications
28 31 00	Fire Detection & Alarm



Steve TeVelde, PE
K-Engineers

Division 00 Specifications

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The Civil Engineer's seal and signature affixed hereon indicates this Engineer's review and participation in the preparation of the Project Manual. Participation is limited to the following specification sections:

02 41 13	Site Demolition
31 20 00	Earth Moving
32 12 16	Asphalt Paving
32 16 11	Cement Concrete Sidewalk, Curbs, & Gutters
32 17 24	Pavement Markings & Signage
33 40 00	Storm Drainage Utilities
33 46 00	Subdrainage

Mark Davis, PE
Reid Middleton



DIVISION, SECTION, AND PARAGRAPH NUMBERING

Numbering and lettering of sections and paragraphs in these specifications are merely for identification. Sections included are listed in the "Index" together with the number of pages in each section. The Contractor shall check their copies of the specifications with the Index to be sure they are complete.

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For Washington State Facility Construction and Small Works

Effective: July 27, 2025

Approved by: Kimberly Sockle
Kimberly Sockle
Interim Assistant Director
Facility Professional Services



Washington State
DEPARTMENT OF
ENTERPRISE SERVICES

Facility Professional Services
Post Office Box 41476
Olympia, Washington 98504-1476
(360) 902-7272

Section 00 72 00 GENERAL CONDITIONS
FOR WASHINGTON STATE FACILITY CONSTRUCTION AND SMALL WORKS

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PART 1 - GENERAL PROVISIONS

1.01 DEFINITIONS

- A. "Application for Payment" means a written request submitted by Contractor to A/E for payment of Work completed in accordance with the Contract Documents and approved Schedule of Values, supported by such substantiating data as Owner or A/E 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. "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.
- D. "Claim" means Contractor's exclusive remedy for resolving disputes with Owner regarding the terms of a Change Order or a request for equitable adjustment, as more fully set forth in Part 8.
- E. "Contract Award Amount" is the sum of the Base Bid and any accepted Alternates.
- F. "Contract Documents" means the Advertisement for Bids, Instructions for Bidders, completed bid submission on the DES Public Procurement Portal DES Public Procurement Portal (<https://deswa.bonfirehub.com>), General Conditions, Modifications to the General Conditions, Supplemental Conditions, Public Works Contract, other Special Forms, Drawings and Specifications, and all addenda and modifications thereof.
- G. "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.
- H. "Contract Time" is the number of calendar days allotted in the Contract Documents for achieving Substantial Completion of the Work.
- I. "Contractor" means the person or entity who has agreed with Owner to perform the Work in accordance with the Contract Documents.
- J. "Day(s):" Unless otherwise specified, day(s) shall mean calendar day(s)."
- K. "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.
- L. "Final Acceptance" means the written acceptance issued to Contractor by Owner after Contractor has completed the requirements of the Contract Documents, as more fully set forth in Section 6.09 B.
- M. "Final Completion" means that the Work is fully and finally complete in accordance with the Contract Documents, as more fully set forth in Section 6.09 A.
- N. "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.
- O. "Notice" means a written notice that has been delivered to the authorized representative or officer of the addressed party by registered or certified mail, or by email as a PDF attachment. Notices should clearly identify the project number and date of notice.

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- P. "Notice to Proceed" means a notice from Owner to Contractor that defines the date on which the Contract Time begins to run.
- Q. "Owner" means the state agency, institution, or its authorized representative with the authority to enter into, administer, and/or terminate the Work in accordance with the Contract Documents and make related determinations and findings.
- R. "Person" means a corporation, partnership, business association of any kind, trust, company, or individual.
- S. "Prior Occupancy" means Owner's use of all or parts of the Project before Substantial Completion, as more fully set forth in Section 6.08 A.
- T. "Progress Schedule" means a schedule of the Work, in a form satisfactory to Owner, as further set forth in Section 3.02.
- U. "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.
- V. "Project Record" means the separate set of Drawings and Specifications as further set forth in paragraph 4.02A.
- W. "Schedule of Values" means a written breakdown allocating the total Contract Sum to each principal category of Work, in such detail as requested by Owner.
- X. "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.
- Y. "Subcontract" means a contract entered into by Subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind for or in connection with the Work.
- Z. "Subcontractor" means any person, other than Contractor, who agrees to furnish or furnishes any supplies, materials, equipment, or services of any kind in connection with the Work.
- AA. "Substantial Completion" means that stage in the progress of the Work when the construction is sufficiently complete, as more fully set forth in Section 6.07.
- AB. "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.

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:

- 1. Signed Public Works Contract, including any Change Orders.
- 2. Supplemental Conditions.
- 3. Modifications to the General Conditions.
- 4. General Conditions.
- 5. Specifications. Provisions in Division 1 shall take precedence over provisions of any other Division.
- 6. Drawings. In case of conflict within the Drawings, large-scale drawings shall take precedence over small-scale drawings.

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7. Completed Bid Submission on the DES Public Procurement Portal.
8. Advertisement for Bids.

1.03 EXECUTION AND INTENT

Contractor Representations: Contractor makes the following representations to Owner:

1. Contract Sum 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. Review of the Contractor's insurance by Owner shall not relieve or decrease the liability of Contractor. Companies writing the insurance to be obtained by this part 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 its bid the cost of all insurance and bond costs required to complete the base bid work and accepted alternates. Insurance carriers providing insurance in accordance with the Contract Documents 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 Final Acceptance. Contractor shall also maintain the following insurance coverage during the performance of any corrective Work required by Section 5.16.
 1. General Liability Insurance: Commercial General Liability (CGL) on an Occurrence Form. Coverage shall include, but not be limited to:
 - a. Completed operations/products liability;
 - b. Explosion, collapse, and underground; and
 - c. Employer's liability coverage.
 2. Automobile Liability Insurance: Automobile liability
- 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.

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- 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 as an additional named insured for Work performed in accordance with the Contract Documents, and all insurance certificates shall evidence the Owner as an additional insured.

2.02 COVERAGE LIMITS

A. Insurance Coverage Certificates and Policies

The Contractor shall furnish acceptable proof of insurance coverage on the state of Washington Certificate of Insurance form SF500A, dated 07/02/92 or ACORD form, as well as copies of insurance policies.

B. Required Insurance Coverages

1. For a contract less than \$100,000.00, the coverage required is:

- a. Comprehensive General Liability Insurance – The Contractor shall at all times during the term of this contract, at its cost and expense, carry and maintain general public liability insurance, including contractual liability, against claims for bodily injury, personal injury, death or property damage occurring or arising out of services provided under this contract. This insurance shall cover claims caused by any act, omission, or negligence of the Contractor or its officers, agents, representatives, assigns or servants. The limits of liability insurance, which may be increased as deemed necessary by the contracting parties, shall be:

Each Occurrence	\$1,000,000.00
General Aggregate Limits (other than products – commercial operations)	\$1,000,000.00
Products – Commercial Operations Limit	\$1,000,000.00
Personal and Advertising Injury Limit	\$1,000,000.00
Fire Damage Limit (any one fire)	\$50,000.00
Medical Expense Limit (any one person)	\$5,000.00

- b. If the contract is for underground utility work, then the Contractor shall provide proof of insurance for that above in the form of Explosion, Collapse and Underground (XCU) coverage.
- c. Employers Liability on an occurrence basis in an amount not less than \$1,000,000.00 per occurrence.
2. For contracts over \$100,000.00 but less than \$5,000,000.00 the contractor shall obtain the coverage limits as listed for contracts below \$100,000.00 and General Aggregate and Products – Commercial Operations Limit of not less than \$2,000,000.00.
3. Coverage for Comprehensive General Bodily Injury Liability Insurance for a contract over \$5,000,000.00 is:

Each Occurrence	\$2,000,000.00
General Aggregate Limits (other than products – commercial operations)	\$4,000,000.00
Products – Commercial Operations limit	\$4,000,000.00
Personal and Advertising Injury Limit	\$2,000,000.00
Fire Damage Limit (any one fire)	\$50,000.00
Medical Expense Limit (any one Person)	\$5,000.00

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4. For all Contracts – Automobile Liability: in the event that services delivered pursuant to this contract involve the use of vehicles or the transportation of clients, automobile liability insurance shall be required. If Contractor-owned personal vehicles are used, a Business Automobile Policy covering at a minimum Code 2 “owned autos only” must be secured. If Contractor employee’s vehicles are used, the Contractor must also include under the Business Automobile Policy Code 9, coverage for non-owned autos. The minimum limits for automobile liability is: \$1,000,000.00 per occurrence, using a combined single limit for bodily injury and property damage.
5. For Contracts for Hazardous Substance Removal (Asbestos Abatement, PCB Abatement, etc.)
 - a. In addition to providing insurance coverage for the project as outlined above, the Contractor shall provide Pollution Liability insurance for the hazardous substance removal as follows:

<u>EACH OCCURRENCE</u>	<u>AGGREGATE</u>
\$500,000.00	\$1,000,000.00

or \$1,000,000.00 each occurrence/aggregate bodily injury and property damage combined single limit.

- i. Insurance certificate must state that the insurer is covering hazardous substance removal.
- ii. Should this insurance be secured on a “claims made” basis, the coverage must be continuously maintained for one year following the project’s “final completion” through official completion of the project, plus one year following.

For Contracts where hazardous substance removal is a subcomponent of contracted work, the general contractor shall provide to the Owner a certificate of insurance for coverage as defined in 5a. above. The State of Washington must be listed as an additional insured. This certificate of insurance must be provided to the Owner prior to commencing work.

2.03 INSURANCE COVERAGE CERTIFICATES

- A. Certificate required: Prior to commencement of the Work, Contractor shall furnish to Owner a completed certificate of insurance coverage.
- B. List Project info: All insurance certificates shall name Owner’s Project number and Project title.
- C. Cancellation provisions: All insurance certificates shall specifically require 45 Days prior notice to Owner of cancellation or any material change, except 30 Days for surplus line insurance.

2.04 PAYMENT AND PERFORMANCE BONDS

Conditions for bonds: Payment and performance bonds for 100% of the Contract Award Amount, plus state sales tax, shall be furnished for the Work, using the Payment Bond and Performance Bond form published by and available from the American Institute of Architects (AIA) – form A312. Prior to execution of a Change Order that, cumulatively with previous Change Orders, increases the Contract Award Amount by 15% or more, the Contractor shall provide either new payment and performance bonds for the revised Contract Sum, or riders to the existing payment and performance bonds increasing the amount of the bonds. The Contractor shall likewise provide additional bonds or riders when subsequent Change Orders increase the Contract Sum by 15% or more.

No payment or performance bond is required if the Contract Sum is \$150,000 or less and the Contractor or General Contractor/Construction Manager agrees that Owner may, in lieu of the bond, retain 10% of the Contract Sum for the period allowed by RCW 39.08.010.

2.05 ALTERNATIVE SURETY

When alternative surety required: Contractor shall promptly furnish payment and performance bonds from an alternative surety as required to protect Owner and persons supplying labor or materials required by the Contract Documents 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. Contractor to buy Property Insurance: Contractor shall purchase and maintain property 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, "Installation Floater" is an acceptable substitute for the Builder's Risk Insurance. The insurance shall cover the interest of Owner, Contractor, and any Subcontractors, as their interests may appear.
- B. Losses covered: Contractor property insurance shall be placed on an "all risk" basis 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 occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for A/E's services and expenses required as a result of an insured loss.
- 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 5.20, 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 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 a reasonable period thereafter.

3.02 CONSTRUCTION SCHEDULE

- A. Preliminary Progress Schedule: Unless otherwise provided in Division 1, Contractor shall, within 14 Calendar Days after issuance of the Notice to Proceed, submit a preliminary Progress Schedule. The Progress Schedule 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 shop drawings and other submittals, and for acquiring materials and equipment.

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- B. Form of Progress Schedule: The Progress Schedule shall be in the form of a Critical Path Method (CPM) logic network or, with the approval of the Owner, a bar chart schedule may be submitted. The scheduling of construction is the responsibility of the Contractor and is included in the contract to assure adequate planning and execution of the work. The schedule will be used to evaluate progress of the work for payment based on the Schedule of Values. The schedule shall show the Contractor's planned order and interdependence of activities, and sequence of work. As a minimum the schedule shall include:

1. Date of Notice to Proceed;
2. Activities (resources, durations, individual responsible for activity, early starts, late starts, early finishes, late finishes, etc.);
3. Utility Shutdowns;
4. Interrelationships and dependence of activities;
5. Planned vs. actual status for each activity;
6. Substantial completion;
7. Punch list;
8. Final inspection;
9. Final completion, and
10. Float time

The Schedule Duration shall be based on the Contract Time of Completion listed on the Euna Procurement Submittal Questionnaire in the Euna Procurement Portal. The Owner shall not be obligated to accept any Early Completion Schedule suggested by the Contractor. The Contract Time for Completion shall establish the Schedule Completion Date.

If the Contractor feels that the work can be completed in less than the Specified Contract Time, then the Surplus Time shall be considered Project Float. This Float time shall be shown on the Project Schedule. It shall be available to accommodate changes in the work and unforeseen conditions.

Neither the Contractor nor the Owner have exclusive right to this Float Time. It belongs to the project.

- 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, 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 which meets the requirements of this section.
- 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 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 promptly notify Owner in writing of any actual or anticipated event which 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 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 satisfactory corrective action has been taken.
- B. 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, other than the payment of money, shall not constitute a default hereunder if and to the extent the cause for such delay or failure of performance was unforeseeable and beyond the control of the party ("Force Majeure"). 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;
 - 3. Fire or other casualty for which Contractor is not responsible;
 - 4. Quarantine or epidemic;
 - 5. 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.

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- 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 according to Section 7.03. 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 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 according to Sections 7.02 and 7.03.
- 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 according to Section 7.03, 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.

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. 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.

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3. Contractor responsible even if Liquidated Damages assessed: Assessment of liquidated damages shall not release Contractor from any further obligations or liabilities pursuant to the Contract Documents.

B. Actual Damages

Calculation of Actual Damages: Actual damages will be assessed for failure to achieve 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 Final Completion should have been achieved, based on the date Substantial Completion is actually achieved, to the date Final Completion is actually achieved. 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, or written modifications, or Shop Drawings where required, 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 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, and Change Order Proposals (COP). This separate set of Drawings and Specifications shall be the "Project Record."

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- 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 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 SHOP DRAWINGS

- A. Definition of Shop Drawings: "Shop Drawings" 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. Shop Drawings 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 Shop Drawings provided in accordance with the Contract Documents.
- B. Approval of Shop Drawings by Contractor and A/E: Contractor shall coordinate all Shop Drawings, and 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, Shop Drawings shall be stamped by an appropriate professional licensed by the state of Washington. Shop Drawings submitted to A/E without evidence of Contractor's approval shall be returned for resubmission. Contractor shall review, approve, and submit Shop Drawings 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 Shop Drawings. Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings 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 Shop Drawing submittals with reasonable promptness. Any Work by Contractor shall be in accordance with reviewed Shop Drawings. Submittals made by Contractor which are not required by the Contract Documents may be returned without action.

- C. Contractor not relieved of responsibility when Shop Drawings approved: Approval, or other appropriate action with regard to Shop Drawings, by Owner or A/E shall not relieve Contractor of responsibility for any errors or omissions in such Shop Drawings, 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 Shop Drawings and Contract Documents: If Shop Drawings show variations from the requirements of the Contract Documents, Contractor shall describe such variations in writing, separate from the Shop Drawings, at the time it submits the Shop Drawings containing such variations. If A/E 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 recorded upon the Project Record.

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- E. Contractor to submit 5 copies of Shop Drawings: Unless otherwise provided in Division 1, Contractor shall submit to A/E for approval 5 copies of all Shop Drawings. Unless otherwise indicated, 3 sets of all Shop Drawings 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 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. Shop Drawing 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 Shop Drawings, together with the information and diagrams contained therein, prepared by Contractor or any Subcontractor. In providing Shop Drawings, Contractor and all Subcontractors warrant that they have authority to grant to Owner a license to use the Shop Drawings, 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 Shop Drawings hereunder, or to secure for Owner, at Contractor's own cost, licenses in conformity with this section.
- D. Shop Drawings to be used only for this Project: The Shop Drawings and other 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 Shop Drawings and other submittals appropriate to and for use in the execution of their Work under 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: Performance of the Work shall be directly supervised by a competent superintendent who has authority to act for Contractor. The superintendent must be satisfactory to the Owner and shall not be changed without the prior written consent of Owner. Owner may require Contractor to remove the superintendent from the Work or Project site, at no cost to the Owner for delay or any other claim, if Owner reasonably deems the superintendent incompetent, negligent, or otherwise objectionable, provided Owner has first notified Contractor in writing and allowed a reasonable period for transition. Noncompliance with the Owner's request to remove and replace the superintendent for a material reason shall also be grounds for terminating the Contract for cause.
- 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, require Contractor to remove from the Work or Project site, at no cost to the Owner for delay or any other claim, any employee Owner reasonably deems incompetent, negligent, or otherwise objectionable. Noncompliance with the Owner's request to remove and replace personnel at any level for a material reason shall also be grounds for terminating the Contract for cause.
- E. Contractor to keep project documents on site: Contractor shall keep on the Project site a copy of the Drawings, Specifications, addenda, reviewed Shop Drawings, 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 pay for and obtain all 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: The actual cost of the general building permit (only) and the public utility hook-up fees will be a direct reimbursement to the Contractor or paid directly to the permitting agency by the Owner. ***Fees for these permits should not be included by the Contractor in his bid amount.***

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- 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. Contractor to submit copies: The General Contractor shall submit copies of each valid permit required on the project to the Owner's representative. Nothing in this part shall be construed as imposing a duty upon the Owner or A/E to secure permits.

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.

5.04 PREVAILING WAGES

- A. Contractor to pay Prevailing Wages or applicable Federal 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 (L&I). 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. If applicable, the Contractor shall comply with all Federal Funding requirements of the Davis

Bacon Act that will be addressed in a separate "DIVISION 00 SPECIAL CONDITIONS" specification section that will be based on the specific requirements of the funding source.

- 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 L&I, 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 L&I, for the Contractor and every subcontractor, of any tier, that performed work on the Project.
- D. Disputes: Disputes regarding prevailing wage rates shall be referred for arbitration to the Director of the L&I. 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 prefiled 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 L&I 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 L&I the currently established fee(s) for each statement of intent and/or affidavit of wages paid submitted to the L&I for certification.

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- G. Certified Payrolls: Consistent with RCW 31.12.120, contractors, subcontractors, or employers shall file a copy of its certified payroll records using the L&I' online system at least once per month. If the L&I' online system is not used, a contractor, subcontractor, or employer shall file a copy of its certified payroll records directly with the L&I in a format approved by the L&I at least once per month. A contractor, subcontractor, or employer's noncompliance with this section constitutes a violation of RCW 39.12.050.
- H. Compliance with Federal Funding requirements: If applicable, the Contractor shall comply with all Federal Funding requirements of the Davis Bacon Act that will be addressed in a separate "DIVISION 00 SPECIAL CONDITIONS" specification section that will be based on the specific requirements of the funding source.

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. Pursuant to that statute, no laborer, worker, or mechanic employed by Contractor, any Subcontractor, or any other person performing or contracting to do the whole or any part of the Work, shall be permitted or required to work more than eight hours in any one calendar day, provided, that in cases of extraordinary emergency, such as danger to life or property, the hours of work may be extended, but in such cases the rate of pay for time employed in excess of eight hours of each calendar day shall be not less than one and one-half times the rate allowed for this same amount of time during eight hours of service.
- B. 4-10 Agreements: Notwithstanding the preceding paragraph, RCW 49.28 permits a contractor or subcontractor in any public works contract subject to those provisions, to enter into an agreement with its employees in which the employees work up to ten hours in a calendar day. No such agreement may provide that the employees work ten-hour days for more than four calendar days a week. Any such agreement is subject to approval by the employees. The overtime provisions of RCW 49.28 shall not apply to the hours, up to forty hours per week, worked pursuant to any such agreement.

5.06 NONDISCRIMINATION

- A. Discrimination prohibited by applicable laws: The Contractor and all Subcontractors shall comply with all applicable federal and state non-discrimination laws, regulations, and policies. No person shall, on the grounds of age, race, creed, color, sex, sexual orientation, religion, national origin, marital status, honorably discharged veteran or military status, or disability (physical, mental, or sensory) be denied the benefits of, or otherwise be subjected to discrimination under any project, program, or activity, funded, in whole or in part, under this Agreement.
- 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, sex, age, marital status, or the presence of any physical, sensory, or mental disability, Vietnam era veteran status, or disabled veteran status, 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, sex, age, marital status, or the presence of any physical, sensory, or mental 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.

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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. In performing this contract, the Contractor shall provide for protecting the lives and health of employees and other persons; preventing damage to property, materials, supplies, and equipment; and avoid work interruptions. For these purposes, the Contractor shall:
 1. Follow Washington Industrial Safety and Health Act (WISHA) regional directives and provide a site-specific safety program that will require an accident prevention and hazard analysis plan for the contractor and each subcontractor on the work site. The Contractor shall submit a site-specific safety plan to the Owner's representative prior to the initial scheduled construction meeting.
 2. Provide adequate safety devices and measures including, but not limited to, the appropriate safety literature, notice, training, permits, placement and use of barricades, signs, signal lights, ladders, scaffolding, staging, runways, hoist, construction elevators, shoring, temporary lighting, grounded outlets, wiring, hazardous materials, vehicles, construction processes, and equipment required by all applicable state, federal, and local laws and regulations.
 3. Comply with the State Environmental Policy Act (SEPA), Clean Air Act, Shoreline Management Act, and other applicable federal, state, and local statutes and regulations dealing with the prevention of environmental pollution and the preservation of public natural resources.
 4. Post all permits, notices, and/or approvals in a conspicuous location at the construction site.
 5. Provide any additional measures that the Owner determines to be reasonable and necessary for ensuring a safe environment in areas open to the public. Nothing in this part shall be construed as imposing a duty upon the Owner or A/E to prescribe safety conditions relating to employees, public, or agents of the Contractors.
- 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 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.

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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 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.

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- 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 shall be construed as imposing any duty upon Owner or A/E with regard to, or as constituting any express or implied assumption of control or responsibility over, Project site safety, or over any other safety conditions relating to employees or agents of Contractor or any of its Subcontractors, or the public.

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 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: Contractor shall protect from damage all existing structures, equipment, improvements, utilities, and vegetation: at or near the Project site; and 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.
- 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.

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, is equal to that named in the specifications, unless otherwise specifically provided in the Contract Documents.
- B. Use of asbestos-containing building materials: The use of asbestos-containing building materials in new construction or renovation work is strictly prohibited. For the determination of asbestos-containing building materials, the following shall apply:

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1. Until January 1, 2025, asbestos deliberately added in any concentration that contains more than one percent asbestos by weight or area as determined using the United States environmental protection agency method for the determination of asbestos in bulk building materials, EPA/600/R-93/116, July 1993.
 2. Following January 1, 2025, asbestos building material deliberately added in any concentration that contains more than 1/10th of one percent asbestos by weight or area for the determination of asbestos in bulk building materials, EPA/600/R-93/116, July 1993.
- C. Contractor responsible for fitting parts together: Contractor shall do all cutting, fitting, or patching that may be required 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 endanger any work by cutting, excavating, or otherwise altering the Work and shall not cut or alter the work of any other contractor unless approved in advance by Owner.
- D. 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.

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;

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3. Relieve Contractor of responsibility for risk of loss or damage to the Work, materials, or equipment;
 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 requirements in the Contract Documents, it must, if required in writing by Owner, be uncovered for Owner's observation and be replaced at the Contractor's expense and without change in the 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 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 replacement. Obligations under this paragraph shall survive Final Acceptance.

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- 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. Contractor 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.

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:

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1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, an electrical contractor license, if required by chapter 19.28 RCW, an elevator contractor license, if required by chapter 70.87 RCW, or a plumbing contractor license if required by chapter 18.106.16 RCW;
 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;
 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. Within the three-year period immediately preceding the date of the bid solicitation, not have been determined by a final and binding citation and notice of assessment issued by the L&I or through a civil judgment entered by a court of limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, any provision of chapter 49.46, 49.48, or 49.52 RCW.
- B. Provide names of Subcontractors and use qualified firms: 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 the Owner has a reasonable objection, and shall obtain Owner's written consent before making any substitutions or additions. Substitutions of subcontractors listed on Forms A and B are only allowable according to RCW 39.30.060.
- 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.

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- 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.

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 all warranties that would be given in normal commercial practice;
 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: Contractor shall defend, indemnify, and hold Owner and A/E harmless from and against all 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, caused by or resulting from:
1. Sole negligence of Contractor: The sole negligence of Contractor or any of its Subcontractors;
 2. Concurrent negligence: The concurrent negligence of Contractor, or any Subcontractor, but only to the extent of the negligence of Contractor or such Subcontractor; and
 3. Patent infringement: The use of any design, process, or equipment which constitutes an infringement of any United States patent presently issued, or violates any other proprietary interest, including copyright, trademark, and trade secret.

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- 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.

PART 6 – PAYMENTS AND COMPLETION

6.01 CONTRACT SUM

Owner shall pay Contract Sum: Owner shall pay Contractor the Contract Sum plus 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 include appropriate amounts for demobilization, record drawings, O&M manuals, and any other requirements for Project closeout, and shall be used by Owner as the basis for 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 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 certificate of 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.
- 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.
- 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;
 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;

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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.
- 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.

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;

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3. Owner correction or completion Work: Work by Owner to correct defective Work or complete the Work in accordance with Section 5.16;
 4. Contractor's failure to perform: Contractor's failure to perform in accordance with the Contract Documents; or
 5. 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 AND BOND CLAIM RIGHTS

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.

6.07 SUBSTANTIAL COMPLETION

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. All Work other than incidental corrective or punch list work shall be completed. Substantial Completion shall not have been achieved if all systems and parts are not functional, if utilities are not connected and operating normally, if all required occupancy permits have not been issued, or if the Work is not accessible by normal vehicular and pedestrian traffic routes. 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.

6.08 PRIOR OCCUPANCY

- A. Prior Occupancy defined; Restrictions: Owner may, upon written notice thereof 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. 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 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 constitute Final Acceptance which is a subsequent, separate, and distinct action.

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- B. Final Acceptance defined: Final Acceptance shall be achieved when the Contractor has completed the requirements of the Contract Documents. The date Final Acceptance is achieved shall be established by Owner in writing. Prior to Final Acceptance, Contractor shall, in addition to all other requirements in the Contract Documents, submit to Owner a written notice of any outstanding disputes or claims between Contractor and any of its Subcontractors, including the amounts and other details thereof. 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.
- 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 Work, Contract Sum, and Contract Time by Change Order: Owner may, at any time and without notice to Contractor's surety, order additions, deletions, revisions, or other changes in the Work. These changes in the Work shall be incorporated into the Contract Documents through the execution of Change Orders. If any change in the Work ordered by Owner causes an increase or decrease in the Contract Sum or the Contract Time, an equitable adjustment shall be made as provided in Section 7.02 or 7.03, respectively, and such adjustment(s) shall be incorporated into a Change Order.
- B. Owner may request COP from Contractor: If Owner desires to order a change in the Work, it may request a written Change Order Proposal (COP) from Contractor. Contractor shall submit a Change Order Proposal within 14 Days of the request from Owner, or within such other period as mutually agreed. Contractor's Change Order Proposal shall be full compensation for implementing the proposed change in the Work, including any adjustment in the Contract Sum or Contract Time, and including compensation for all delays in connection with such change in the Work and for any expense or inconvenience, disruption of schedule, or loss of efficiency or productivity occasioned by the change in the Work.
- C. COP negotiations: Upon receipt of the Change Order Proposal, or a request for equitable adjustment in the Contract Sum or Contract Time, or both, as provided in Sections 7.02 and 7.03, Owner may accept or reject the proposal, request further documentation, or negotiate acceptable terms with Contractor. Pending agreement on the terms of the Change Order, Owner may direct Contractor to proceed immediately with the Change Order Work. Contractor shall not proceed with any change in the Work until it has obtained Owner's approval. All Work done pursuant to any Owner-directed change in the Work shall be executed in accordance with the Contract Documents.
- D. Change Order as full payment and final settlement: If Owner and Contractor reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, such agreement shall be incorporated in a Change Order. The Change Order shall constitute full payment and final settlement of all claims for time and for direct, indirect, and consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity, related to any Work either covered or affected by the Change Order, or related to the events giving rise to the request for equitable adjustment.

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- E. Failure to agree upon terms of Change Order; Final offer and Claims: If Owner and Contractor are unable to reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, Contractor may at any time in writing, request a final offer from Owner. Owner shall provide Contractor with its written response within 30 Days of Contractor's request. Owner may also provide Contractor with a final offer at any time. If Contractor rejects Owner's final offer, or the parties are otherwise unable to reach agreement, Contractor's only remedy shall be to file a Claim as provided in Part 8.
- F. Field Authorizations: The Owner may direct the Contractor to proceed with a change in the work through a written Field Authorization (also referred to as a Field Order) when the time required to price and execute a Change Order would impact the Project.

The Field Authorization shall describe and include the following:

1. The scope of work.
2. An agreed upon maximum not-to-exceed amount.
3. Any estimated change to the Contract Time.
4. The method of final cost determination in accordance with the requirements of Part 7 of the General Conditions.
5. The supporting cost data to be submitted in accordance with the requirements of Part 7 of the General Conditions.

Upon satisfactory submittal by the Contractor and approval by the Owner of supporting cost data, a Change Order will be executed. The Owner will not make payment to the Contractor for Field Authorization work until that work has been incorporated into an executed Change Order.

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. Contractor shall include any request for a change in the Contract Sum in its Change Order Proposal.
2. Owner fault or negligence as basis for change in Contract Sum: If the cost of Contractor's performance is changed due to the fault or negligence of Owner, or anyone for whose acts Owner is responsible, Contractor shall be entitled to make a request for an equitable adjustment in the Contract Sum in accordance with the following procedure. 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; the change is concurrently caused by Contractor and Owner; or the change is caused by an act of Force Majeure as defined in Section 3.05.
 - (a) Notice and record keeping for equitable adjustment: A request for an equitable adjustment in the Contract Sum shall be based on written notice delivered to Owner within 7 Days of the occurrence of the event giving rise to the request. For purposes of this part, "occurrence" means when Contractor knew, or in its diligent prosecution of the Work should have known, of the event giving rise to the request. If Contractor believes it is entitled to an adjustment in the Contract Sum, Contractor shall immediately notify Owner and begin to keep and maintain complete, accurate, and specific daily records. Contractor shall give Owner access to any such records and, if requested shall promptly furnish copies of such records to Owner.

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- (b) Content of notice for equitable adjustment; Failure to comply: Contractor shall not be entitled to any adjustment in the Contract Sum for any occurrence of events or costs that occurred more than 7 Days before Contractor's written notice to Owner. The written notice shall set forth, at a minimum, a description of: the event giving rise to the request for an equitable adjustment in the Contract Sum; the nature of the impacts to Contractor and its Subcontractors of any tier, if any; and to the extent possible the amount of the adjustment in Contract Sum requested. Failure to properly give such written notice shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.
 - (c) Contractor to provide supplemental information: Within 30 Days of the occurrence of the event giving rise to the request, unless Owner agrees in writing to allow an additional period of time to ascertain more accurate data, Contractor shall supplement the written notice provided in accordance with subparagraph a. above with additional supporting data. Such additional data shall include, at a minimum: the amount of compensation requested, itemized in accordance with the procedure set forth herein; specific facts, circumstances, and analysis 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 and that the Contract Documents provide entitlement to an equitable adjustment to Contractor for such act, event, or condition; and documentation sufficiently detailed to permit an informed analysis of the request by Owner. When the request for compensation relates to a delay, or other change in Contract Time, Contractor shall demonstrate the impact on the critical path, in accordance with Section 7.03C. Failure to provide such additional information and documentation within the time allowed or within the format required shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.
 - (d) Contractor to proceed with Work as directed: Pending final resolution of any request made in accordance with this paragraph, unless otherwise agreed in writing, Contractor shall proceed diligently with performance of the Work.
 - (e) Contractor to combine requests for same event together: Any requests by Contractor for an equitable adjustment in the Contract Sum and in the Contract Time that arise out of the same event(s) shall be submitted together.
3. Methods for calculating Change Order amount: The value of any Work covered by a Change Order, or of any request for an equitable adjustment in the Contract Sum, shall be determined by one of the following methods:
- (a) Fixed Price: On the basis of a fixed price as determined in paragraph 7.02B.
 - (b) Unit Prices: By application of unit prices to the quantities of the items involved as determined in paragraph 7.02C.
 - (c) Time and Materials: On the basis of time and material as determined in paragraph 7.02D.
4. Fixed price method is default; Owner may direct otherwise: When Owner has requested Contractor to submit a Change Order Proposal, Owner may direct Contractor as to which method in subparagraph 3 above to use when submitting its proposal. Otherwise, Contractor shall determine the value of the Work, or of a request for an equitable adjustment, on the basis of the fixed price method.

B. Change Order Pricing – Fixed Price

Procedures: When the fixed price method is used to determine the value of any Work covered by a Change Order, or of a request for an equitable adjustment in the Contract Sum, the following procedures shall apply:

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1. Breakdown and itemization of details on COP: Contractor's Change Order Proposal, or request for adjustment in the Contract Sum, shall be accompanied by a complete itemization of the costs, including labor, material, subcontractor costs, and overhead and profit. The costs shall be itemized in the manner set forth below, and shall be submitted on breakdown sheets in a form approved by Owner.
2. Use of industry standards in calculating costs: All costs shall be calculated based upon appropriate industry standard methods of calculating labor, material quantities, and equipment costs.
3. Costs contingent on Owner's actions: If any of Contractor's pricing assumptions are contingent upon anticipated actions of Owner, Contractor shall clearly state them in the proposal or request for an equitable adjustment.
4. Markups on additive and deductive Work: The cost of any additive or deductive changes in the Work shall be calculated as set forth below, except that overhead and profit shall not be included on deductive changes in the Work. Where a change in the Work involves additive and deductive work by the same Contractor or Subcontractor, small tools, overhead, profit, bond and insurance markups will apply to the net difference.
5. Breakdown not required if change less than \$1,000: If the total cost of the change in the Work or request for equitable adjustment does not exceed \$1,000, Contractor shall not be required to submit a breakdown if the description of the change in the Work or request for equitable adjustment is sufficiently definitive for Owner to determine fair value.
6. Breakdown required if change between \$1,000 and \$2,500: If the total cost of the change in the Work or request for equitable adjustment is between \$1,000 and \$2,500, Contractor may submit a breakdown in the following level of detail if the description of the change in the Work or if the request for equitable adjustment is sufficiently definitive to permit the Owner to determine fair value:
 - a. lump sum labor;
 - b. lump sum material;
 - c. lump sum equipment usage;
 - d. overhead and profit as set forth below; and
 - e. insurance and bond costs as set forth below.
7. Components of increased cost: Any request for adjustment of Contract Sum based upon the fixed price method shall include only the following items:
 - a. Craft labor costs: These are the labor costs determined by multiplying the estimated or actual additional number of craft hours needed to perform the change in the Work by the hourly labor costs. Craft hours should cover direct labor, as well as indirect labor due to trade inefficiencies. The hourly costs shall be based on the following:
 - (1) Basic wages and benefits: Hourly rates and benefits as stated on the L&I approved "statement of intent to pay prevailing wages" or a higher amount if approved by the Owner. Direct supervision shall be a reasonable percentage not to exceed 15% of the cost of direct labor. No supervision markup shall be allowed for a working supervisor's hours.
 - (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 L&I.
 - (3) Federal insurance: Direct contributions required by the Federal Insurance Compensation Act; Federal Unemployment Tax Act; and the State Unemployment Compensation Act.

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- (4) Travel allowance: Travel allowance and/or subsistence, if applicable, not exceeding those allowances established by regional labor union agreements, which are itemized and identified separately.
- (5) Safety: Cost incurred due to the Washington Industrial Safety and Health Act, which shall be a reasonable percentage not to exceed 2% of the sum of the amounts calculated in (1), (2), and (3) above.
- b. Material costs: This is an itemization of the quantity and cost of materials needed to perform the change in the Work. Material costs shall be developed first from actual known costs, second from supplier quotations or if these are not available, from standard industry pricing guides. Material costs shall consider all available discounts. Freight costs, express charges, or special delivery charges, shall be itemized.
- c. Equipment costs: This is an itemization of the type of equipment and 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. Costs will be allowed for construction equipment only if used solely for the changed Work, or for additional rental costs actually incurred by the Contractor. Equipment charges shall be computed on the basis of actual invoice costs or if owned, from the current edition of one of the following sources:
- (1) The National Electrical Contractors Association for equipment used on electrical work.
 - (2) The Mechanical Contractors Association of America for equipment used on mechanical work.
 - (3) The EquipmentWatch Fleet Manager Estimator Package (digital). The maximum rate for standby equipment shall not exceed that shown in the Associated General Contractors Washington State Department of Transportation (AGC WSDOT) Equipment Rental Agreement, current edition on 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 sources. The maximum rate for standby equipment shall not exceed that shown in the AGC WSDOT Equipment Rental Agreement, current edition on the Contract execution date.
- d. Allowance for small tools, expendables & consumable supplies: Small tools consist of tools which cost \$250 or less and are normally furnished by the performing contractor. The maximum rate for small tools shall not exceed the following:
- (1) 3% for Contractor: For Contractor, 3% of direct labor costs.
 - (2) 5% for Subcontractors: For Subcontractors, 5% of direct labor costs.
- Expendables and consumables supplies directly associated with the change in Work must be itemized.
- e. Subcontractor costs: This is defined as payments Contractor makes to Subcontractors for changed Work performed by Subcontractors of any tier. The Subcontractors' cost of Work shall be calculated and itemized in the same manner as prescribed herein for Contractor.
- f. Allowance for overhead: This is defined as costs of any kind attributable to direct and indirect delay, acceleration, or impact, added to the total cost to Owner of any change in the Contract Sum. If the Contractor is compensated under Section 7.03D, the amount of such compensation shall be reduced by the amount Contractor is otherwise entitled to under this subsection (f). This allowance shall compensate Contractor for all noncraft labor, temporary construction facilities, field engineering, schedule updating, as-built

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drawings, home office cost, B&O taxes, office engineering, estimating costs, additional overhead because of extended time, and any other cost incidental to the change in the Work. It shall be strictly limited in all cases to a reasonable amount, mutually acceptable, or if none can be agreed upon to an amount not to exceed the rates below:

- (1). Projects less than \$3 million: For projects where the Contract Award Amount is under \$3 million, the following shall apply:
 - (a) Contractor markup on Contractor Work: For Contractor, for any Work actually performed by Contractor's own forces, 16% of the first \$50,000 of the cost, and 4% of the remaining cost, if any.
 - (b) Subcontractor markup for Subcontractor Work: For each Subcontractor (including lower tier subcontractors), for any Work actually performed by its own forces, 16% of the first \$50,000 of the cost, and 4% of the remaining cost, if any.
 - (c) Contractor markup for Subcontractor Work: For Contractor, for any work performed by its Subcontractor(s) 6% of the first \$50,000 of the amount due each Subcontractor, and 4% of the remaining amount if any.
 - (d) Subcontractor markup for lower tier Subcontractor Work: For each Subcontractor, for any Work performed by its Subcontractor(s) of any lower tier, 4% of the first \$50,000 of the amount due the sub-Subcontractor, and 2% of the remaining amount if any.
 - (e) Basis of cost applicable for markup: The cost to which overhead is to be applied shall be developed in accordance with Section 7.02B 7a. – e.
- (2). Projects more than \$3 million: For projects where the Contract Award Amount is equal to or exceeds \$3 million, the following shall apply:
 - (a) Contractor markup on Contractor Work: For Contractor, for any Work actually performed by Contractor's own forces, 12% of the first \$50,000 of the cost, and 4% of the remaining cost, if any.
 - (b) Subcontractor markup for Subcontractor Work: For each Subcontractor (including lower tier subcontractors), for any Work actually performed by its own forces, 12% of the first \$50,000 of the cost, and 4% of the remaining cost, if any.
 - (c) Contractor markup for Subcontractor Work: For Contractor, for any Work performed by its Subcontractor(s), 4% of the first \$50,000 of the amount due each Subcontractor, and 2% of the remaining amount if any.
 - (d) Subcontractor markup for lower tier Subcontractor Work: For each Subcontractor, for any Work performed by its Subcontractor(s) of any lower tier, 4% of the first \$50,000 of the amount due the sub-Subcontractor, and 2% of the remaining amount if any.
 - (e) Basis of cost applicable for markup: The cost to which overhead is to be applied shall be developed in accordance with Section 7.02B 7a. – e.
- g. Allowance for profit: Allowance for profit is an amount to be added to the cost of any change in contract sum, but not to the cost of change in Contract Time for which contractor has been compensated pursuant to the conditions set forth in Section 7.03. It shall be limited to a reasonable amount, mutually acceptable, or if none can be agreed upon, to an amount not to exceed the rates below:

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- (1) Contractor / Subcontractor markup for self-performed Work: For Contractor or Subcontractor of any tier for work performed by their forces, 6% of the cost developed in accordance with Section 7.02B 7a. – e.
 - (2) Contractor / Subcontractor markup for Work performed at lower tier: For Contractor or Subcontractor of any tier for work performed by a subcontractor of a lower tier, 4% of the subcontract cost developed in accordance with Section 7.02B 7a. – h.
- h. Insurance and bond premiums: Cost of change in insurance or bond premium: This is defined as:
- (1) Contractor's liability insurance: The cost of any changes in Contractor's liability insurance arising directly from execution of the Change Order; and
 - (2) Payment and Performance Bond: The cost of the additional premium for Contractor's bond arising directly from the changed Work.

The cost of any change in insurance or bond premium shall be added after overhead and allowance for profit are calculated in accordance with subparagraph f. and g above.

C. Change Order Pricing – Unit Prices

1. Content of Owner authorization: Whenever Owner authorizes Contractor to perform Work on a unit-price basis, Owner's authorization shall clearly state:
 - a. Scope: Scope of work to be performed;
 - b. Reimbursement basis: Type of reimbursement including pre-agreed rates for material quantities; and
 - c. Reimbursement limit: Cost limit of reimbursement.
2. Contractor responsibilities: Contractor shall:
 - a. Cooperate with Owner and assist in monitoring the Work being performed. As requested by Owner, Contractor shall identify workers assigned to the Change Order Work and areas in which they are working;
 - b. Leave access as appropriate for quantity measurement; and
 - c. Not exceed any cost limit(s) without Owner's prior written approval.
3. Cost breakdown consistent with Fixed Price requirements: Contractor shall submit costs in accordance with paragraph 7.02B and satisfy the following requirements:
 - a. Unit prices must include overhead, profit, bond and insurance premiums: Unit prices shall include reimbursement for all direct and indirect costs of the Work, including overhead, profit, bond, and insurance costs; and
 - b. Owner verification of quantities: Quantities must be supported by field measurement statements signed by Owner.

D. Change Order Pricing – Time-and-Material Prices

1. Content of Owner authorization: Whenever Owner authorizes Contractor to perform Work on a time-and-material basis, Owner's authorization shall clearly state:
 - a. Scope: Scope of Work to be performed;

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- b. Reimbursement basis: Type of reimbursement including pre-agreed rates, if any, for material quantities or labor; and
- c. Reimbursement limit: Cost limit of reimbursement.
- 2. Contractor responsibilities: Contractor shall:
 - a. Identify workers assigned: Cooperate with Owner and assist in monitoring the Work being performed. As requested by Owner, identify workers assigned to the Change Order Work and areas in which they are working;
 - b. Provide daily timesheets: Identify on daily time sheets all labor performed in accordance with this authorization. Submit copies of daily time sheets within 2 working days for Owner's review.
 - c. Allow Owner to measure quantities: Leave access as appropriate for quantity measurement;
 - d. Perform Work efficiently: Perform all Work in accordance with this section as efficiently as possible; and
 - e. Not exceed Owner's cost limit: Not exceed any cost limit(s) without Owner's prior written approval.
- 3. Cost breakdown consistent with Fixed Price requirements: Contractor shall submit costs in accordance with paragraph 7.02B and additional verification supported by:
 - a. Timesheets: Labor detailed on daily time sheets; and
 - b. Invoices: Invoices for material.

7.03 CHANGE IN THE CONTRACT TIME

- A. COP requests for Contract Time: The Contract Time shall only be changed by a Change Order. Contractor shall include any request for a change in the Contract Time in its Change Order Proposal.
- B. Time extension permitted if not Contractor's fault: If the time of Contractor's performance is changed due to an act of Force Majeure, or due to the fault or negligence of Owner or anyone for whose acts Owner is responsible, Contractor shall be entitled to make a request for an equitable adjustment in the Contract Time in accordance with the following procedure. 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.
 - 1. Notice and record keeping for Contract Time request: A request for an equitable adjustment in the Contract Time shall be based on written notice delivered within 7 Days of the occurrence of the event giving rise to the request. If Contractor believes it is entitled to adjustment of Contract Time, Contractor shall immediately notify Owner and begin to keep and maintain complete, accurate, and specific daily records. Contractor shall give Owner access to any such record and if requested, shall promptly furnish copies of such record to Owner.
 - 2. Timing and content of Contractor's Notice: Contractor shall not be entitled to an adjustment in the Contract Time for any events that occurred more than 7 Days before Contractor's written notice to Owner. The written notice shall set forth, at a minimum, a description of: the event giving rise to the request for an equitable adjustment in the Contract Time; the nature of the impacts to Contractor and its Subcontractors of any tier, if any; and to the extent possible the amount of the adjustment in Contract Time requested. Failure to properly give such written notice shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.

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3. Contractor to provide supplemental information: Within 30 Days of the occurrence of the event giving rise to the request, unless Owner agrees in writing to allow an additional period of time to ascertain more accurate data, Contractor shall supplement the written notice provided in accordance with subparagraph 7.03B.2 with additional supporting data. Such additional data shall include, at a minimum: the amount of delay claimed, itemized in accordance with the procedure set forth herein; specific facts, circumstances, and analysis that confirms not only that Contractor suffered the delay claimed, but that the delay claimed was actually a result of the act, event, or condition complained of, and that the Contract Documents provide entitlement to an equitable adjustment in Contract Time for such act, event, or condition; and supporting documentation sufficiently detailed to permit an informed analysis of the request by Owner. Failure to provide such additional information and documentation within the time allowed or within the format required shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.
 4. Contractor to proceed with Work as directed: Pending final resolution of any request in accordance with this paragraph, unless otherwise agreed in writing, Contractor shall proceed diligently with performance of the Work.
- C. Contractor to demonstrate impact on critical path of schedule: Any change in the Contract Time covered by a Change Order, or based on a request for an equitable adjustment in the Contract Time, shall be limited to the change in the critical path of Contractor's schedule attributable to the change of Work or event(s) giving rise to the request for equitable adjustment. Any Change Order Proposal or request for an adjustment in the Contract Time shall demonstrate the impact on the critical path of the schedule. 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.
- D. Cost of change in Contract Time: Contractor may request compensation for the cost of a change in Contract Time in accordance with this paragraph, 7.03D, subject to the following conditions:
1. Must be solely fault of Owner or A/E: The change in Contract Time shall solely be caused by the fault or negligence of Owner or A/E;
 2. Procedures: Contractor shall follow the procedure set forth in paragraph 7.03B;
 3. Demonstrate impact on critical path: Contractor shall establish the extent of the change in Contract Time in accordance with paragraph 7.03C; and
 4. Limitations on daily costs: The daily cost of any change in Contract Time shall be limited to the items below, less the amount of any change in the Contract Sum the Contractor may otherwise be entitled to pursuant to Section 7.02B 7f for any change in the Work that contributed to this change in Contract Time:
 - a. Non-productive supervision or labor: cost of nonproductive field supervision or labor extended because of delay;
 - b. Weekly meetings and indirect activities: cost of weekly meetings or similar indirect activities extended because of the delay;
 - c. Temporary facilities or equipment rental: cost of temporary facilities or equipment rental extended because of the delay;
 - d. Insurance premiums: cost of insurance extended because of the delay;
 - e. Overhead: general and administrative overhead in an amount to be agreed upon, but not to exceed 3% of the Contract Award Amount divided by the originally specified Contract Time for each Day of the delay.

PART 8 – CLAIMS AND DISPUTE RESOLUTION

8.01 CLAIMS PROCEDURE

- A. Claim is Contractor's remedy: If the parties fail to reach agreement on the terms of any Change Order for Owner-directed Work as provided in Section 7.01, or on the resolution of any request for an equitable adjustment in the Contract Sum as provided in Section 7.02 or the Contract Time as provided in Section 7.03, Contractor's only remedy shall be to file a Claim with Owner as provided in this section.
- B. Claim filing deadline for Contractor: Contractor shall file its Claim within 120 Days from Owner's final offer made in accordance with paragraph 7.01E, or by the date of Final Acceptance, whichever occurs first.
- C. Claim must cover all costs and be documented: The Claim shall be deemed to cover all changes in cost and time (including direct, indirect, impact, and consequential) to which Contractor may be entitled. It shall be fully substantiated and documented. At a minimum, the Claim shall contain the following information:
1. Factual statement of Claim: A detailed factual statement of the Claim for additional compensation and time, if any, providing all necessary dates, locations, and items of Work affected by the Claim;
 2. Dates: The date on which facts arose which gave rise to the Claim;
 3. Owner and A/E employee's knowledgeable about Claim: The name of each employee of Owner or A/E knowledgeable about the Claim;
 4. Support from Contract Documents: The specific provisions of the Contract Documents which 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: Copies of any identified documents, other than the Contract Documents, that support the Claim;
 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;
 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 set forth in, and in the detail as 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 liable.
- D. Owner's response to Claim filed: After Contractor has submitted a fully documented Claim that complies with all applicable provisions of Parts 7 and 8, Owner shall respond, in writing, to Contractor as follows:
1. Response time for Claim less than \$50,000: If the Claim amount is less than \$50,000, with a decision within 60 Days from the date the Claim is received; or

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2. Response time for Claim of \$50,000 or more: If the Claim amount is \$50,000 or more, with a decision within 60 Days from the date the Claim is received, or with notice to Contractor of the date by which it will render its decision. Owner will then respond with a written decision in such additional time.
- E. Owner's review of Claim and finality of decision: To assist in the review of Contractor's Claim, Owner may visit the Project site, or request additional information, in order to fully evaluate the issues raised by the Claim. Contractor shall proceed with performance of the Work pending final resolution of any Claim. Owner's written decision as set forth above shall be final and conclusive as to all matters set forth in the Claim, unless Contractor follows the procedure set forth in Section 8.02.
- F. Waiver of Contractor rights for failure to comply with this Section: Any Claim of the Contractor against the Owner for damages, additional compensation, or additional time, shall be conclusively deemed to have been waived by the Contractor unless made in accordance with the requirements of this Section.

8.02 ARBITRATION

- A. Timing of Contractor's demand for arbitration: If Contractor disagrees with Owner's decision rendered in accordance with paragraph 8.01D, Contractor shall provide Owner with a written demand for arbitration. No demand for arbitration of any such Claim shall be made later than 30 Days after the date of Owner's decision on such Claim; failure to demand arbitration within said 30 Day period shall result in Owner's decision being final and binding upon Contractor and its Subcontractors.
- B. Filing of Notice for arbitration: Notice of the demand for arbitration shall be filed with the American Arbitration Association (AAA), with a copy provided to Owner. The parties shall negotiate or mediate under the Voluntary Construction Mediation Rules of the AAA, or mutually acceptable service, before seeking arbitration in accordance with the Construction Industry Arbitration Rules of AAA as follows:
 1. Claims less than \$30,000: Disputes involving \$30,000 or less shall be conducted in accordance with the Northwest Region Expedited Commercial Arbitration Rules; or
 2. Claims greater than \$30,000: Disputes over \$30,000 shall be conducted in accordance with the Construction Industry Arbitration Rules of the AAA, unless the parties agree to use the expedited rules.
- C. Arbitration is forum for resolving Claims: All Claims arising out of the Work shall be resolved by arbitration. The judgment upon the arbitration award may be entered, or review of the award may occur, in the superior court having jurisdiction thereof. No independent legal action relating to or arising from the Work shall be maintained.
- D. Owner may combine Claims into same arbitration: Claims between Owner and Contractor, Contractor and its Subcontractors, Contractor and A/E, and Owner and A/E shall, upon demand by Owner, be submitted in the same arbitration or mediation.
- E. Settlement outside of arbitration to be documented in Change Order: If the parties resolve the Claim prior to arbitration judgment, the terms of the resolution shall be incorporated in a Change Order. The Change Order shall constitute full payment and final settlement of the Claim, including all claims for time and for direct, indirect, or consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity.

8.03 CLAIMS AUDITS

- A. 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 maintain and retain sufficient records to allow Owner to verify all or a portion of the Claim or to permit Owner access to the books and records of Contractor, or Subcontractors of any tier, shall constitute a waiver of the Claim and shall bar any recovery.
- B. Contractor to make documents available: In support of Owner audit of any Claim, Contractor shall, upon request, promptly make available to Owner the following documents:
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;
 13. Cancelled checks (payroll and vendors);
 14. Job cost report, including 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 reflecting the operations on the Work. In addition, the 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;

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22. All nonprivileged documents which relate to each and every Claim together with all documents which support the amount of any adjustment in Contract Sum or Contract Time sought by each Claim;
 23. Work sheets or software used to prepare the Claim establishing the cost components for items of the Claim including but not limited to labor, benefits and insurance, materials, equipment, Subcontractors, all documents which establish the time periods, individuals involved, the hours for the individuals, and the rates for the individuals; and
 24. Work sheets, software, and all other documents used by Contractor to prepare its bid.
- C. Contractor to provide facilities for audit and shall cooperate: The audit may be performed by employees of Owner or a representative 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.

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.

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- 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: 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 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.

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- 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.

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 laws of the state of Washington. Venue shall be in the county in which Owner's principal place of business 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 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 Work 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 such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations set forth in the Contract Documents.

10.03 MEANING OF WORDS

Meaning of words used in Specifications: Unless otherwise stated in the Contract Documents, words which 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 be specific or by implication, shall be to the latest standard specification, manual, or code in effect on the date for submission of bids, except as may be otherwise specifically stated. Wherever in these 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 articles as are shown on the drawings, or required to complete the installation.

10.04 RIGHTS AND REMEDIES

No waiver of rights: No action or failure to act by Owner or A/E shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall action or failure to act constitute approval or an acquiescence in a breach therein, except as may be specifically agreed in writing.

10.05 CONTRACTOR REGISTRATION

Contractor must be registered or licensed: Pursuant to RCW 39.06, Contractor shall be registered or licensed as required by the laws of the State of Washington, including but not limited to RCW 18.27.

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.

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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.

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 DIVERSE BUSINESS PARTICIPTION

The state of Washington encourages participation in all of its contracts by Diverse Businesses as found in RCW Chapters 39, 43, and WAC 326. The voluntary Diverse Business goal of 26%, which is an aggregate of: 10% Minority Business Enterprises (MBE), 6% Women Business Enterprises (WBE), 5% Veteran-owned Business, 5% Small Business (SBE) Enterprise, and Public Works Small Business Enterprise (PWSBE) self- identified in the DES diversity compliance program B2Gnow system. Contractors are encouraged to meet or exceed the project goals in the advertisement by any level of participation, regardless of category.

DES reserves the right to adjust the voluntary participation goals.

Businesses are encouraged to register in WEBS, and B2Gnow as well as registering as a state certified M/WBE/Veteran Business.

For reporting, Contractor is required to register and create an account in the DES Public Works Diversity Tracking & Management System powered by B2GNow.

Every month for the duration of your contract, and while your contract is active in the DES Public Works Diversity Tracking & Management System, submit and accurately maintain the following information:

1. Payments received by the prime contractor from the Agency.
2. Payments paid to each first tier subcontractor.
3. Payments paid to each first tier supplier.

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You must also ensure the following information is reported in the DES Public Works Diversity Tracking & Management System by your first tier subcontractors and suppliers for the duration of your contract:

1. Confirmation of payments from the prime contractor to the first-tier subcontractor
2. Confirmation of payments from the prime contractor to first tier suppliers

10.12 MINIMUM LEVELS OF APPRENTICESHIP PARTICIPATION

In accordance with RCW 39.04.320, the State of Washington requires 15% apprenticeship participation for projects estimated to cost one million dollars or more unless otherwise stated on the Bid Advertisement and the Submittal Questionnaire/Bidding Terms and Conditions. Contractors who meet or exceed minimum participation requirement are eligible for monetary incentive of \$1,000 and will be paid to the contractor meeting the apprentice utilization requirement. A monetary penalty will be applied to the contractor failing to meet the utilization requirement and failing to demonstrate a Good Faith Effort. The penalty will be applied to every hour of shortfall of the minimum number of required apprentice hours using the applicable published wage of a Step 1 apprentice laborer.

The penalty will not exceed five percent (5%) of the total Contract Sum. The cost value associated with meeting the apprentice utilization requirement is included in the Base Bid.

- A. Apprentice participation, under this contract, may be counted towards the required percentage (%) only if the apprentices are from an apprenticeship program registered and approved by the Washington State Apprenticeship and Training Council (RCW 49.04 and WAC 296-05).
- B. Bidders may contact the L&I to obtain more information about apprenticeship programs.
- C. No changes to the required percentage (%) of apprentice participation shall be allowed without written approval of the Owner. In any request for the change, the Contractor shall clearly demonstrate a good faith effort to comply with the requirements for apprentice participation.
- D. Any substantive violation of the mandatory requirements of this part of the contract may be a material breach of the contract by the Contractor. The Owner may withhold payment pursuant to Part 6.05, stop the work for cause pursuant to Part 3.04, and terminate the contract for cause pursuant to Part 9.01.

10.13 SPECIAL CONDITIONS

The Owner may have Federal Funding or other special requirements for this project. If applicable, the Contractor will be required to comply with the "DIVISION 00 SPECIAL CONDITIONS" section in the specifications that will be based on the specific requirements of the funding source.

Hazardous Materials Summary Report

7948 Birch Bay Drive
Blaine, Washington 98230

Prepared for:
Whatcom County Library System
5205 Northwest Dr
Bellingham, WA 98226

April 2, 2026
PBS Project No. 41937.000



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APPENDICES

APPENDIX A: Photo Documentation & PLM Bulk Sampling Information

PLM Bulk Sample Inventory

PLM Bulk Sample Laboratory Data Sheets and Chain of Custody Documentation

APPENDIX B: AA Lead Paint Chip Sampling Information

AA Lead Paint Chip Sample Inventory

AA Lead Paint Chip Laboratory Data Sheets and Chain of Custody Documentation

APPENDIX C: PCBs Sampling Information and Lab Results

APPENDIX D: Certifications

1 INTRODUCTION

1.1 Project Background

PBS Engineering and Environmental, Inc. (PBS) performed a hazardous materials survey of:

- The single-family residence located at 7948 Birch Bay Drive Blaine, Washington
- Two storage sheds on the north side of the property

The survey was completed in conjunction with the planned renovations of the structure and demolition of the two separate sheds. The intent of this investigation is to ensure that the Whatcom County Library System is in compliance with applicable regulatory requirements that a "good faith inspection" for asbestos-containing materials be performed prior to renovation or demolition activities.

At the request of the Whatcom County Library System, all accessible areas of the building were inspected for the presence of asbestos-containing materials (ACMs), lead-containing paint (LCP), light tubes (mercury) and light ballast (PCBs).

1.2 Subject Site Building Descriptions

The building inspected is a two-level structure with a partial basement built in 1913 and totaling approximately 2,133 square feet. The subject site's interior floor finishes include carpeting and sheet vinyl flooring. Wall finishes consist of textured gypsum wallboard and plaster. Ceilings throughout consist of textured gypsum wallboard and plaster. The exterior walls consist of metal siding, wood, and concrete masonry on a concrete foundation with framed windows. The roof is pitched with 3-tab shingles. Heating is provided by a forced air system.

Two sheds are also situated on the property, shed one measuring 1,334 square feet and the second measuring 1,392 square feet. Both sheds interior contains no wallboard and are concrete floors with fiberglass insulation on the roofs and walls. The exterior walls consist of metal siding on a concrete foundation with framed windows. The roofs are corrugated metal.

1.3 Asbestos Survey Process

All accessible areas were inspected by AHERA Certified Building Inspector Katie King (Cert. No. IRO-25-4605C Exp. 12/18/2026) on June 6, 2024. Additional sampling was completed on May 16, 2025 by AHERA Certified Building Inspector Katie King.

PBS endeavored to inspect all accessible areas of the scope of work. Inaccessible areas consist of those requiring selective demolition, fall protection, or confined space entry protocols in order to gain access. When observed, suspect materials were sampled. All samples were assigned a unique identification number and transmitted for analysis to Seattle Asbestos Test (NVLAP #201057-0) under chain-of-custody protocols. Samples were analyzed according to EPA Method 600R-93/116 using Polarized Light Microscopy (PLM), which has a reliable limit of quantification of 1% asbestos by volume. Information regarding the type and location of sampled materials can be found on the attached PLM Sample Inventory located in Appendix A.

Suspect ACMs may exist in inaccessible areas. PBS endeavored to determine the presence and estimate the condition of suspect materials in all inaccessible areas included in the scope of work. While PBS has endeavored to identify the ACM that may be found in concealed locations, additional unidentified ACM may exist. All building demolition activities should be performed cautiously to prevent impacts to concealed asbestos-containing materials.

2 FINDINGS

2.1 Asbestos-Containing Materials (ACMs)

Federal and state regulations define an Asbestos-Containing Material as any materials that contains greater than 1% asbestos (per laboratory PLM analytical method):

- Sealant tape around HVAC metal ducts in basement (200 LF). And assumed in wall/ceiling cavities associated with metal ducts.
- Vinyl sheet backing and mastic – 1st floor bathroom (85 SQ FT)
- Black window putty – 1st and 2nd floor interior of windows (900 LF), and assumed on the exterior of windows
- White sink undercoat – 1st floor utility room (one sink)
- Cement asbestos board (CAB) – skirting of the house on north and northwest sides (300 SF)

Less than 1% Asbestos:

Less than 1% of asbestos was analyzed in the ceiling and wall textures (1st floor). This triggers workers and personnel impacting the material to adhere to regulatory requirements outlined in WAC 296-62-17712(2) and training as outlined in WAC 296-62-07722(5) and WAC 296-62-0728. Refer to Washington Industrial Safety and Health Act (WISHA) Regional Directive 23.30 for additional information and handling requirements.

Non-Asbestos-Containing Materials:

The following materials were sampled and found **NOT** to contain detectable concentrations of asbestos:

Building Material Sampled	General Location
Concrete	Basement at bottom of stairwell, shed two exterior
Yellow fiberglass insulation	Basement around the HVAC
Tan speckled vinyl floor, vinyl sheet backing and mastic	1 st floor kitchen and utility room
Tan mastic under old carpet	1 st floor west living room
Brick and mortar	1 st floor fireplace
Plaster	1 st floor archway between central and front living room, 1 st floor central living room, 2 nd floor south room closet, 2 nd floor central room near closet
Gypsum wallboard and joint compound	1 st floor west living room near kitchen, 1 st floor kitchen (throughout the building)
Yellow pipe insulation	1 st floor kitchen

Building Material Sampled	General Location
White 4" ceramic tile and grout	1 st floor kitchen above sink
Orange fire stop	1 st floor doorway between kitchen and side hall
White tub sealant	1 st floor bathroom
Clear sealant	1 st floor bathroom counter
Clear mastic behind cove base	1 st floor kitchen on southeast side
Brown 3" cove back and clear mastic	1 st floor kitchen near rear door
Ceiling boards	1 st floor west living room
Off-white vinyl flooring, vinyl sheet backing, and mastic	2 nd floor bathroom
2" brown cove base and tan mastic	2 nd floor bathroom
Gray insulation	2 nd floor south room closet access, 2 nd floor bathroom attic access
Plastic wrapped insulation	Shed one and shed two
Window caulk	Shed two side door, exterior back porch window
Asphalt aggregate	Shed two exteriors
Mortar	Exterior chimney
Clear and white window caulk	Window on southeast side of house
Anti-slip coating	Exterior back porch
Vapor barrier and shingles	Throughout entire roof

For a complete listing of representative bulk sampling, sample locations and associated laboratory analysis, refer to the inventory in Appendix A.

2.2 Lead-Containing Components

Representative painted coatings were sampled for lead content. The samples were assigned unique identification numbers and transmitted to NVL Laboratories, Inc. (AIHA IH #101861) in Seattle, Washington under chain-of-custody protocols for analysis using Flame Atomic Absorption.

The following paint samples and materials were analyzed to contain lead **above** detectable limits and include:

- Red paint on cement steps to front porch (**0.047% Lead**)
- White paint on concrete wall in basement stairwell (**0.0072% Lead**)
- White paint on wood window frame in 1st floor stairwell (**0.13% Lead**)
- Varnish on wood base boards on stairs to 2nd floor (**0.21% Lead**)
- Off-white paint on plaster walls on top of 2nd floor stairs (**0.027% Lead**)
- Off-white paint on plaster walls 2nd floor near southern bedroom (**0.014% Lead**)
- Pink paint on plaster wall in 2nd floor south bedroom closet (**0.022% Lead**)
- Brown paint on metal wall of shed one (**0.031% Lead**)
- Orange paint on wood door on shed two (**7.6% Lead**)
- Mint paint on wood door on shed two (**0.46% Lead**)
- Red paint on metal wall on shed two (**4.1% Lead**)

Paint samples and materials were analyzed NOT to contain lead above detectable limits include:

- Brown paint on wood siding of exterior porch
- Off-white paint on wood pole on front porch south side
- Off-white paint on gypsum wallboard near utility room window
- Light salmon paint on gypsum wallboard in 1st floor kitchen closet
- Off-white paint on plaster ceiling in 2nd floor bathroom
- Brown paint on wood garage door frame on shed one
- Brown paint on metal wall from exterior of house south side
- Creosote soaked wood from basement level.

Refer to the Appendix B for locations and laboratory results of paint samples.

2.3 Mercury-Containing Components

All fluorescent light tubes and compact fluorescent lamps are presumed to contain mercury. PBS counted the number of fluorescent tubes in the facility for the purposes of mercury vapor recovery prior to demolition activities. Approximately 6 eight-foot fluorescent tube, 4 four-foot fluorescent tubes, and 45 compact fluorescent lamps were observed during the investigation.

2.4 PCB-Containing Components

PBS recommends all light ballasts be inspected prior to disposal. Representative Fluorescent light fixtures at the project site were inspected and 30 magnetic ballasts were found. Magnetic ballasts should be presumed to contain PCBs and properly removed, stored, transported and disposed of in accordance with Washington Administrative Code (WAC) 173-303 Dangerous Waste Regulations and 40 CFR Part 761 Subpart D.

PCB Caulking/Sealants: PBS collected bulk samples of caulking at representative locations of the building. All samples were assigned a unique identification number and transmitted for analysis to NVL Labs in Seattle, Washington under chain-of-custody protocols. Samples were analyzed for PCB content by NVL Labs according to EPA Method 8082. See attached sample inventory, laboratory data, and chain of custody documentation for sample locations and results.

Sample Number	Material	Location	Result
41937.000-PCB01	Black window putty	1 st floor utility room	<18 mg/Kg
41937.000-PCB02	Window caulk	Back porch exterior window	<7.8 mg/Kg
41937.000-PCB03	White and clear window caulk	Exterior window on southeast side of house	<7.8 mg/Kg
41937.000-PCB04	Window caulk	Side door of shed two	<3.9 mg/Kg

Sample analysis was less than the lab detection levels (all samples).
Current EPA regulations for PCBs in bulk materials is 50 parts per million (mg/kg) and greater.

3 RECOMMENDATIONS

3.1 ACMs

ACMs were identified at the subject site.

PBS recommends that all ACMs be removed prior to demolition activities. A qualified Washington State licensed asbestos abatement contractor should be employed to manage, handle, and remove all such ACMs according to applicable local, state and federal regulations. These state and federal regulations include, but not limited to Washington State Labor and Industries' WAC 296-62, 296-65, Local Clean Air Agency Asbestos Rules, AHERA 40 CFR 763, OSHA 29 CFR and US EPA NESHAP 40- CFR Part 61.

Due to the age of the building and various renovations, additional suspect ACM flooring may exist underneath plywood substrates associated with non-ACM flooring. PBS recommends that any flooring found underneath plywood substrates should be presumed as ACM until confirmation testing.

The possibility exist that suspect ACMs may be present in equipment, wall and ceiling cavities, and in other select concealed areas. These may include, but are not limited to roofing, waterproofing membrane, vapor barriers, internal gasketing, mastics, caulking, and sealants on heating, ventilation, and air conditioning (HVAC) equipment, construction adhesives, electrical insulators, below grade pipe covering, and insulation. If suspect ACMs are uncovered during construction, contractors should stop work immediately and inform the Owner promptly for confirmation testing. All untested materials should be presumed asbestos-containing or tested for asbestos content prior to impact.

Less than 1% of Asbestos: Ceiling and wall textures. Current regulations do not consider these materials to be regulated materials (<1% asbestos content). However, current asbestos regulations require various employee/worker compliance (for all trades and sub-contractors) during impact of less <1% asbestos materials, which include and not limited to asbestos training, initial worker exposure monitoring, worker and environmental protection, engineering controls (such as the use of wet methods and HEPA vacuums for debris cleanup) and supervision by an asbestos "competent person".

3.2 Lead-Containing Components

Lead-containing paint and coatings were identified at the subject site and analyzed via laboratory Flame Atomic Absorption methodology as part of this investigation.

Painted coatings may exist in inaccessible areas of the work area or in secondary coatings the under the top paint layer. Any previously unidentified painted coatings not sampled should be considered lead containing until sampled and proven otherwise.

Impact of painted surfaces with detectable concentrations of Lead requires construction activities to be performed according to Washington Labor and Industries regulations for Lead in Construction (WAC 296-155-176). Workers impacting LCP should be Lead/Metals-trained, provided the proper personal protective equipment and use proper work methods to limit occupational and environmental exposure to lead until an initial exposure assessment has been conducted. Handling/managing of painted coatings that contain lead content must be in accordance with 40 CFR Part 745 Lead and WAC 296-155-176. Toxicity Characteristic Leaching Procedure (TCLP) testing should be performed for waste and demolition debris disposal. All demolition waste shall be handled in accordance with WAC 173-303.

Workers potentially impacting lead-containing materials are advised to confirm training requirements of Washington Industrial Safety and Health Act (WISHA), and to ensure that proper worker protection and work practices are implemented. Exposure to the lead found is regulated by the Washington State Labor and Industries rules. Appropriate personnel protective equipment (PPE), lead training and housekeeping measures should be in place to limit exposures to personnel and impacts to the project site.

3.3 Mercury-Containing Components

Fluorescent lamps (tubes and bulbs) are known to contain mercury and mercury vapors. All fluorescent lamps at this site are presumed to be mercury-containing. PBS recommends that all fluorescent lamps be carefully handled and recycled/disposed of in accordance with the contract documents and applicable regulations during demolition activities. Breakage of lamps should be avoided to prevent potential exposures to mercury. Washington Department of Safety and Health requires specific training, handling, engineering controls and disposal practices when performing this work. All waste shall be handled in accordance with Washington Administrative Code (WAC) 173-303.

3.4 PCB-Containing Components

PBS recommends all light ballasts be inspected during handling and demolition.

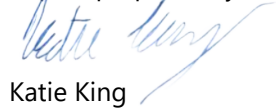
Magnetic ballasts should be presumed to contain PCBs and properly removed, stored, transported and disposed of in accordance with Washington Administrative Code (WAC) 173-303 Dangerous Waste Regulations and 40 CFR Part 761 Subpart D. Electronic ballasts do not contain PCB's and can be disposed of as general debris in compliance with applicable codes and endpoint facility requirements.

3.5 Limitations

Suspect materials (regulated lead-containing paint or asbestos) may exist in inaccessible areas at the project site, such as in ceiling/wall cavities and in interstitial spaces.

PBS endeavors to determine the presence and estimate the condition of suspect materials in all accessible areas included in the scope of work. In the event suspect materials are uncovered during construction, contractors should contact immediately the property Owner and PBS for associated asbestos or other regulated hazardous materials confirmation testing.

Report prepared by:



Katie King
AHERA Building Inspector
Cert. No. IRO-25-4605C, Exp. 12/18/2026

Report reviewed by:

Willem Mager
Sr. Project Manager, AHERA Building Inspector
Cert. No. IRO-26-0536B, Exp. 1/22/2027

APPENDIX A

Photo Documentation & PLM Bulk Sampling Information

PLM Bulk Sample Inventory

PLM Bulk Sample Laboratory Data Sheets

PLM Bulk Sample Chain of Custody Documentation



Photo 1: 7948 Birch Bay Drive, Blaine (subject house).



Photo 2: 7948 Birch Bay Drive, Blaine (Subject sheds).



Photo 3: Sample 18: ACM White sink undercoat in utility room



Photo 4: Sample: 03 ACM sealant tape on HVAC pipe



Photo 5: Sample 04 ACM vinyl sheet backing under vinyl flooring



Photo 6: Texturing on walls and ceiling tested non-detect or less than 1% of asbestos (0.25%)



Photo 7: Sample L16 Lead-containing orange paint on wood door (**7.6%% Lead**)



Photo 8: Sample L3 Lead-containing red paint on stairs (**0.047% Lead**)



Photo shees Photo 9: Sample L11 Lead-containing pink paint of plaster walls (**0.022% Lead**)

7948 Birch Bay Dr, Blaine, WA
Whatcom County Library System
PLM ASBESTOS SAMPLE INVENTORY

PBS Engineering + Environmental
PBS Project #41937.000

<u>PBS Sample #</u>	<u>Material Type</u>	<u>Sample Location</u>	<u>Lab Description</u>	<u>Lab Result</u>	<u>Lab</u>
41937.000-01	Concrete	Basement at bottom of stairwell	Layer 1: Gray sandy/brittle material with paint	NAD	SAT
41937.000-02	Yellow fiberglass insulation	Basement around HVAC	Layer 1: Yellow fibrous material	NAD	SAT
41937.000-03	Sealant tape (HVAC tape)	Basement HVAC	Layer 1: Gray fibrous material	65% Chrysotile	SAT
41937.000-04	Off-white vinyl flooring Vinyl sheet backing and mastic	1st floor bathroom	Layer 1: Off-white sheet vinyl Layer 2: Gray fibrous material with mastic	NAD 50% Chrysotile	SAT
41937.000-05	Tan speckled vinyl floor Vinyl sheet backing and mastic	1st floor kitchen closet	Layer 1: Tan sheet vinyl Layer 2: Gray fibrous material with clear mastic	NAD NAD	SAT
41937.000-06	Tan speckled vinyl floor Clear mastic	1st floor kitchen, south side	Layer 1: Tan sheet vinyl Layer 2: Gray fibrous material with clear mastic	NAD NAD	SAT
41937.000-07	Tan mastic under old carpet	1st floor west living room	Layer 1: Tan mastic	NAD	SAT
41937.000-08	Brick Mortar	1st floor fire place	Layer 1: Red sandy-brittle material Layer 2: Gray sandy/brittle material	NAD NAD	SAT
41937.000-09	Plaster walls	Archway between central living room and front room	Layer 1: White sandy/brittle material with paint	NAD	SAT
41937.000-10	Plaster walls	1st floor central living room near window	Layer 1: White sandy/brittle material with paint	NAD	SAT
41937.000-11	Joint compound White gypsum wallboard	1st floor west living room near kitchen	Layer 1: White powdery material Layer 2: White chalky material with paper	NAD NAD	SAT
41937.000-12	Joint compound White gypsum wallboard	1st floor kitchen near rear door	Layer 1: White powdery material Layer 2: White chalky material with paper	NAD NAD	SAT
41937.000-13	Joint compound	1st floor kitchen southwest corner	Layer 1: White powdery material	NAD	SAT

April 2, 2026

NAD - No Asbestos Detected

1 of 27

7948 Birch Bay Dr, Blaine, WA
Whatcom County Library System
PLM ASBESTOS SAMPLE INVENTORY

PBS Engineering + Environmental
PBS Project #41937.000

<u>PBS Sample #</u>	<u>Material Type</u>	<u>Sample Location</u>	<u>Lab Description</u>	<u>Lab Result</u>	<u>Lab</u>
	White gypsum wallboard		Layer 2: White chalky material with paper	NAD	
41937.000-14	White sandy surfacing material Texture	1st floor west living room in alcove wall	Layer 1: White soft/loose material	NAD	SAT
41937.000-15	White sandy surfacing material Texture	1st floor west living room ceiling	Layer 1: White powdery material with paint PLM 400-Point Count Result	2% Chrysotile 0.25%	SAT
41937.000-16	White sandy surfacing material Texture	1st floor west living room ceiling	Layer 1: White powdery material with paint	NAD	SAT
41937.000-17	Black window putty	1st floor utility room	Layer 1: Black soft material	3% Chrysotile	SAT
41937.000-18	White sink undercoat	1st floor utility room	Layer 1: White soft/loose material	2% Chrysotile	SAT
41937.000-19	Yellow pipe insulation	1st floor kitchen sink	Layer 1: Yellow foamy material	NAD	SAT
41937.000-20	White 4" ceramic tile Grout	1st floor kitchen above sink	Layer 1: White ceramic Layer 2: White brittle/sandy material Layer 3: Trace white mastic	NAD NAD NAD	SAT
41937.000-21	Orange fire stop	1st floor doorway between kitchen and side hall	Layer 1: Orange soft/elastic material	NAD	SAT
41937.000-22	White tub sealant	1st floor bathroom	Layer 1: White soft/elastic material	NAD	SAT
41937.000-23	Clear sealant	1st floor bathroom counter	Layer 1: Clear soft/elastic material	NAD	SAT
41937.000-24	Clear mastic behind covebase	1st floor kitchen on southeast side	Layer 1: Clear soft/elastic material	NAD	SAT
41937.000-25	Brown 3" cove base Clear mastic	1st floor kitchen near rear door	Layer 1: Brown rubbery material Layer 2: Clear mastic	NAD NAD	SAT
41937.000-26	Ceiling board	1st floor west living room	Layer 1: White soft lump material with paint	NAD	SAT

April 2, 2026

NAD - No Asbestos Detected

2 of 27

7948 Birch Bay Dr, Blaine, WA
Whatcom County Library System
PLM ASBESTOS SAMPLE INVENTORY

PBS Engineering + Environmental
PBS Project #41937.000

<u>PBS Sample #</u>	<u>Material Type</u>	<u>Sample Location</u>	<u>Lab Description</u>	<u>Lab Result</u>	<u>Lab</u>
			Layer 2: White chalky material with paper	NAD	
41937.000-27	Off-white vinyl flooring	2nd floor bathroom	Layer 1: Off-white sheet vinyl	NAD	SAT
	Vinyl sheet backing and mastic		Layer 2: Gray fibrous material with clear mastic	NAD	
41937.000-28	2" brown cove base	2nd floor bathroom	Layer 1: Brown rubbery material	NAD	SAT
	Tan mastic		Layer 2: Tan mastic	NAD	
41937.000-29	Plaster walls	2nd floor south room closet	Layer 1: Gray sandy/brittle material with paint	NAD	SAT
41937.000-30	Plaster	2nd floor central room near closet	Layer 1: Gray sandy/brittle material with paint	NAD	SAT
41937.000-31	4" white ceramic tile	2nd floor bathroom shower	Layer 1: White ceramic	NAD	SAT
	Grout		Layer 2: White brittle/sandy material	NAD	
	Sealant and mastic		Layer 3: Brown mastic	NAD	
41937.000-32	Gray insulation	2nd floor south room closet access	Layer 1: Gray fibrous material	NAD	SAT
41937.000-33	Gray insulation	2nd floor bathroom attic access	Layer 1: Gray fibrous material	NAD	SAT
41937.000-34	Plastic wrap	Shed 1	Layer 1: Off-white soft/elastic material with woven fibrous material	NAD	SAT
			Layer 2: Clear mastic	NAD	SAT
	Yellow insulation		Layer 3: Yellow fibrous material	NAD	
41937.000-35	Plastic wrap	Shed 1	Layer 1: Off-white soft/elastic material with woven fibrous material	NAD	SAT
			Layer 2: Clear mastic	NAD	SAT
	Yellow insulation		Layer 3: Yellow fibrous material	NAD	
41937.000-36	Window caulk	Shed 2 side door	Layer 1: White brittle material and paint	NAD	SAT
41937.000-37	Asphalt aggregate	Shed 2 exterior	Layer 1: Black asphaltic material with sand	NAD	SAT
41937.000-38	Concrete	Shed 2 exterior	Layer 1: Gray sandy/brittle material	NAD	SAT

April 2, 2026

NAD - No Asbestos Detected

3 of 27

<u>PBS Sample #</u>	<u>Material Type</u>	<u>Sample Location</u>	<u>Lab Description</u>	<u>Lab Result</u>	<u>Lab</u>
41937.000-39	Window caulk	Exterior back porch window	Layer 1: Tan soft/elastic material	NAD	SAT
41937.000-40	Mortar	Exterior chimney	Layer 1: Gray sandy/brittle material	NAD	SAT
41937.000-41	Clear and white window caulk	Window on southeast side of house	Layer 1: Clear/white soft/elastic material	NAD	SAT
41937.000-42	Anti-slip coating	Exterior back porch	Layer 1: Gray sandy/brittle material with paint	NAD	SAT
41937.000-43	Vapor barrier and shingles	Roof on southeast side	Layer 1: Black asphaltic material with sand Layer 2: Black asphaltic fibrous material	NAD NAD	SAT
41937.000-44	Vapor barrier and shingles	Roof on northeast side	Layer 1: Black asphaltic material with sand Layer 2: Black asphaltic fibrous material	NAD NAD	SAT
41937.000-45	Vapor barrier under shingles	Under roof on northwest side	Layer 1: Black asphaltic fibrous material	NAD	SAT
41937.000-5.16-01	Cement asbestos board	North exterior on west side	Layer 1: Gray cementitious material with s wood flakes and debris	29% Chrysotile	NVL
41937.000-5.16-02	Cement asbestos board	North exterior low wall	Layer 1: Gray cementitious material	31% Chrysotile	NVL

SEATTLE ASBESTOS TEST, LLC

Lynnwood Laboratory: 19701 Scriber Lake Road, Suite 103, Lynnwood, WA 98036, Tel: 425.673.9850, Cell & Text: 206.369.6421, NVLAP Lab Code: 200768-0

www.seattleasbestostest.com, admin@seattleasbestostest.com

Project Manager: Willem Mager

Client: PBS Engineering and Environmental, Seattle

Address: 214 E Galer Street, Suite 300, Seattle, WA 98102

Tel: 206.233.9639

Date Report Issued: 6/11/2024

Date Analyzed: 6/11/2024

Client Job#: 41937.000

Project Location: Birch Bay Vogl Library Express

Laboratory batch#: 202410106

Samples Received: 45

Enclosed please find the test results for the bulk samples submitted to our laboratory for asbestos analysis. Analysis was performed using polarized light microscopy (PLM) in accordance with Test Method US EPA - 40 CFR Appendix E of Part 763, Interim Method of Determination of Asbestos in Bulk Insulation Samples and Test Method US EPA/600/R-93/116.

Percentages for this report are done by visual estimate and relate to the suggested acceptable error ranges by the method. Since variation in data increases as the quantity of asbestos decreases toward the limit of detection, the EPA recommends point counting for samples containing between <1% and 10% asbestos (NESHAP, 40 CFR Part 61). Statistically, point counting is a more accurate method. If you feel a point count might be beneficial, please feel free to call and request one.

The test results refer only to the samples or items submitted and tested. The accuracy with which these samples represent the actual materials is totally dependent on the acuity of the person who took the samples. This report must not be used by the client to claim product certification, approval, or endorsement by Seattle Asbestos Test, LLC, NVLAP, NIST, or any agency of the Federal government. The test report or calibration certificate shall not be reproduced except in full, without written approval of the laboratory. If the sample is inhomogeneous the sub-samples of the components are analyzed separately as layers. This report in its entirety consists of this cover letter, the customer sampling COC or data sheet, and the analytical report which is page numbered.

This report is highly confidential and will not be released without your consent. Samples are archived for 30 days after the analysis, and disposed of as hazardous waste thereafter.

Thank you for using our service and let us know if we can further assist you.

Sincerely

Steve Zhang

Steve (Fanyao) Zhang
Approved Signatory

2024/01/06

SAT

LABORATORY CHAIN OF CUSTODY

Project: Bruce Bay Vogel Library Express

Project #: 41937.000 Page 1 of 1

Analysis requested: PLM

Date: 6/10/24

Relinq'd by/Signature: [Signature]

Date/Time: 6/10/24

Received by/Signature: [Signature]

Date/Time: 6/10/24 14:30

Email ALL INVOICES to: seattleap@pbsusa.com

E-mail results to:

- ☒ Willem Mager
☐ Gregg Middaugh
☐ Mark Hiley
☐ Ryan Hunter
☐ Janet Murphy

- ☐ Ferman Fletcher
☐ Claire Tsai
☐ Toan Nguyen
☐ Peter Stensland
☐ Cameron Budnick

- ☐ Nick San
☒ Katie King
☐ Sam Christensen
☐ Kameron DeMonnin

TURN AROUND TIME:

- ☐ 1 Hour
☐ 2 Hours
☐ 4 Hours

- ☒ 24 Hours
☐ 48 Hours

- ☐ 3-5 Days
☐ Other _____

NOTE: ***Composite if positive

SAMPLE DATA FORM

Sample #	Material	Location	Lab
41937.000-01	Concrete	Basement at bottom of stairwell	SAT
" - 02	Yellow fiberglass insulation	Basement HVAC system	
" - 03	Sealing tape	Basement HVAC	
" - 04	off-white vinyl flooring and	1st floor bathroom	
" - 05	tan speckled vinyl flooring and	1st floor kitchen closet	
" - 06	" "	1st floor kitchen, south side	
" - 07	Tan mastic under old carpet	1st floor west living room	
" - 08	Brick and mortar	1st floor fireplace ^{south} living room	
" - 09	Plaster	Archway between 1st floor living rooms	
" - 10	" "	1st floor central room by window	
" - 11	White gypsum wall board	1st floor west living room near kitchen	
" - 12	off-white gypsum wall board	1st floor kitchen new rear door	
" - 13	" "	1st floor kitchen southwest corner	
" - 14	White sandy surfacing material	1st floor west living room	
" - 15	" "	1st floor west living room ceiling	
" - 16	" "	1st floor west living room	

2024/01/06

Project: Brick Bay Vogt Library Express

Project #: 41437.000 Page 2 of 2

SAMPLE DATA FORM

Sample #	Material	Location	Lab
" - 17	Black window putty	Utility room 1st floor	SAT
" - 18	White sink undercoat	1st floor utility room	
" - 19	Yellow pipe insulation	1st floor kitchen sink	
" - 20	white 4" ceramic tile and grout	1st floor kitchen above sink	
" - 21	Orange fire stop	1st floor doorway ^{kitchen to} hall by bathroom	
" - 22	White tub sealant	1st floor bathroom	
" - 23	Clear sealant	1st floor bathroom counter	
" - 24	Clear mastic behind cove base	1st floor kitchen on ^{south east} side	
" - 25	Brown 3" cove base and clear mastic	1st floor kitchen near rear door	
" - 26	Ceiling board	1st floor West living room	
" - 27	off-white vinyl flooring and mastic	2nd floor bathroom	
" - 28	2" brown cove base and mastic	" "	
" - 29	Plaster	2nd floor South room closet	
" - 30	" "	2nd floor center room near closet	
" - 31	4" ceramic tile, grout, and sealant	2nd floor bathroom shower	
" - 32	Insulation	2nd floor South room in ^{closet} access	
" - 33	" "	2nd floor bathroom attic access	
" - 34	" "	Storage 1	
" - 35	" "	Storage 2	
" - 36	Window caulk	Storage 2 side door	
" - 37	Asphalt aggregate	Storage 2	
" - 38	Concrete	" "	
" - 39	Window caulk	exterior back porch window	
" - 40	Mortar	Exterior chimney	
" - 41	clear and white window caulk	South window of ^{south east} side of house	
" - 42	anti-slip coating	Exterior back porch	
" - 43	Vapor barrier and shingles	Roof on Southeast side	
" - 44	" "	Roof on northeast side	
" - 45	Vapor barrier under shingles	Under roof on northwest side	

SEATTLE ASBESTOS TEST

Lynnwood Laboratory: 19701 Scriber Lake Road, Suite 103, Lynnwood, WA 98036, Tel: 425.673.9850, Cell & Text: 206.369.6421, NVLAP Lab Code: 200768-0

Disclaimer: This report must not be used by the client to claim product certification, approval, or endorsement by Seattle Asbestos Test, LLC, NVLAP, NIST, or any agency of the Federal government.

ANALYTICAL LABORATORY REPORT

[PLM] EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples;

[PLM] EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Attn.: Willem Mager

Client: PBS Engineering and Environmental, Seattle

Address: 214 E Galer Street, Suite 300, Seattle, WA 98102

Job#: 41937.000

Batch#: 202410106

Date Received: 6/10/2024

Samples Rec'd: 45

Date Analyzed: 6/11/2024

Samples Analyzed: 45

Project Loc.: Birch Bay Vogl Library Express

Analyzed by:  Steve (Fanyao) Zhang

Approved Signatory:  Steve (Fanyao) Zhang, President

Lab ID	Client Sample ID	Layer	Description	%	Asbestos Fibers	Non-fibrous Components	%	Non-asbestos Fibers
1	41937.000-01	1	Gray sandy/brittle material with paint		None detected	Sand, Filler, Binder, Paint	3	Cellulose
2	41937.000-02	1	Yellow fibrous material		None detected	Filler	90	Glass fibers
3	41937.000-03	1	Gray fibrous material	65	Chrysotile	Filler	25	Cellulose
4	41937.000-04	1	Off-white sheet vinyl		None detected	Vinyl/binder		None detected
		2	Gray fibrous material with mastic	50	Chrysotile	Binder/filler, Mastic/binder	35	Cellulose
5	41937.000-05	1	Tan sheet vinyl		None detected	Vinyl/binder		None detected
		2	Gray fibrous material with clear mastic		None detected	Binder/filler, Mastic/binder	65	Cellulose
6	41937.000-06	1	Tan sheet vinyl		None detected	Vinyl/binder		None detected
		2	Gray fibrous material with clear mastic		None detected	Binder/filler, Mastic/binder	65	Cellulose
7	41937.000-07	1	Tan mastic		None detected	Mastic/binder	5	Synthetic fibers, Cellulose
8	41937.000-08	1	Red sandy/brittle material		None detected	Sand, Filler, Binder	2	Cellulose
		1	Gray sandy/brittle material		None detected	Sand, Filler, Binder	3	Cellulose
9	41937.000-09	1	White sandy/brittle material with paint		None detected	Sand, Filler, Binder, Paint	4	Cellulose
10	41937.000-10	1	White sandy/brittle material with paint		None detected	Sand, Filler, Binder, Paint	2	Cellulose
11	41937.000-11	1	White powdery material		None detected	Filler, Binder	3	Cellulose
		2	White chalky material with paper		None detected	Binder/filler, Gypsum/binder	25	Cellulose
12	41937.000-12	1	White soft/elastic material		None detected	Binder, Filler	4	Cellulose
		2	White powdery material		None detected	Filler, Binder	3	Cellulose
		3	White chalky material with paper		None detected	Binder/filler, Gypsum/binder	24	Cellulose
13	41937.000-13	1	White powdery material		None detected	Filler, Binder	3	Cellulose
		2	White chalky material with paper		None detected	Binder/filler, Gypsum/binder	26	Cellulose

SEATTLE ASBESTOS TEST

Lynnwood Laboratory: 19701 Scriber Lake Road, Suite 103, Lynnwood, WA 98036, Tel: 425.673.9850, Cell & Text: 206.369.6421, NVLAP Lab Code: 200768-0

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ANALYTICAL LABORATORY REPORT

[PLM] EPA - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples;

[PLM] EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Attn.: Willem Mager

Client: PBS Engineering and Environmental, Seattle

Address: 214 E Galer Street, Suite 300, Seattle, WA 98102

Job#: 41937.000

Batch#: 202410106

Date Received: 6/10/2024

Samples Rec'd: 45

Date Analyzed: 6/11/2024

Samples Analyzed: 45

Project Loc.: Birch Bay Vogl Library Express

Analyzed by: Cici Xu
Steve Fanyao Zhang

Approved Signatory: *S Zhang*
Steve (Fanyao) Zhang, President

Lab ID	Client Sample ID	Layer	Description	%	Asbestos Fibers	Non-fibrous Components	%	Non-asbestos Fibers
14	41937.000-14	1	White soft/loose material		None detected	Filler, Fine particles	5	Cellulose
15	41937.000-15	1	White powdery material with paint	2	Chrysotile	Binder/filler, Paint	5	Cellulose
16	41937.000-16	1	White powdery material with paint		None detected	Binder/filler, Paint	5	Cellulose
17	41937.000-17	1	Black soft material	3	Chrysotile	Filler, Binder	3	Cellulose
18	41937.000-18	1	White soft/loose material	2	Chrysotile	Filler, Fine particles	5	Cellulose
19	41937.000-19	1	Yellow foamy material		None detected	Synthetic foam		None detected
20	41937.000-20	1	White ceramic		None detected	Ceramic/binder		None detected
		2	White brittle/sandy material		None detected	Binder, Sand	2	Cellulose
		3	Trace white mastic		None detected	Mastic/binder	2	Cellulose
21	41937.000-21	1	Orange soft/elastic material		None detected	Binder, Filler	4	Cellulose
22	41937.000-22	1	White soft/elastic material		None detected	Binder, Filler	3	Cellulose
23	41937.000-23	1	Clear soft/elastic material		None detected	Binder, Filler	2	Cellulose
24	41937.000-24	1	Clear soft/elastic material		None detected	Binder, Filler	4	Cellulose
25	41937.000-25	1	Brown rubbery material		None detected	Rubber/binder	2	Cellulose
		2	Clear mastic		None detected	Mastic/binder	2	Cellulose
26	41937.000-26	1	White soft lumpy material with paint		None detected	Synthetic foam, Filler, Binder, Paint	3	Cellulose
		2	White chalky material with paper		None detected	Binder/filler, Gypsum/binder	25	Cellulose, Glass fibers
27	41937.000-27	1	Off-white sheet vinyl		None detected	Vinyl/binder		None detected
		2	Gray fibrous material with mastic		None detected	Binder/filler, Mastic/binder	65	Cellulose
28	41937.000-28	1	Brown rubbery material		None detected	Rubber/binder	2	Cellulose
		2	Tan mastic		None detected	Mastic/binder	2	Cellulose
29	41937.000-29	1	Gray sandy/brittle material with paint		None detected	Sand, Filler, Binder, Paint	3	Cellulose

SEATTLE ASBESTOS TEST

Lynnwood Laboratory: 19701 Scriber Lake Road, Suite 103, Lynnwood, WA 98036, Tel: 425.673.9850, Cell & Text: 206.369.6421, NVLAP Lab Code: 200768-0

Disclaimer: This report must not be used by the client to claim product certification, approval, or endorsement by Seattle Asbestos Test, LLC, NVLAP, NIST, or any agency of the Federal government.

ANALYTICAL LABORATORY REPORT

[PLM] EPA – 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples;

[PLM] EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Attn.: Willem Mager

Client: PBS Engineering and Environmental, Seattle

Address: 214 E Galer Street, Suite 300, Seattle, WA 98102

Job#: 41937.000

Batch#: 202410106

Date Received: 6/10/2024

Samples Rec'd: 45

Date Analyzed: 6/11/2024

Samples Analyzed: 45

Project Loc.: Birch Bay Vogl Library Express

Cici Xu

Analyzed by: Steve (Fanyao) Zhang

Approved Signatory: Steve (Fanyao) Zhang, President

Lab ID	Client Sample ID	Layer	Description	%	Asbestos Fibers	Non-fibrous Components	%	Non-asbestos Fibers
30	41937.000-30	1	Gray sandy/brittle material with paint		None detected	Sand, Filler, Binder, Paint	4	Cellulose
31	41937.000-31	1	White ceramic		None detected	Ceramic/binder		None detected
		2	White brittle/sandy material		None detected	Binder, Sand	2	Cellulose
		3	Brown mastic		None detected	Mastic/binder	2	Cellulose
32	41937.000-32	1	Gray fibrous material		None detected	Filler, Fine particles	82	Cellulose
33	41937.000-33	1	Gray fibrous material		None detected	Filler, Fine particles	84	Cellulose
34	41937.000-34	1	Off-white soft/elastic material with woven fibrous material		None detected	Binder, Filler	20	Synthetic fibers
		2	Clear mastic		None detected	Mastic/binder	3	Cellulose
		3	Yellow fibrous material		None detected	Filler	90	Glass fibers
35	41937.000-35	1	Off-white soft/elastic material with woven fibrous material		None detected	Binder, Filler	18	Synthetic fibers
		2	Clear mastic		None detected	Mastic/binder	2	Cellulose
		3	Yellow fibrous material		None detected	Filler	88	Glass fibers
36	41937.000-36	1	White brittle material with paint		None detected	Filler, Binder, Paint	2	Cellulose
37	41937.000-37	1	Black asphaltic material with sand		None detected	Asphalt/binder, Sand	4	Cellulose
38	41937.000-38	1	Gray sandy/brittle material		None detected	Sand, Filler, Binder	3	Cellulose
39	41937.000-39	1	Tan soft/elastic material		None detected	Binder, Filler	4	Cellulose
40	41937.000-40	1	Gray sandy/brittle material		None detected	Sand, Filler, Binder	3	Cellulose
41	41937.000-41	1	Clear/white soft/elastic material		None detected	Binder, Filler	2	Cellulose
42	41937.000-42	1	Gray sandy/brittle material with paint		None detected	Sand, Filler, Binder, Paint	3	Cellulose

SEATTLE ASBESTOS TEST

Lynnwood Laboratory: 19701 Scriber Lake Road, Suite 103, Lynnwood, WA 98036, Tel: 425.673.9850, Cell & Text: 206.369.6421, NVLAP Lab Code: 200768-0

Disclaimer: This report must not be used by the client to claim product certification, approval, or endorsement by Seattle Asbestos Test, LLC, NVLAP, NIST, or any agency of the Federal government.

ANALYTICAL LABORATORY REPORT

[PLM] EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples;

[PLM] EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Attn.: Willem Mager

Client: PBS Engineering and
Environmental, Seattle

Address: 214 E Galer Street, Suite 300, Seattle, WA 98102

Job#: 41937.000

Batch#: 202410106

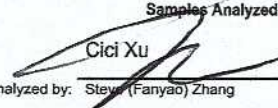
Date Received: 6/10/2024

Samples Rec'd: 45

Date Analyzed: 6/11/2024

Samples Analyzed: 45

Project Loc.: Birch Bay Vogl Library Express

Analyzed by:  Cici Xu
Steve (Fanyao) Zhang

Approved Signatory:  Steve (Fanyao) Zhang, President

Lab ID	Client Sample ID	Layer	Description	%	Asbestos Fibers	Non-fibrous Components	%	Non-asbestos Fibers
43	41937.000-43	1	Black asphaltic material with sand		None detected	Asphalt/binder, Sand	25	Glass fibers
		2	Black asphaltic fibrous material		None detected	Filler, Asphalt, Binder	67	Cellulose
44	41937.000-44	1	Black asphaltic material with sand		None detected	Asphalt/binder, Sand	26	Glass fibers
		2	Black asphaltic fibrous material		None detected	Filler, Asphalt, Binder	68	Cellulose
45	41937.000-45	1	Black asphaltic fibrous material		None detected	Filler, Asphalt, Binder	59	Cellulose

SEATTLE ASBESTOS TEST

NVLAP Accreditation Lab Codes: 200768

19701 Scriber Lake Road, Suite 103, Lynnwood, WA 98036, Tel:425.673.9850, Fax:425.673.9810
4500 9th Ave., NE, Suite 300, Seattle, WA 98105
Website:www.seattleasbestostest.com, Email:admin@seattleasbestostest.com

PLM by Point Count (400 points)

Attention: Willem Mager

Client: PBS Engineering and Environmental, Seattle

Address: 214 E Galer Street, Suite 300, Seattle, WA 98102

Client Job #: 41937.000

Laboratory Batch #: 202410113

Date Received: 6/11/2024

Samples Received: 1

Date Analyzed: 6/11/2024

Project: Birch Bay Vogl Library Express

Sample Requested for Point Count 41937.000-15Previous Analytical Information

Previously Analyzed by: Cici Xu

Previous Batch #: 202410106

Previous Lab ID: 15

Previous Description: White powdery material with paint

Layer to be Point Counted: 1

Asbestos Type Found: Chrysotile

Asbestos Percentage Found: 2

Point Count Analytical Procedures

New Lab ID: 1

	Asbestos Points	Non-Asbestos Points	Total Points Counted
Slide 1	0	50	50
Slide 2	0	50	50
Slide 3	0	50	50
Slide 4	0	50	50
Slide 5	0	50	50
Slide 6	1	49	50
Slide 7	0	50	50
Slide 8	0	50	50
Total	1	399	400

Point Count Summary Results

Type of Asbestos: Chrysotile

Percentage of Asbestos: 0.25%

Analyzed By: Cici Xu

Reviewed by: Steve Zhang, President

May 19, 2025



Willem Mager
PBS Environmental - Seattle
214 E Galer St. Suite. 300
Seattle, WA 98102

RE: Bulk Asbestos Fiber Analysis; NVL Batch # 2508698.00

Client Project: 41937.000
Location: Birch Bay Vogt Library

Dear Mr. Mager,

Enclosed please find test results for the 2 sample(s) submitted to our laboratory for analysis on 5/16/2025.

Examination of these samples was conducted for the presence of identifiable asbestos fibers using polarized light microscopy (PLM) with dispersion staining in accordance with **U. S. EPA 40 CFR Appendix E to Subpart E of Part 763**, Interim Method for the Determination of Asbestos in Bulk Insulation Samples and **EPA 600/R-93/116**, Method for the Determination of Asbestos in Bulk Building Materials.

For samples containing more than one separable layer of materials, the report will include findings for each layer (labeled Layer 1 and Layer 2, etc. for each individual layer). The asbestos concentration in the sample is determined by calibrated visual estimation.

For those samples with asbestos concentrations between 1 and 10 percent based on visual estimation, the EPA recommends a procedure known as point counting (NESHAPS, 40 CFR Part 61). Point counting is a statistically more accurate means of quantification for samples with low concentrations of asbestos.

The detection limit for the calibrated visual estimation is <1%, 400 point counts is 0.25% and 1000 point counts is 0.1%

Samples are archived for two weeks following analysis. Samples that are not retrieved by the client are discarded after two weeks.

Thank you for using our laboratory services. Please do not hesitate to call if there is anything further we can assist you with.

Sincerely,

A handwritten signature in black ink, appearing to read 'Hilary Crumley'.

Hilary Crumley, Manager Asbestos Laboratory

The logo for NVLAP Testing. It features the letters 'NVLAP' in a large, stylized, outlined font, with a small 'Q' shape at the end of the 'P'. Below this, the word 'Testing' is written in a smaller, sans-serif font.

Lab Code: 102063-0

Enc.: Sample Results

Phone: 206 547.0100 | Fax: 206 634.1936 | Toll Free: 1.888.NVL.LABS (685.5227)
4708 Aurora Avenue North | Seattle, WA 98103-6516



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Attention: Mr. Willem Mager

Project Location: Birch Bay Vogt Library

Batch #: 2508698.00

Client Project #: 41937.000

Date Received: 5/16/2025

Samples Received: 2

Samples Analyzed: 2

Method: EPA/600/R-93/116

Lab ID: 250050258 Client Sample #: 41937.000-5.16-01

Location: Birch Bay Vogt Library

Layer 1 of 2 Description: Gray cementitious material with wood flakes and debris

Non-Fibrous Materials:	Other Fibrous Materials: %
Cement/Binder, Fine grains, Fine particles	Cellulose 2%
Wood flakes, Debris	Synthetic fibers <1%

Asbestos Type: %

Chrysotile 29%

Layer 2 of 2 Description: Gray cementitious material

Non-Fibrous Materials:	Other Fibrous Materials: %
Cement/Binder, Fine particles, Fine grains	None Detected ND

Asbestos Type: %

Chrysotile 31%

Sampled by: Client

Analyzed by: Ghulam Nazari

Reviewed by: Hilary Crumley

Date: 05/19/2025

Date: 05/19/2025

Hilary Crumley, Manager Asbestos Laboratory

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government

ASBESTOS LABORATORY SERVICES



Company PBS Environmental - Seattle
Address 214 E Galer St. Suite. 300
 Seattle, WA 98102
Project Manager Mr. Willem Mager
Phone (206) 233-9639
Office: (800) 628-9639

NVL Batch Number 2508698.00
TAT 1 Day **AH** No
Rush TAT
Due Date 5/19/2025 **Time** 12:15 PM
Email willem.mager@pbsusa.com
Fax (866) 727-0140

Project Name/Number: 41937.000 **Project Location:** Birch Bay Vogt Library

Subcategory PLM Bulk

Item Code ASB-02 EPA 600/R-93-116 Asbestos by PLM <bulk>

Total Number of Samples 2

Rush Samples

	Lab ID	Sample ID	Description	A/R
1	250050258	41937.000-5.16-01		A
2	250050259	41937.000-5.16-02		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Kelly AuVu		NVL	5/16/25	1215
Analyzed by	Ghulam Nazari		NVL	5/19/25	
Results Called by					
☐ Faxed ☐ Emailed					

Special Instructions:

Date: 5/16/2025
 Time: 12:42 PM
 Entered By: Laura Carcone

APPENDIX B

FAA Lead Paint Chip Sampling Information

FAA Lead Paint Chip Sample Inventory

FAA Lead Paint Chip Laboratory Data Sheets

FAA Lead Paint Chip Chain of Custody Documentation

AA LEAD PAINT CHIP SAMPLE INVENTORY

<u>PBS Sample #</u>	<u>Paint Color / Component or Substrate</u>	<u>Sample Location</u>	<u>Results (mg/kg)</u>	<u>Results (%)</u>	<u>Lab</u>
41937.000-L01	Brown paint on wood siding	Exterior back porch	<71	<0.0071	NVL
41937.000-L02	Off-white paint on wood pole	Front porch on south side	<86	<0.0086	NVL
41937.000-L03	Red paint on cement step	Front porch stairs	470	0.047	NVL
41937.000-L04	White paint on concrete wall	Basement stairwell	72	0.0072	NVL
41937.000-L05	Off-white paint on gypsum wallboard	Utility room near window	<52	<0.0052	NVL
41937.000-L06	Light salmon paint on gypsum wallboard	1st floor kitchen closet	<50	<0.0050	NVL
41937.000-L07	White paint on wood frame	Window in 1st floor stairwell	1300	0.13	NVL
41937.000-L08	Varnish on wood base board	Stairs to 2nd floor	2100	0.21	NVL
41937.000-L09	Off-white paint on plaster wall	2nd floor stairwell	270	0.027	NVL
41937.000-L10	Off-white paint on plaster wall	2nd floor in stairwell near south bedroom	140	0.014	NVL
41937.000-L11	Pink paint on plaster wall	2nd floor south bedroom closet	220	0.022	NVL
41937.000-L12	Varnish on wood floor	2nd floor central bedroom closet	770	0.077	NVL
41937.000-L13	Off-white paint on plaster ceiling	2nd floor bathroom	<46	<0.0046	NVL
41937.000-L14	Brown paint on metal wall	Shed 1	310	0.031	NVL
41937.000-L15	Brown paint on wood garage door frame	Shed 1	<83	<0.0083	NVL
41937.000-L16	Orange paint on on wood door	Shed 2	76000	7.6	NVL
41937.000-L17	Mint paint on wood door	Shed 2	4600	0.46	NVL

AA LEAD PAINT CHIP SAMPLE INVENTORY

<u>PBS Sample #</u>	<u>Paint Color / Component or Substrate</u>	<u>Sample Location</u>	<u>Results (mg/kg)</u>	<u>Results (%)</u>	<u>Lab</u>
41937.000-L18	Red paint on metal wall	Shed 2	41000	4.1	NVL
41937.000-L19	Brown paint on metal wall	Exterior of house on south side	<180	<0.018	NVL
41937.000-5.16-Pb01	Creosote soaked wood	Basement level	<37	<0.0037	NVL

June 11, 2024

Willem Mager

PBS Environmental - Seattle

214 E Galer St. Suite. 300

Seattle, WA 98102



NVL Batch # 2410269.00

RE: Total Metal Analysis
Method: EPA 7000B Lead by FAA <paint>
Item Code: FAA-02

Client Project: 41937.000

Location: Birch Bay Vogt Library Express

Dear Mr. Mager,

NVL Labs received 19 sample(s) for the said project on 6/10/2024. Preparation of these samples was conducted following protocol outlined in EPA 3051/7000B , unless stated otherwise. Analysis of these samples was performed using analytical instruments in accordance with EPA 7000B Lead by FAA <paint>. The results are usually expressed in mg/Kg and percentage (%). Test results are not blank corrected.

For recent regulation updates pertaining to current regulatory levels or permissible exposure levels, please call your local regulatory agencies for more detail.

At NVL Labs all analyses are performed under strict guidelines of the Quality Assurance Program. This report is considered highly confidential and will not be released without your approval. Samples are archived after two weeks from the analysis date. Please feel free to contact us at 206-547-0100, in case you have any questions or concerns.

Sincerely,

A handwritten signature in black ink, appearing to read "Munaf Khan".

Munaf Khan, President/Laboratory Director

Enc.: Sample results



Phone: 206 547.0100 | Fax: 206 634.1936 | Toll Free: 1.888.NVL.LABS (685.5227)
4708 Aurora Avenue North | Seattle, WA 98103-6516

Analysis Report

Total Lead (Pb)



Client: PBS Environmental - Seattle
Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2410269.00

Matrix: Paint
Method: EPA 3051/7000B
Client Project #: 41937.000
Date Received: 6/10/2024
Samples Received: 19
Samples Analyzed: 19

Attention: Mr. Willem Mager

Project Location: Birch Bay Vogt Library Express

Lab ID	Client Sample #	Sample Weight (g)	RL in mg/Kg	Results in mg/Kg	Results in percent
24062357	41937.000-L01	0.1401	71	< 71	<0.0071
24062358	41937.000-L02	0.1159	86	< 86	<0.0086
24062359	41937.000-L03	0.1800	56	470	0.047
24062360	41937.000-L04	0.1509	66	72	0.0072
24062361	41937.000-L05	0.1940	52	< 52	<0.0052
24062362	41937.000-L06	0.2000	50	< 50	<0.0050
24062363	41937.000-L07	0.1218	82	1300	0.13
24062364	41937.000-L08	0.0473	110	2100	0.21
24062365	41937.000-L09	0.2062	48	270	0.027
24062366	41937.000-L10	0.1801	56	140	0.014
24062367	41937.000-L11	0.2063	48	220	0.022
24062368	41937.000-L12	0.1801	56	770	0.077
24062369	41937.000-L13	0.2153	46	< 46	<0.0046
24062370	41937.000-L14	0.0246	200	310	0.031
24062371	41937.000-L15	0.1204	83	< 83	<0.0083
24062372	41937.000-L16	0.1912	52	76000	7.6
24062373	41937.000-L17	0.1816	55	4600	0.46
24062374	41937.000-L18	0.0202	250	41000	4.1
24062375	41937.000-L19	0.0542	180	< 180	<0.018

Comments: Small sample size (<0.5g) for 41937.000-L08, -L14, and -L18.

Sampled by: Client

Analyzed by: Yasuyuki Hida

Reviewed by: Munaf Khan

Date Analyzed: 06/10/2024

Date Issued: 06/11/2024

Munaf Khan, President/Laboratory Director

mg/ Kg =Milligrams per kilogram

Percent = Milligrams per kilogram / 10000

Note : Method QC results are acceptable unless stated otherwise.

Unless otherwise indicated, the condition of all samples was acceptable at time of receipt.

RL = Reporting Limit

'<' = Below the reporting Limit

Bench Run No: 2024-0610-13

FAA-02

LEAD LABORATORY SERVICES



Company PBS Environmental - Seattle
Address 214 E Galer St. Suite. 300
 Seattle, WA 98102
Project Manager Mr. Willem Mager
Phone (206) 233-9639
Office: (800) 628-9639

NVL Batch Number 2410269.00
TAT 2 Days **AH** No
Rush TAT
Due Date 6/12/2024 **Time** 1:45 PM
Email willem.mager@pbsusa.com
Fax (866) 727-0140

Project Name/Number: 41937.000 **Project Location:** Birch Bay Vogt Library Express

Subcategory Flame AA (FAA)
Item Code FAA-02 EPA 7000B Lead by FAA <paint>

Total Number of Samples 19 **Rush Samples**

	Lab ID	Sample ID	Description	A/R
1	24062357	41937.000-L01		A
2	24062358	41937.000-L02		A
3	24062359	41937.000-L03		A
4	24062360	41937.000-L04		A
5	24062361	41937.000-L05		A
6	24062362	41937.000-L06		A
7	24062363	41937.000-L07		A
8	24062364	41937.000-L08		A
9	24062365	41937.000-L09		A
10	24062366	41937.000-L10		A
11	24062367	41937.000-L11		A
12	24062368	41937.000-L12		A
13	24062369	41937.000-L13		A
14	24062370	41937.000-L14		A
15	24062371	41937.000-L15		A
16	24062372	41937.000-L16		A
17	24062373	41937.000-L17		A
18	24062374	41937.000-L18		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Kelly AuVu		NVL	6/10/24	1345
Analyzed by	Yasuyuki Hida		NVL	6/10/24	
Results Called by					
☐ Faxed ☐ Emailed					

Special Instructions:

Date: 6/10/2024
 Time: 2:11 PM
 Entered By: Kelly AuVu

LEAD LABORATORY SERVICES



Company PBS Environmental - Seattle
Address 214 E Galer St. Suite. 300
 Seattle, WA 98102
Project Manager Mr. Willem Mager
Phone (206) 233-9639
Office: (800) 628-9639

NVL Batch Number 2410269.00
TAT 2 Days **AH** No
Rush TAT
Due Date 6/12/2024 **Time** 1:45 PM
Email willem.mager@pbsusa.com
Fax (866) 727-0140

Project Name/Number: 41937.000 **Project Location:** Birch Bay Vogt Library Express

Subcategory Flame AA (FAA)

Item Code FAA-02 EPA 7000B Lead by FAA <paint>

Total Number of Samples 19

Rush Samples

	Lab ID	Sample ID	Description	A/R
19	24062375	41937.000-L19		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Kelly AuVu		NVL	6/10/24	1345
Analyzed by	Yasuyuki Hida		NVL	6/10/24	
Results Called by					
☐ Faxed ☐ Emailed					

Special Instructions:

Date: 6/10/2024
 Time: 2:11 PM
 Entered By: Kelly AuVu

Project: Birch Bay Vag Library Express
 Analysis requested: FAA-Lead
 Relinq'd by/Signature: [Signature]
 Received by/Signature: Kearsten e nm

Project #: 41937.000 Page 1 of 1
 Date: 6/10/24
 Date/Time: 6/10/24
 Date/Time: 6/10/24 1345

Email ALL INVOICES to: seattleap@pbsusa.com

E-mail results to:

- ☒ Willem Mager
☐ Gregg Middaugh
☐ Mark Hiley
☐ Ryan Hunter
☐ Janet Murphy

- ☐ Ferman Fletcher
☐ Claire Tsai
☐ Toan Nguyen
☐ Peter Stensland
☐ Cameron Budnick

- ☐ Nick San
☒ Katie King
☐ Sam Christensen
☐ Kameron DeMonnin
☐ _____

TURN AROUND TIME:

- ☐ 1 Hour
☐ 2 Hours
☐ 4 Hours

- ☐ 24 Hours
☒ 48 Hours

- ☐ 3-5 Days
☐ Other _____

NOTE: ***Composite if positive

SAMPLE DATA FORM

Sample #	Material	Location	Lab
41937.000-101	brown paint on wood siding	Exterior back porch	NVL
"-L02	off-white paint on wood pole	Front porch South side	
"-L03	Red paint on cement step	Front porch stairs	
"-L04	white paint on concrete wall	Basement stairwell	
"-L05	off-white paint on gypsum wall	Utility room by window	
"-L06	light salmon paint on gypsum wall	1st floor kitchen closet	
"-L07	White paint on wood frame	Window in 1st floor stairwell	
"-L08	Wood vernish on wood baseboard	Stairs to 2nd floor	
"-L09	off-white paint on plaster wall	2nd floor stairwell	
"-L10	off-white paint on plaster wall	2nd floor west bedroom closet	
"-L11	Pink paint on plaster wall	2nd floor South room closet	
"-L12	Vernish on wood floor	2nd floor central room closet	
"-L13	Off-white paint on plaster ceiling	2nd floor bathroom	
"-L14	Brown paint on metal wall	Storage Shed 1	
"-L15	Brown paint on wood door	Storage Shed 1	
"-L16	Orange paint on wood door	Storage Shed 2	
"-L17	Mint paint on wood door	Storage Shed 2	
"-L18	Red paint on metal wall	Storage Shed 2	
"-L19	Brown paint on metal walls	Exterior of house	

May 17, 2025

Willem Mager

PBS Environmental - Seattle

214 E Galer St. Suite. 300

Seattle, WA 98102



NVL Batch # 2508700.00

RE: Total Metal Analysis
Method: EPA 7000B Lead by FAA <paint>
Item Code: FAA-02

Client Project: 41937.000
Location: Birch Bay Vogt Library

Dear Mr. Mager,

NVL Labs received 1 sample(s) for the said project on 5/16/2025. Preparation of these samples was conducted following protocol outlined in EPA 3051/7000B , unless stated otherwise. Analysis of these samples was performed using analytical instruments in accordance with EPA 7000B Lead by FAA <paint>. The results are usually expressed in mg/Kg and percentage (%). Test results are not blank corrected.

For recent regulation updates pertaining to current regulatory levels or permissible exposure levels, please call your local regulatory agencies for more detail.

At NVL Labs all analyses are performed under strict guidelines of the Quality Assurance Program. If samples were collected by the customer, then the reported test results apply only to the samples as received by NVL Labs. This report is considered highly confidential and will not be released without your approval. Samples are archived after two weeks from the analysis date. Please feel free to contact us at 206-547-0100, in case you have any questions or concerns.

Sincerely,

A handwritten signature in black ink, appearing to read "Shalini Patel".

Shalini Patel, Manager Metals/Org Laboratory

Enc.: Sample results



Phone: 206 547.0100 | Fax: 206 634.1936 | Toll Free: 1.888.NVL.LABS (685.5227)
4708 Aurora Avenue North | Seattle, WA 98103-6516

Analysis Report

Total Lead (Pb)



Client: PBS Environmental - Seattle
Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2508700.00

Matrix: Bulk
Method: EPA 3051/7000B
Client Project #: 41937.000
Date Received: 5/16/2025
Samples Received: 1
Samples Analyzed: 1

Attention: Mr. Willem Mager

Project Location: Birch Bay Vogt Library

Lab ID	Client Sample #	Sample Weight (g)	RL in mg/Kg	Results in mg/Kg	Results in percent
250050261	41937.000-5.16-Pb01	0.2674	37	< 37	<0.0037

Sampled by: Client

Analyzed by: Yasuyuki Hida

Reviewed by: Shalini Patel

Date Analyzed: 05/16/2025

Date Issued: 05/17/2025


Shalini Patel, Manager Metals/Org Laboratory

mg/ Kg =Milligrams per kilogram

Percent = Milligrams per kilogram / 10000

Note : Method QC results are acceptable unless stated otherwise.

Unless otherwise indicated, the condition of all samples was acceptable at time of receipt.

RL = Reporting Limit

'<' = Below the reporting Limit

Bench Run No: 2025-0516-01

FAA-02

LEAD LABORATORY SERVICES



Company PBS Environmental - Seattle
Address 214 E Galer St. Suite. 300
 Seattle, WA 98102
Project Manager Mr. Willem Mager
Phone (206) 233-9639
Office: (800) 628-9639

NVL Batch Number 2508700.00
TAT 1 Day **AH** No
Rush TAT
Due Date 5/19/2025 **Time** 12:15 PM
Email willem.mager@pbsusa.com
Fax (866) 727-0140

Project Name/Number: 41937.000 **Project Location:** Birch Bay Vogt Library

Subcategory Flame AA (FAA)

Item Code FAA-02 EPA 7000B Lead by FAA <paint>

Total Number of Samples 1

Rush Samples

	Lab ID	Sample ID	Description	A/R
1	250050261	41937.000-5.16-Pb01		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Kelly AuVu		NVL	5/16/25	1215
Analyzed by	Yasuyuki Hida		NVL	5/16/25	
Results Called by					
☐ Faxed ☐ Emailed					

Special Instructions:

Date: 5/16/2025
 Time: 12:45 PM
 Entered By: Laura Carcone

APPENDIX C

PCBs Sampling Information and Lab Results

7948 Birch Bay Dr, Blaine, WA
Whatcom County Library System
PCB SAMPLE INVENTORY

PBS Engineering + Environmental
PBS Project #41937.000

<u>PBS Sample #</u>	<u>Material</u>	<u>Sample Location</u>	<u>Analyte</u>	<u>Lab Results (mg/kg)</u>	<u>Lab</u>
41937.000-PCB01	Black window putty	1st floor utility room	Aroclor-1016	< 18	NVL
			Aroclor-1221	< 18	
			Aroclor-1232	< 18	
			Aroclor-1242	< 18	
			Aroclor-1248	< 18	
			Aroclor-1254	< 18	
			Aroclor-1260	< 18	
			Total PCBs:	< 18	
41937.000-PCB02	White window caulk	Exterior back porch window	Aroclor-1016	< 2.1	NVL
			Aroclor-1221	< 2.1	
			Aroclor-1232	< 2.1	
			Aroclor-1242	< 2.1	
			Aroclor-1248	< 2.1	
			Aroclor-1254	< 2.1	
			Aroclor-1260	< 2.1	
			Total PCBs:	< 2.1	
41937.000-PCB03	White and clear window caulk	Exterior window southeast side of house on	Aroclor-1016	< 7.8	NVL
			Aroclor-1221	< 7.8	
			Aroclor-1232	< 7.8	
			Aroclor-1242	< 7.8	
			Aroclor-1248	< 7.8	
			Aroclor-1254	< 7.8	
			Aroclor-1260	< 7.8	
			Total PCBs:	< 7.8	

7948 Birch Bay Dr, Blaine, WA
Whatcom County Library System
PCB SAMPLE INVENTORY

PBS Engineering + Environmental
PBS Project #41937.000

<u>PBS Sample #</u>	<u>Material</u>	<u>Sample Location</u>	<u>Analyte</u>	<u>Lab Results (mg/kg)</u>	<u>Lab</u>
41937.000-PCB04	White window caulk	Shed 2 side door	Aroclor-1016	< 3.9	NVL
			Aroclor-1221	< 3.9	
			Aroclor-1232	< 3.9	
			Aroclor-1242	< 3.9	
			Aroclor-1248	< 3.9	
			Aroclor-1254	< 3.9	
			Aroclor-1260	< 3.9	
			Total PCBs:	< 3.9	

June 13, 2024

Willem Mager

PBS Environmental - Seattle

214 E Galer St. Suite. 300
Seattle, WA 98102



NVL Batch # 2410270.00

RE: Organics PCB
Method: 8082 PCB Aroclors <Bulk>
Item Code: ORG-05

Client Project: 41937.000
Location: Birch Bay Vogt Library Express

Dear Mr. Mager,

Enclosed please find test results for samples submitted to our laboratory for analysis. Preparation and analysis of these samples were conducted in accordance with published industry standards and methods specified on the attached analytical report.

The content of this package consists of the following:

- Case Narrative & Definition of Data Qualifiers
- Analytical Test Results
- Applicable QC Summary
- Client Chain-of-Custody (CoC)
- NVL Receiving Record

The report is considered highly confidential and will not be released without your approval. Samples are archived for two weeks following analysis. Samples that are not retrieved by the client will be discarded after two weeks.

Thank you for using our laboratory services. If you need further assistance, please contact us at 206-547-0100 or 1-888-NVLLABS.

Sincerely,

Aaron Brown, Laboratory Analyst

Enc.: Sample results



NVL Batch # 2410270.00

Case Narrative:

The following summarizes samples received on date as shown on the accompanied Chain of custody by NVL Laboratories, Inc. from PBS Environmental - Seattle for Project Number 41937.000. Samples were logged in for PCB analysis per client request using both customer sample ID's and laboratory assigned ID's as listed on the Chain-of-Custody (CoC). All samples as received were processed and analyzed within specified turnaround time without any abnormalities and deviations that may affect the analytical results. All quality control requirements were acceptable unless stated otherwise. The conditions of all samples were acceptable at time of receipt and all samples submitted with this batch were analyzed unless stated otherwise on the CoC.

Test Results are reported in milligrams per kilogram (mg/kg) for PCB samples as shown on the analytical reports.

Definition Appendix**Terms**

% Rec	Percent recovery.
<	Below Reporting Limit(RL) or Limit of Quantitation(LoQ) of the instrument.
B	Blank contamination. The recorded results is associated with a contaminated blank.
DF	Dilution Factor
J	The reported concentration is an estimated value because something may be present in the sample that interfered with the analysis.
J1	The reported concentration is an estimated value because the laboratory control sample (LCS) is out of control limits.
J2	The reported concentration is an estimated value because the percent recovery for matrix spike is out of control limits.
J3	The reported concentration is an estimated value because the relative percent difference(RPD) for duplicate analysis is out of control limits.
J4	Percent recovery is outside of established control limits.
LCS	Laboratory Control Sample.
LFS	Laboratory Fortified Spike
Limits	The upper and lower control limits for spike recoveries.
LN	Quality control sample is outside of control limits. This analyte was not detected in the sample.
LOQ	Limit of quantitation(same as RL)
mg/kg	Milligrams per kilogram.
ND	Analyte not detected or below the reporting limit of the instrument or methodology

Definition Appendix**Terms**

PPM	Parts per Million.
QC Batch Group	Quality Control Batch Group. The entity that links analytical results and supporting quality control results.
R	The data are not reliable due to possible contamination or loss of material during preparation or analysis. Re-sampling and reanalysis are necessary for verification.
RL	Reporting Limit. The minimum concentration that can be quantified under routine operating conditions.
RPD	Relative Percent Difference. The relative difference between duplicate results(matrix spike, blank spike, or samples duplicate) expressed as a percentage.
RPD Limit	The maximum RPD allowed for a set of duplicate measurements(see RPD).
SSMI	Surrogate has matrix interference.
Spike Conc	The measured concentration, in sample basis units, of a spiked sample.
SURR-ND	Surrogate was not detected due to matrix interference or dilution.
ug/m ³	Micrograms per cubic meter.
ug/100cm ²	Micrograms per hundred square centimeter.

Samples Analyzed: 4

mg/Kg

Comments: Reporting limit raised due to small sample size and dilution (matrix interference).

Analysis Report

Polychlorinated Biphenyls by Gas Chromatography



Client: PBS Environmental - Seattle
Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2410270.00

Matrix: Bulk
Analysis Method: EPA 8082
Preparation Method: EPA 3546
Client Project #: 41937.000
Date Received: 6/10/2024
Samples Received: 4
Samples Analyzed: 4

Attention: Mr. Willem Mager
Project Location: Birch Bay Vogt Library Express

Sample Number **41937.000-PCB02**
Lab Sample ID 24062377
Initial Sample Size 0.4833 gm

Matrix Bulk
Units of Result mg/Kg

Analyte	RL	Final Result	Analysis Date
Aroclor-1016	2.1	< 2.1	6/11/2024
Aroclor-1221	2.1	< 2.1	6/11/2024
Aroclor-1232	2.1	< 2.1	6/11/2024
Aroclor-1242	2.1	< 2.1	6/11/2024
Aroclor-1248	2.1	< 2.1	6/11/2024
Aroclor-1254	2.1	< 2.1	6/11/2024
Aroclor-1260	2.1	< 2.1	6/11/2024
PCBs, Total	2.1	< 2.1	

Comments: Reporting limit raised due to small sample size.

Analysis Report

Polychlorinated Biphenyls by Gas Chromatography



Batch #: 2410270.00

Matrix: Bulk

Analysis Method: EPA 8082

Preparation Method: EPA 3546

Client Project #: 41937.000

Date Received: 6/10/2024

Samples Received: 4

Samples Analyzed: 4

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Attention: Mr. Willem Mager

Project Location: Birch Bay Vogt Library Express

Sample Number **41937.000-PCB03**

Lab Sample ID 24062378

Initial Sample Size 0.1277 gm

Matrix

Bulk

Units of Result

mg/Kg

Analyte	RL	Final Result	Analysis Date
Aroclor-1016	7.8	< 7.8	6/11/2024
Aroclor-1221	7.8	< 7.8	6/11/2024
Aroclor-1232	7.8	< 7.8	6/11/2024
Aroclor-1242	7.8	< 7.8	6/11/2024
Aroclor-1248	7.8	< 7.8	6/11/2024
Aroclor-1254	7.8	< 7.8	6/11/2024
Aroclor-1260	7.8	< 7.8	6/11/2024
PCBs, Total	7.8	< 7.8	

Comments: Reporting limit raised due to small sample size.

Analysis Report

Polychlorinated Biphenyls by Gas Chromatography



Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2410270.00

Matrix: Bulk

Analysis Method: EPA 8082

Preparation Method: EPA 3546

Client Project #: 41937.000

Date Received: 6/10/2024

Samples Received: 4

Samples Analyzed: 4

Attention: Mr. Willem Mager

Project Location: Birch Bay Vogt Library Express

Sample Number **41937.000-PCB04**

Lab Sample ID 24062379

Initial Sample Size 0.2596 gm

Matrix

Bulk

Units of Result

mg/Kg

Analyte	RL	Final Result	Analysis Date
Aroclor-1016	3.9	< 3.9	6/11/2024
Aroclor-1221	3.9	< 3.9	6/11/2024
Aroclor-1232	3.9	< 3.9	6/11/2024
Aroclor-1242	3.9	< 3.9	6/11/2024
Aroclor-1248	3.9	< 3.9	6/11/2024
Aroclor-1254	3.9	< 3.9	6/11/2024
Aroclor-1260	3.9	< 3.9	6/11/2024
PCBs, Total	3.9	< 3.9	

Comments: Reporting limit raised due to small sample size.

Quality Control Results

Client Project #: 41937.000		Batch #: 2410270.00	
		Project Manager: Mr. Willem Mager	
Preparation Method: EPA 3546		Analysis Method: EPA 8082	
Preparation Date: 6/11/2024		Analysis Description: Polychlorinated Biphenyls by Gas Chromatography	
Blank: 2410270			

Analyte	Blank Results	Units	DF	RL	Control Limit	Qualifiers
Aroclor-1016	ND	mg/Kg	1	1.00	1.00	
Aroclor-1221	ND	mg/Kg	1	1.00	1.00	
Aroclor-1232	ND	mg/Kg	1	1.00	1.00	
Aroclor-1242	ND	mg/Kg	1	1.00	1.00	
Aroclor-1248	ND	mg/Kg	1	1.00	1.00	
Aroclor-1254	ND	mg/Kg	1	1.00	1.00	
Aroclor-1260	ND	mg/Kg	1	1.00	1.00	
PCBs, Total	ND	mg/Kg	1			
<i>Surrogates:</i>				% Rec		
Tetrachloro-m-xylene			1	94	40-140	
Decachlorobiphenyl			1	110	40-140	

Lab Control Sample: LCS 1254-2410270

Analyte	Blank Spike Results	Units	DF	Spike Conc	% Rec	Limits	Qualifiers
Aroclor-1254	17	mg/Kg	1	20.00	85	40-140	
<i>Surrogates:</i>							
Tetrachloro-m-xylene			1		95	40-140	
Decachlorobiphenyl			1		100	40-140	

Lab Control Sample: LCS 1016+1260-2410270

Lab Control Sample Duplicate: LCS Dup 1016+1260

Analyte	Blank Spike Results	Units	DF	Spike Conc	% Rec	Limits	RPD %	RPD Limit	Qualifiers
Aroclor-1016	16	mg/Kg	1	20.00	80	40-140			
	21			20.00	110	40-140	25	50%	
Aroclor-1260	19	mg/Kg	1	20.00	95	40-140			
	22			20.00	110	40-140	15	50%	
<i>Surrogates:</i>									
Tetrachloro-m-xylene			1		78	40-140			
					94	40-140			
Decachlorobiphenyl			1		120	40-140			
					110	40-140			

* Recovery outside of control limits

Surrogate Recovery Summary Report

Client PBS Environmental - Seattle

Batch # 2410270.00

Project 41937.000

Customer Sample ID	Lab Sample ID	Analyte	Recovery	Limits
41937.000-PCB01	24062376	Decachlorobiphenyl	61%	40-140
41937.000-PCB01	24062376	Tetrachloro-m-xylene	44%	40-140
41937.000-PCB02	24062377	Decachlorobiphenyl	85%	40-140
41937.000-PCB02	24062377	Tetrachloro-m-xylene	82%	40-140
41937.000-PCB03	24062378	Decachlorobiphenyl	81%	40-140
41937.000-PCB03	24062378	Tetrachloro-m-xylene	73%	40-140
41937.000-PCB04	24062379	Decachlorobiphenyl	81%	40-140
41937.000-PCB04	24062379	Tetrachloro-m-xylene	66%	40-140

*Recovery outside of the limits

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Sample	Analyzed	Analyte	Target	Solution Conc	Unit	% Rec	Limits
ICV-1016	6/11/2024	Aroclor-1016	5.0	5.48	ug/mL	110	85-115
ICV-1254	6/11/2024	Aroclor-1254	5.0	5.45	ug/mL	109	85-115
ICV-1260	6/11/2024	Aroclor-1260	5.0	5.66	ug/mL	113	85-115
CCV1-1016	6/11/2024	Aroclor-1016	5.0	5.00	ug/mL	100	80-120
CCV1-1254	6/11/2024	Aroclor-1254	5.0	5.00	ug/mL	100	80-120
CCV1-1260	6/11/2024	Aroclor-1260	5.0	5.00	ug/mL	100	80-120
CCV2-1016	6/11/2024	Aroclor-1016	5.0	5.24	ug/mL	105	80-120
CCV2-1254	6/11/2024	Aroclor-1254	5.0	5.14	ug/mL	103	80-120
CCV2-1260	6/11/2024	Aroclor-1260	5.0	5.43	ug/mL	109	80-120
CCV3-1016	6/11/2024	Aroclor-1016	5.0	4.96	ug/mL	99	80-120
CCV3-1254	6/11/2024	Aroclor-1254	5.0	5.12	ug/mL	102	80-120
CCV3-1260	6/11/2024	Aroclor-1260	5.0	5.16	ug/mL	103	80-120

% Rec - Percent recovery

* Percent recovery not within control limits

ORGANICS LABORATORY SERVICES



Company PBS Environmental - Seattle
Address 214 E Galer St. Suite. 300
 Seattle, WA 98102
Project Manager Mr. Willem Mager
Phone (206) 233-9639
Office: (800) 628-9639

NVL Batch Number 2410270.00
TAT 5 Days **AH** No
Rush TAT
Due Date 6/17/2024 **Time** 1:45 PM
Email willem.mager@pbsusa.com
Fax (866) 727-0140

Project Name/Number: 41937.000 **Project Location:** Birch Bay Vogt Library Express

Subcategory Quantitative analysis

Item Code ORG-05 8082 PCB Aroclors <Bulk>

Total Number of Samples 4

Rush Samples

	Lab ID	Sample ID	Description	A/R
1	24062376	41937.000-PCB01		A
2	24062377	41937.000-PCB02		A
3	24062378	41937.000-PCB03		A
4	24062379	41937.000-PCB04		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Kelly AuVu		NVL	6/10/24	1345
Analyzed by	Evelyn Ahulu		NVL	6/11/24	
Results Called by					
☐ Faxed ☐ Emailed					

Special Instructions:

Date: 6/10/2024
 Time: 2:15 PM
 Entered By: Kelly AuVu



Date/Time: 6/6/24 1345

APPENDIX D

Certifications

THIS IS TO CERTIFY THAT

KATIE KING

HAS SUCCESSFULLY COMPLETED THE TRAINING COURSE

for

ONLINE AHERA ASBESTOS INSPECTOR REFRESHER

In accordance with TSCA Title II, Part 763, Subpart E, Appendix C of 40 CFR

Course Date: 12/18/2025

Course Location: Online

Certificate: IRO-25-4605C

For verification of the authenticity of this
certificate contact:

Apex Companies, LLC, by and through its wholly owned
subsidiary PBS Engineering and Environmental LLC (Apex)
4412 S Corbett Avenue
Portland, OR 97239
503.248.1939



CCB #SRA0615 4-Hr Training

4-Hour Online AHERA Inspector Refresher
Training; AHERA is the Asbestos Hazard
Emergency Response Act enacting Title II
of Toxic Substance Control Act (TSCA)

Expiration Date: 12/18/2026

A handwritten signature in black ink, reading 'David Kahn'.

David Kahn, Instructor

THIS IS TO CERTIFY THAT

WILLEM MAGER

HAS SUCCESSFULLY COMPLETED THE TRAINING COURSE

for

ONLINE AHERA ASBESTOS INSPECTOR REFRESHER

In accordance with TSCA Title II, Part 763, Subpart E, Appendix C of 40 CFR

Course Date: 01/22/2026

Course Location: Online

Certificate: IRO-26-0536B

For verification of the authenticity of this
certificate contact:

Apex Companies, LLC, by and through its wholly owned
subsidiary PBS Engineering and Environmental LLC (Apex)
4412 S Corbett Avenue
Portland, OR 97239
503.248.1939



CCB #SRA0615 4-Hr Training

4-Hour Online AHERA Inspector Refresher
Training; AHERA is the Asbestos Hazard
Emergency Response Act enacting Title II
of Toxic Substance Control Act (TSCA)

Expiration Date: 01/22/2027

A handwritten signature in black ink, reading 'David Kahn', is written over a horizontal line.

David Kahn, Instructor

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Birch Bay Vogt Library
- B. Owner's Name: Whatcom County Library System
- C. A/E's Name: OAI, PS.
- D. The Project consists of a substantial alteration and conversion of an existing single-family residence for use as a Library Express branch.

1.02 SECTION INCLUDES

- A. Contract Description
- B. Description of Work
- C. Work by Owner
- D. Permits, Fees, and Bonds
- E. Copies of Contract Documents Provided by the Owner
- F. Owner Occupancy
- G. Contractors Use of Site and Premises

1.03 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including the General Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.

1.04 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a lump sum price as described in Division 00.

1.05 DESCRIPTION OF WORK

- A. Work includes the substantial alteration and conversion of an existing single-family residence for use as a Library Express branch. The scope of work generally includes, but is not limited to:
 - 1. Demolition of two existing pole buildings and miscellaneous site elements.
 - 2. Site paving, new parking areas, stormwater dispersion, site lighting, monument signage, EV charging infrastructure, accessible entry ramp, and right-of-way improvements.
 - 3. Flood mitigation including filling of the existing crawlspace, new flood vents, sump pump, and anchorage of the existing structure.
 - 4. Structural upgrades including new footings, beams, columns, and floor joist framing.
 - 5. Demolition and replacement of existing mechanical, electrical, and plumbing systems.
 - 6. Replacement of existing doors, windows, and exterior siding.
 - 7. Replacement of interior finishes throughout.
 - 8. New fire alarm, security, and access control systems.
 - 9. Removal of select trees and new landscaping throughout.
 - 10. Abatement and disposal of hazardous materials including lead and asbestos.

1.06 WORK BY OWNER

- A. Owner will contract and pay for third-party commissioning of new mechanical work. Contractor is responsible for coordinating and scheduling the activities of the commissioning agent.

1.07 OWNER OCCUPANCY

- A. Owner does not intend to occupy the site during construction.
- B. Contractor is responsible for maintaining the safety and security of the site and structure.

1.08 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Contractor will be given full use of the property and existing structure during construction.
 - 1. Maintain site security and prevent unauthorized access to the work area.
- B. Arrange use of site to allow:
 - 1. Work by Others.
 - 2. Work by Owner.
- C. Provide access to and from site as required by law and by Owner:
 - 1. Do not obstruct roadways, sidewalks, or other public ways without permit.
 - 2. Maintain Fire Department access and use to all fire lanes at all times.
- D. Contractor Staging Area:
 - 1. Contractor will have full use of the site during construction.
 - 2. Contractor shall enclose the project site with temporary construction fencing.
- E. Time Restrictions:
 - 1. Limit conduct of especially noisy, odorous, and dusty exterior work between the hours of 7am and 6pm, or as specifically requested by the Owner.
- F. Utility Outages and Shutdown:
 - 1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days' notice to Owner and authorities having jurisdiction.
 - 2. Limit shutdown of utility services to 8 hours at a time, arranged at least 72 hours in advance with Owner.
 - 3. Prevent accidental disruption of utility services to other facilities.
- G. Archeological Resources: During the execution of all site work, the Contractor and all subcontractors shall comply with all regulations regarding the discovery of archeological resources. If suspected materials/remains are encountered, stop work immediately and notify the A/E consultant for direction.
 - 1. See Chapters 27.34.200, 27.44, 79.02 of the Revised Code of Washington (RCW), the Washington Administrative Code (WAC), and Executive Order 21-02, as applicable.
 - 2. More information is available at <https://dahp.wa.gov/about-us>.
 - 3. Should archaeological resources (e.g., shell midden, animal remains, stone tools) be observed during project activities, all work in the immediate vicinity should stop, and the area should be secured. The Washington State Department of Archaeology and Historic

Preservation and the Lummi Nation Tribal Historic Preservation Office should be contacted immediately in order to help assess the situation and to determine how to preserve the resource(s). Compliance with all applicable laws pertaining to archaeological resources is required.

4. Inadvertent Discovery of Human Skeletal Remains on Non-Federal and Non-Tribal Land in the State of Washington (RCWs 68.50.645, 27.44.055, and 68.60.055)
 - a. If ground disturbing activities encounter human skeletal remains during the course of construction, then all activity will cease that may cause further disturbance to those remains. The area of the find will be secured and protected from further disturbance until the State provides notice to proceed. The finding of human skeletal remains will be reported to the county medical examiner/coroner and local law enforcement in the most expeditious manner possible. The remains will not be touched, moved, or further disturbed. The county medical examiner/coroner will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or non-forensic. If the county medical examiner/coroner determines the remains are non-forensic, then they will report that finding to the Department of Archaeology and Historic Preservation (DAHP) who will then take jurisdiction over the remains. The DAHP will notify any appropriate cemeteries and all affected tribes of the find. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and the affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains" (DAHP).

1.09 PERMITS AND FEES

- A. The Owner will submit, obtain, and pay for the following permits and fees. The Contractor will pick-up these permits from the AHJ and make any necessary arrangements for the Owner's payment. Cost for these permits ARE NOT to be included in the Bid Amount.
 1. Commercial Building Permit (COM2026-00011).
 2. Conditional Use Permit (CUP2025-0001).
 3. Shoreline Substantial Development Permit (SHR2025-00002).
 4. DAHP Excavation Permit.
- B. The Contractor has sole responsibility to submit, obtain, and pay for all other permits and fees. All costs including, but not limited to, the following, are to be included in the base bid amount:
 1. Whatcom County permit, fees, and bond costs can be found at:
<https://www.whatcomcounty.us/358/Planning-Development-Services>.
 2. L&I Electrical Permit, if applicable.
 3. Fire Alarm Plan Review, Permit, and Processing Fees.
 4. Low Voltage Permits for any work installed by the Contractor as part of the contract work
 5. Any one-time electrical or plumbing permits required for cover (only if allowed by the AHJ)
 6. If required by the Contractor's means and methods, any additional permits for right-of-way, street use, traffic control; etc.
 7. Air Quality Permits, if required.
- C. Business Licenses are required for the Contractor and all subcontractors.

1.10 COPIES OF CONTRACT DOCUMENTS PROVIDED BY THE OWNER.

- A. The Owner will supply the Contractor with up to two (2) sets of contract drawings, specifications, and addenda. The Contractor is solely responsible for the incorporate of all bid addenda and product substitutions. The Contractor is responsible for the purchase and payment of any additional sets of Contract Documents required.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section includes administrative and procedural requirements for hazardous materials.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Section 01 7419 Construction Waste Management and Disposal.
- C. Section 02 82 00 – Asbestos Abatement.
- D. Section 02 83 00 – Lead Paint Controls.

1.03 OWNER NOTIFICATION

- A. The Owner has surveyed the existing site for hazardous materials and has not discovered any known hazardous materials.
- B. Owner is to attain a certified environmental consultant to determine any hazardous materials on project site and provide a “Good Faith” Survey report of the project area which might be impacted by hazardous materials and dangerous wastes.

1.04 CONTRACTOR NOTIFICATION

- A. Pursuant to WAC 296.62.054 to 296.62.05425, provide the Owner with a complete list of all hazardous chemicals and other materials intended to be used during execution of the project, including storage locations.

1.05 ASBESTOS CONTAINING MATERIAL AND LEAD PAINT

- A. The Contractor shall bring to the attention of the Architect any material suspected of being hazardous which is encountered during execution of the Work. The Owner will arrange for tests to determine if the material is hazardous. If the material is found to be hazardous, the Owner will initiate the construction modification procedure for its abatement by the Contractor.
- B. Compliance with Regulations: All work shall comply with the applicable requirements of 29 CFR 1926/1910. The disposal of any hazardous materials encountered shall also comply with the requirements of applicable state and municipal safety and health requirements. Where there is a conflict between applicable regulations, the most stringent shall apply.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including the General Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.
- C. Section 01 3216 - Construction Progress Schedule: For linking Schedule of Values with Construction Progress Schedule
- D. Section 01 7800 - Closeout Submittals and Procedures: Project record documents

1.03 SCHEDULE OF VALUES

- A. Handwritten forms will not be accepted.
- B. Submit Schedule of Values on AIA G702 form within 30 days after date established as the Notice to Proceed or 7 days prior to first Application for Payment, whichever is first.
 - 1. Approved Schedule of Values shall be used by the Owner as the basis for progress payments.
- C. Format: Schedule of Values shall breakdown the total Contract Sum into each category of work utilizing, at a minimum, the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section.
 - 1. Procedures:
 - a. When any one line item exceeds 5% of the Contract Sum, provide further breakdown into material, labor, and equipment to install.
 - b. Sum of all entries shall equal the Contract Sum.
 - c. Round figures to nearest dollar amount.
 - 2. The following required values shall be included as separate line items.
 - a. Site Mobilization. Total shall not exceed 3% of Contract Sum.
 - b. Bonds and Insurance.
 - c. Major cost items, which are not directly a cost of actual work-in-place, such as distinct temporary facilities, construction barriers, dust control measures, etc.
 - d. Completion of work noted on Punch List.
 - e. Final Cleaning.
 - f. Construction closeout. Total shall not be less than 2% of Contract Sum. Closeout shall include individual line items for:
 - 1) Demobilization
 - 2) Record Drawings
 - 3) Operation and Maintenance Manuals
 - 4) Warranties and Bonds

1.04 CONTRACTOR DAILY OVERHEAD RATE

- A. Submit within 30 days after issuance of Notice to Proceed, the Contractor's Daily Overhead costs broken out by labor, material, and equipment including all reasonable direct and indirect expenses associated with maintaining an on-site presence, including non-craft labor, temporary construction facilities, field engineering, schedule updating, as-built drawings, home office cost, B&O taxes, office engineering, estimating costs, and incidental costs.

1.05 APPLICATIONS FOR PAYMENTS

- A. Payment Period: Submit at Monthly Intervals.
- B. Prior to the first Application for Payment, submit approved Intents to Pay Prevailing Wages for the Contractor and all subcontractors and/or for all subcontractors listed on submitted pay application.
- C. Use Form State of Washington Invoice Voucher, Form A-19.
- D. Handwritten forms will not be accepted.
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work. Provide itemized list of Change Order Proposals and Field Authorizations.
- H. Submit draft Application for Payment to Architect for review and approval 7 days prior to actual date of Application for Payment.
- I. Provide access to Contractor's Record Drawings for review by Architect.
- J. Contractor may follow the electronic submitting process for pay applications through the Architect to the Owner.
- K. Include the following with the application:
 - 1. Department of Labor & Industries (L&I) dashboard printout as evidence that all Intents to Pay Prevailing Wages, for all subcontractors/suppliers included in the Application for Payment, have been submitted and approved by L&I. Client Agency will not make payment until the intents are approved.
 - 2. In accordance with [RCW 39.12.120](#), Contractors and subcontractors shall file a copy of their certified payroll records using the L&I online system each month. The online L&I, Prevailing Wage Intent & Affidavit (PWIA), can be found at: <https://lni.wa.gov/licensing-permits/public-works-projects/contractors-employers/contractor-portal>. Questions about how to access or use this system should be directed to pw1@lni.wa.gov.
 - 3. Construction progress schedule is to be revised as specified in Section 01 3216.
 - 4. Affidavits attesting to off-site stored products if applicable.
- L. When A/E requires substantiating information, submit data justifying dollar amounts in question.

1.06 APPLICATION FOR FINAL PAYMENT

- A. Prepare application for final payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1. Prepare Application for Payment of Retainage Funds or request release of Retainage Bond.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 1. All closeout Procedures specified in Section 01 7800.
 2. Receipt of all Closeout Submittals specified in Section 01 7800.

1.07 RETAINAGE RELEASE

- A. Retainage will not be released or paid until the referenced agencies sends approvals and releases have been received by the public entity/client.
 1. Referenced Agencies are: Department of Revenue, Department of Labor & Industries and Department of Employment Security.
 2. The public entity/client agency must ensure that they have on file an approved Affidavit of Wages paid for the Contractor and all subcontractors listed.
- B. Release of retainage is provided according to the Contractor's chosen Retainage Investment Option.
 1. When retainage is NOT invested, then the Contractor shall submit a Retainage Invoice, once all approved agency releases and lien release have been sent to public entity/client for processing, and to the A/E for payment.
 2. When retainage IS invested/Escrow, Contractor shall submit copies of all approved agency releases to the A/E. The Owner then sends a letter of release of funds to the bank or savings and loan.
 3. When retainage is invested and converted to bonds and securities, Contractor shall submit copies of all agency releases to the A/E. The Owner then sends a letter of release to the bank/trust company.
 4. When the Contractor has a Retainage Bond, Contractor shall submit copies of all approved agency releases to the A/E. The Owner then sends a letter of release to the bonding company.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 20 00

APPLICATION AND CERTIFICATE FOR PAYMENT

AIA DOCUMENT G702

PAGE 1 OF

PAGES

TO (OWNER):

APPLICATION NO.:

Distribution to:

____ OWNER
____ ARCHITECT
____ CONTRACTOR
____ INSPECTOR

FROM (CONTRACTOR):

PERIOD TO:

KA#

CONTRACT FOR:

CONTRACT DATE:

CONTRACTOR'S APPLICATION FOR PAYMENT

CHANGE ORDER SUMMARY

Change Orders approved in previous months by Owner		ADDITIONS	DEDUCTIONS
TOTAL			
Approved this Month			
Number	Date Approved		
TOTALS			

Net change by Change Orders

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief, the Work covered by this Application for payment has been completed in accordance with the Contract Documents, that all previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of: _____ County of: _____
Subscribed and sworn to before me this _____ day of _____, 20____
Notary Public: _____
My Commission expires: _____

Application is made for Payment, as shown, in connection with the Contract. Continuation Sheet, AIA Document G702, is attached.

1. ORIGINAL CONTRACT SUM \$ _____
2. Net change by Change Orders \$ _____
3. CONTRACT SUM TO DATE (Line 1+2)..... \$ _____
4. TOTAL COMPLETED & STORED TO DATE..... \$ _____
(Column G on G702)
5. RETAINAGE:
 - a. ____% of Completed Work \$ _____
(Column D+E)
 - b. ____% of Stored Material \$ _____
(Column F on G703)Total Retainage (Line 5a + 5b or
Total in Column 1 of G702..... \$ _____
6. TOTAL EARNED LESS RETAINAGE..... \$ _____
(Line 4 less Line 5 Total)
7. LESS PREVIOUS CERTIFICATES FOR
PAYMENT (Line 6 from prior Certificate) \$ _____
8. CURRENT PAYMENT DUE..... \$ _____
9. BALANCE TO FINISH, PLUS RETAINAGE..... \$ _____
(Line 3 less Line 6)

CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising the above application, the Architect/Inspector certifies to the Owner that to the best of the his/her knowledge, information and belief, the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

Inspector: _____ Date: _____

Project Manager _____ Date: _____
This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

AMOUNT CERTIFIED \$ _____
(Attach explanation if amount certified differs from the amount applied for.)

CONTINUATION SHEET

AIA DOCUMENT G703

PAGE

OF

PAGES

AIA Document G702, APPLICATION AND CERTIFICATE FOR PAYMENT, containing Contractor's signed Certification is attached.

In Tabulations below, amounts are stated to the nearest dollar.

Use Column 1 on Contracts where variable retainage for line items may apply.

APPLICATION NUMBER:

APPLICATION DATE:

PERIOD TO:

WORK COMPLETED

[illegible]

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Documentation and procedures for changes in Contract Sum and Contract Time
- B. Documentation and procedures for changes in Contract Time due to Schedule Delay
- C. Change procedures

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including the General Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.
- C. Section 01 2000 - Price and Payment Procedures: Obtaining payment on approved changes to Contract Sum.
- D. Section 01 3000 - Administrative Requirements: Submittal procedures for requesting modifications for Contract Sum or Contract Time.
- E. Section 01 3216 - Construction Progress Schedule. Updating required as part of any changes to Contract Time.

1.03 CHANGE PROCEDURES FOR CONTRACT SUM OR CONTRACT TIME

- A. For changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue written instructions directly to Contractor.
- B. Contractor may propose a change to Contract Sum or Contract Time by submitting a written request to the Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation.
- C. Contractor may propose a change to Contract Time due to Schedule Delay per General Conditions 3.02E by submitting a letter to the Owner, and following the documentation required by the following:
 - 1. Request for Equitable Adjustment in Contract Time - Schedule Delay Supplemental Information - Required by Contractors.
- D. For changes to Contract Sum or Contract Time, Architect will issue one of the following:
 - 1. Change Order Proposal (COP): When the timely progression of the work permits, or when advance pricing is desired, Architect will issue a COP document.
 - a. The COP document will include a detailed description of a proposed change with supplementary or revised drawings and specifications.
 - b. Contractor shall prepare and submit a fixed price quotation and any changes to Contract Time within the 14 days of the request or within such other period as mutually agreed.
 - c. Contractor may not execute the change in the work until the COP has been approved and issued as a Change Order.
 - 2. Field Authorization (FA): When the timely progression of the work will not permit the use of a Change Order Proposal, Architect will issue a Field Authorization document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.

- a. The document will describe the required changes and will designate the method of determining any change in the Contract Sum or Contract Time.
 - b. The document will indicate an anticipated Not To Exceed (NTE) amount. The NTE will be negotiated between the Architect and Contractor upon issuance of the FA. If at any time, the Contractor believes the NTE will be exceeded, provide written notice to A/E for revision of the FA.
 - c. The document will indicate the method of cost measurement to be used in final pricing.
 - d. Contractor shall execute the change in the work in a timely manner and submit pricing.
- E. For any FA or COP including a change to Contract Time, the Contractor shall provide the following:
1. Written explanation of the event causing the necessity to change the Contract Time. Number of days must be indicated on the FA/COP form.
 2. A current project schedule depicting work before the change.
 3. A project schedule depicting the revised work with impacts to the critical path clearly identified.
- F. Computation of Changes in Contract Sum, for Contractors and Subcontractors, and the required documentation to support the change: As specified in the General Conditions, Part 7.
- G. Execution of Change Orders: Owner will issue Change Orders for all approved Field Authorizations and Change Order Proposals as provided in the General Conditions.
1. For any FA/COP wherein Contractor and Owner cannot reach mutual agreement on changes to the Contract Time or Contract Sum, the Owner shall prepare, within 30 days, a Change Order for the undisputed amounts. Both parties shall continue negotiations on the disputed amount until resolved. All unresolved issues shall be executed per General Conditions Part 8 – Claims and Dispute Resolution.
- H. After execution of Change Order, promptly revise Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- I. Promptly revise project schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- J. Promptly enter changes in Project Record Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 20 50

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Terms and Conditions, Supplemental Terms and Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Related work in other sections:
 - 1. Section 01 20 50 – Contract Modification Procedures.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements governing handling and processing allowances.
 - 1. Selected materials and equipment, and in some cases, their installation are shown and specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. Additional requirements, if necessary, will be issued by Change Order.
- B. All allowances shall be designated as individual items in the Schedule of Values.
- C. Types of allowances required include the following:
 - 1. Lump sum allowances.

1.03 SELECTION AND PURCHASE

- A. At the earliest feasible date after Contract award, advise the Architect of the date when the final selection and purchase of each product or system described by an allowance must be completed in order to avoid delay in performance of the Work.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

1.04 SUBMITTALS

- A. For all work submitted by the Allowance Contractor and/or subcontractor:
 - 1. Submit time and material cost breakdown of work to show actual quantities of labor materials provided in the fulfillment of this allowance
 - 2. Submit invoices or delivery slips to indicate actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.05 UNIT-COST AND QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

- D. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.06 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related construction activities.

3.02 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1 – Archaeological Monitoring: \$20,000.00
1. This allowance includes labor and materials related to the preservation of cultural artifacts anticipated to be encountered during ground disturbing work. All ground disturbing activities will be overserved by an archaeological monitor. This allowance intends to cover field direction provided by the archeological monitor in accordance with the approved DAHP excavation permit.
- B. Allowance No. 2 – Repair/Replacement of Existing Plaster Finishes: \$15,000.00
1. This allowance includes labor and materials related to the repair of existing lath and plaster finishes including walls and ceilings throughout the second floor. Existing plaster finishes are anticipated to be impacted by new mechanical, electrical and finish work. Finishes shall be repaired to a level that is satisfactory to the Architect. Alternatively, the Contractor may

Division 01 Specifications

Whatcom County Library System

Birch Bay Vogt Library Express

01 21 00

ALLOWANCES

3 of 3

replace impacted plaster finishes with new gypsum wall board to the extents needed to achieve an acceptable uniform appearance under this allowance. The cost for priming and painting of existing finishes, both plaster or gypsum, is to be included under the base bid and should not be allocated towards this allowance.

END OF SECTION 01 21 00

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including the General Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.
- C. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.
- D. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - c. Compatibility relating to Proprietary vs Sole Source.
 - 2. Substitutions to improve project performance: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 5. Has informed the Prime Contractor of any/all changes or impacts to other trades and construction, and all potential costs impacts have been fully addressed without cost impact to the Owner.

6. Waives claims for additional costs or time extension that may subsequently become apparent.
7. Agrees to reimburse Owner for review or redesign services associated with re-approval, through a deductive COP and then an amendment to the A/E.
- B. A Substitution Request for specified installer, constitutes a representation that the submitter:
 1. Has acted in good faith to obtain services of specified installer.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 1. Note explicitly any non-compliant characteristics.
- D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 1. Forms indicated are adequate for this purpose and must be used.
 2. All requests for substitution shall be accompanied by the fully completed Substitution Request Form. Failure to fully complete or sign the form will result in rejection of substitution without review.
- E. Limit each request to a single proposed substitution item.
 1. Submit samples where aesthetics or materials are different than those specified.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Submittal Form (before award of contract):
 1. Submit substitution requests by completing the Substitution Request Form. See form for additional information and instructions. Use only this form; other forms of submission are unacceptable and will be rejected without review.
- B. Owner will consider requests for substitutions only if submitted at least 10 working days prior to the date for receipt of bids.
 1. Substitutions are reviewed in the order they are received and pending the available time of the A/E design team. Every effort will be made to address substitutions requests received but are not guaranteed.
 2. Acceptance will be acknowledged through Addendum only, and to include review time. Rejected requests will not be noted.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
 1. Submit substitution requests by completing the Substitution Request Form. See form for additional information and instructions. Use only this form; other forms of submission are unacceptable and will be rejected without review.
- B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by A/E, in order to stay on approved project schedule.
- C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by A/E, in order to stay on approved project schedule.

1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
 3. Bear the costs engendered by proposed substitution of:
 - a. Owner's compensation to the A/E for any required redesign, time spent processing and evaluating the request.
 - b. Other construction by Owner.
 - c. Other unanticipated project considerations.
- D. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval. Substitution request does not replace approval of shop drawings.
 2. Without a separate written request.
 3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

- A. A/E may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. A/E will notify Contractor in writing of decision to accept or reject request.
 1. A/E's decision following review of proposed substitution will be noted on the submitted form.
 2. Review with Owner and DES PM before approving.

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals and Procedures, for closeout submittals.
 1. Include completed Substitution Request Forms as part of the Project record.

END OF SECTION 01 25 00

SUBSTITUTION REQUEST FORM

ATTENTION: OAI
Attn: Joe Muller
jmuller@oaips.com

PROJECT NAME: WCLS Birch Bay Library Express

Date Submitted:

Submitted By: _____ On behalf of: _____
Proposer of Substitution Contractor (required if post bid)

We hereby submit for consideration, the following product instead of the specified item for above project:

SECTION	PARAGRAPH	SPECIFIED ITEM
Proposed Substitution:		

If requesting after issuance of Contractor's Notice to Proceed, State reason for request:

Attach complete dimensional information and technical data, including laboratory tests, if applicable.

Include complete information on changes to Drawings and Specifications which proposed substitution will require for its proper installation.

Submit with request all necessary samples and substantiating data to provide equal quality, performance, and appearance to that specified. Clearly mark Manufacturer's literature to indicate equality or equivalence in performance. Indicate differences in quality of materials and construction.

Fill in blanks below: (please note – failure to provide a complete and thorough answer to any of the questions below will result in rejection of request. A response of Not Applicable, will also be result in rejection).

A. Does the substitution affect dimensions shown on Drawings: Yes / No If yes, clearly indicate changes:
B. What effect does substitution have on other trades, other Contracts, and contract completion date?
C. What effect does substitution have on applicable code requirements?
D. Differences between proposed substitution and specified item:
E. Manufacturer's warranties of the proposed and specified items are: Same / Different (explain)
F. List of names and addresses of 3 similar projects on which product was used, date of installation, and A/E's name and address: (Attach list with requested information)
G. Cost impact:
H. Has the submitter informed the Contractor of all changes or impacts to other trades and construction, and have all potential costs impacts have been fully addressed without any cost impact to the Owner? Yes / No

**CERTIFICATION OF EQUAL OR EQUIVALENT PERFORMANCE AND ASSUMPTION OF LIABILITY FOR
EQUAL OR EQUIVALENT PERFORMANCE:**

See Division 01 2500 Sections 3.02 & 3.03 for Pre & Post Bid Language.

The undersigned agrees to pay for costs associated with changes to the building design, including engineering and detailing caused by the requested substitution.

(Signature must be by person having authority to legally bind the Contractor/Subcontractor/Supplier to the above terms)

Signature Printed Name

Firm

Address

Telephone E-mail

For Use by A/E

Remarks:

____ Accepted _____ Not Accepted _____ Accepted as Noted _____ Received Too Late

Other Comments:

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements
- B. Electronic document submittal service
- C. Preconstruction meeting
- D. Site mobilization meeting
- E. Construction Progress meetings
- F. Construction Closeout meeting
- G. Daily construction reports
- H. Progress photographs
- I. Requests for Information (RFI)
- J. Submittal schedule
- K. Submittals for review
- L. Submittals for Information
- N. Submittals for project closeout
- O. Number of copies of submittals
- P. Submittal procedures
- Q. Submittal review

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the contract, including General and Supplemental Conditions for Washington State Facilities Construction and other Division 01 Specification Sections, apply to this section.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 7000 - Execution Requirements and Section 01 7800 Closeout Submittals and Procedures for coordination of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to A/E:
 - 1. Contract Initiation Submittals
 - a. Submit within 10 business days after issuance of Notice to Proceed (*Only applies to the Apprenticeship Utilization Plan - AUP*)
 - 1) Apprenticeship Utilization Plan - as identified on the bid form
 - b. Submit within 14 days after issuance of Notice to Proceed
 - 1) Preliminary Progress Schedule - Per General Conditions 3.02
 - 2) Submittals Schedule
 - 3) Project Quality Plan (PQP) – Per section 01 4000
 - c. Submit within 30 days after issuance of Notice to Proceed and before submittal of first Application for Payment.

- 1) Schedule of Values - Per General Conditions 6.02
- 2) Complete list of projects Subcontractors and Suppliers
- 3) Contractors Overhead Daily Rate - Per Section 01 2000, 1.04
- 4) Site Specific Safety Plan, prior to work on site - Per General Conditions 5.07
- 5) Diverse Business Participation - Per General Conditions 10.11. Register and create an account in the DES Diversity Compliance Program (B2GNow) at <https://des.diversitycompliance.com/>
2. Requests for Information (RFI)
3. Substitution Requests
4. Shop drawings, product data, and samples
5. Test and inspection reports
6. Manufacturer's instructions and field reports
7. Applications for payment and change order requests
8. Progress schedules
9. Notice of Substantial Completion
10. Closeout submittals

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 1. Besides submittals for review, information, and closeout, this procedure applies to [Requests for Information](#) (RFIs), progress documentation, contract modification documents (e.g., supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punch list, and any other document any participant wishes to make part of the project record.
 2. Contractor and A/E are required to use this service.
 3. It is Contractor's responsibility to submit documents in allowable format.
 4. Subcontractors, suppliers, and A/E's consultants are to be permitted to use the service at no extra charge.
 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 6. Paper and e-mail submittals should not be used and will not be reviewed without prior approval of the A/E.

7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the contract sum.
- C. Submittal Service: Use one of the following:
 1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com/#sle
 3. Newforma ConstructEx: www.newforma.com/products/constructex/#sle
 4. Procore: www.procore.com
 5. Service proposed by the Contractor and agreed to by the Owner
- D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of A/E and Contractor participating; further training is the responsibility of the user of the service.
 1. Representatives of Owner are scheduled and included in this training.
- E. Project Closeout: A/E will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

- A. Owner will schedule a meeting after Notice to Proceed.
- B. Attendance Required:
 1. Owner
 2. A/E
 3. Contractor
 4. Major Subcontractors and others when required by the Owner
 5. Testing and Inspection agents as determined by the Owner
- C. Agenda:
 1. Project Preconstruction Checklist
 2. Submission of list of subcontractors, schedule of values, and progress schedule
 3. Designation of personnel representing the parties to contract and A/E
 4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and contract closeout procedures
 5. Scheduling
 6. Coordination of mobilization and on-site work
 7. Scheduling activities of Owner-provided Agents (Geotechnical, Testing, etc.)
- D. The Owner will distribute copies to meeting participants. Contractor shall distribute as appropriate to subcontractors and suppliers.

3.03 SITE MOBILIZATION MEETING

- A. Schedule meeting at the project site prior to Contractor mobilization.
- B. Attendance Required:

1. Contractor
 2. Owner
 3. Client Agency Representative
 4. A/E
 5. Special consultants
 6. Contractor's superintendent
 7. Major subcontractors
- C. Agenda:
1. Use of premises by Owner and Contractor
 2. Owner's requirements
 3. Construction facilities and controls provided by Owner
 4. Temporary utilities provided by Owner
 5. Survey and building layout
 6. Security and housekeeping procedures
 7. Schedules
 8. Application for payment procedures
 9. Procedures for testing
 10. Procedures for maintaining record documents
 11. Requirements for start-up of equipment
 12. Inspection and acceptance of equipment put into service during construction period
- D. A/E will record minutes and distribute copies within two days after the meeting to participants, with copies to A/E, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS MEETINGS

- A. A/E will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- B. Attendance Required:
1. Contractor
 2. Owner
 4. A/E
 5. Additional design team consultants as appropriate
 6. Contractor's superintendent
 7. Additional Contractor's Personnel (Quality Assurance Manager, Safety, etc.) when requested by the Owner
 8. Major subcontractors as appropriate
- C. Agenda:
1. Project Number.

2. Project Title.
3. Date of Meeting.
4. Attendees.
5. Other Project participants to be included on meeting minutes' distribution but not necessarily in attendance.
6. Previous Minutes with action items from last meeting.
7. Risk Issues.
8. Construction Progress Schedule Update, (\$3.02D).
 - a. Substantial completion date per schedule: _____.
 - b. Substantial completion date per contract: _____.
 - c. Maintenance of monthly progress schedule update. Last update (date): _____.
 - d. Corrective measures to regain projected schedules.
 - e. Effect of proposed changes on progress schedule and coordination.
9. Review of work progress. (3-week schedule) against CPM schedule prior to invoice release.
10. Coordination of projected progress.
11. Field Observations, problems, and decisions.
 - a. Status of non-conforming work:
 - 1) Notice of Nonconformance # _____
 - 2) Schedule of Values line # _____
 - 3) Estimated correction date _____
12. Identification of problems that impede, or will impede, planned progress.
13. Review pertinent portions of Site-Specific Safety Plan. Address what will occur before next progress meeting and if there have been any incidents.
14. Field Authorization/Change Order Proposal/Change Order Log and Status.
15. Submittal Update; review schedule & status.
16. Material Delivery Status.
17. Review requests for Information (RFI's) log and status of responses.
18. Quality Control/Quality Assurance: Maintenance of quality and work standards.
19. As-built Updates.
20. Construction Waste Management Update.
21. Project Closeout.
22. LEED Requirements and Reporting.
23. Commissioning Update.
24. Inspection and Test Reports.
25. Other business relating to work.

26. At monthly intervals review:

- a. Pay Application. Contractor submits DRAFT Pay Application to consultant for 7 days prior to actual date of Application for Payment.
 - 1) Draft pay application received (date): _____
 - 2) Consultant reviews the Pay application to Identify any discrepancies (incomplete or non-conforming work).
 - 3) Consultant approves or requests revisions of the Pay Application within 7 days (per Instructions for Architects and Engineers)
- b. Certified Payroll. Last submission to L&I's online system (date): _____
- c. Apprenticeship plan progress and Contractor's plan to meet goals. Current apprenticeship utilization rate (from L&I online system): _____.

27. Review of Federal requirements compliance when applicable

28. Discussion.

28. Action Items (by whom and by when).

29. Next Meeting Date & Time.

- D. A/E will record minutes and distribute copies within 2 workdays after the meeting to participants, with 2 copies to A/E, Owner, participants, and those affected by decisions made.

3.05 CONSTRUCTION CLOSEOUT MEETING

- A. The A/E will schedule a dedicated closeout meeting when construction is approximately 75% complete.
- B. Attendance Required:
 1. Owner.
 2. A/E.
 3. Contractor.
 4. Major Subcontractors as appropriate.
 5. Client Agency Information Technology (IT) staff (when applicable).
- C. Agenda:
 1. Review closeout submittal requirements and current status.
 2. Submit DRAFT Operations and Maintenance Manuals.
 3. Submit DRAFT Staff Training Plan
 4. Submit DRAFT Warranties
 5. Review Substantial Completion Checklist
 6. Estimated date when the Contractor will provide written notice of substantial completion with list of incidental corrective (punch list) work remaining.
 7. List of all operational permits required by AHJ and data required for applications.
 8. Is the project scheduled to meet the contracted substantial completion date? _____
 - a. Substantial completion date per schedule: _____.

- b. Substantial completion date per contract: _____.
 - c. When applicable and the changes meet the requirements of Part 7 of the General Conditions, reconcile with a corrective action plan (§3.02D). Contractor to submit corrective action plan by (date): _____
 - d. When applicable, reconcile with change order(s). Contractor to submit COP by (date): _____
 - e. When applicable, calculate the estimated liquidated damages amount (§3.07):
\$ _____
 - 9. Identify outstanding non-conforming work on the schedule of values. The owner will withhold payment until the non-conforming work is corrected in accordance with the General Conditions §6.05.
 - a. Status of non-conforming work:
 - 1) Notice of Nonconformance # _____
 - 2) Schedule of Values line # _____
 - 3) Estimated correction date _____
 - 10. Review status of open COPs, FAs, and change orders.
 - 11. Review status of testing requirements.
 - 12. IT coordination.
 - 13. Client Agency responsibilities after substantial completion.
 - a. Operating building systems.
 - b. Maintenance and repairs.
 - c. Warranty notification procedures.
 - d. Security and Contractor access.
 - 14. Furnishing, Fixtures, and Equipment installation coordination.
 - 15. Occupant move-in schedule.
 - 16. Review Final Acceptance Checklist.
 - 17. Submitting affidavits to L&I.
 - 18. Apprenticeship utilization rate and potential incentive or penalty.
 - 19. Demobilization.
 - 20. Final invoice.
 - 21. Retainage will be paid upon completion of the lien period and after receiving releases from the Employment Security Department, the Department of Revenue, and Labor and Industries.
- D. The A/E will distribute copies to meeting participants. Contractor shall distribute as appropriate to Subcontractors.

3.06 DAILY CONSTRUCTION REPORTS

- A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

- B. In addition to transmitting electronically a copy to Owner and A/E, submit 2 printed copies at monthly intervals.
 - 1. Submit each daily report by e-mail to the Architect within 24 hours. Upload to electronic tracking system.
 - 2. Submit with monthly Application for Payment.
- C. Prepare a daily construction report recording the following information concerning events at the project site and project progress:
 - 1. Date
 - 2. High and low temperatures, and general weather conditions
 - 3. List of subcontractors at project site
 - 4. Count of personnel at project site
 - a. Include a breakdown for supervisors, laborers, journeymen, equipment operators, helpers, and others
 - 5. Construction activities performed
 - 6. Major equipment at project site
 - 7. Material deliveries
 - 8. Safety, environmental, or industrial relations incidents
 - 9. Meetings and significant decisions
 - 10. Unusual events (submit a separate special report)
 - 11. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
 - 12. Directives and requests of Authority(s) Having Jurisdiction (AHJ)
 - 13. Testing and/or inspections performed
 - 14. Signature of Contractor's authorized representative

3.07 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
- C. Photography Type: Digital; electronic files.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
 - 1. Existing conditions prior to start of the work
 - 2. Each work element upon completion
- E. Digital Photographs: 24-bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: Via email

2. File Naming: Include project identification, date and time of view, and view identification
 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
- F. Include all photo PDFs in Closeout Submittals.

3.08 REQUESTS FOR INFORMATION (RFI)

- A. Definition: A request seeking one of the following:
1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in the Contract Documents.
 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
 2. Prepare in a format and with content acceptable to A/E.
 3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from the Contract Documents information requiring interpretation.
 2. Acceptable Uses for RFIs:
 - a. Proposals to construction to achieve results of higher quality.
 3. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
 - a. Approval of submittals (use procedures specified elsewhere in this section)
 - b. Approval of substitutions (see Section - 01 2500 - Substitution Procedures)
 - c. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract)
 4. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
 5. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.

- a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the A/E, and any of its consultants, due to processing of such RFIs.
- D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 1. Official Project name and number.
 2. Owner's, A/E's, and Contractor's names.
 3. Discrete and consecutive RFI number, and descriptive subject/title.
 4. Issue date and requested reply date.
 5. Reference to particular contract document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on contract time or the contract sum.
- E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- F. Review Time: A/E will respond and return RFIs to Contractor within 7 calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
 2. When results are urgent, Contractor to contact A/E directly and establish necessary time frame prior to submittal of RFI.
- G. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to contract sum or contract time, promptly issue a notice to this effect to A/E.
 1. If, in the opinion of the A/E, the response will impact contract sum or time, A/E will prepare Change Order request documents.
 2. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
 3. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
 4. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.

5. Notify A/E within 7 calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.09 SUBMITTAL SCHEDULE

- A. A/E will provide a preliminary list of anticipated submittals to Contractor for preparation of schedule.
- B. Submit to A/E for review a schedule for submittals in tabular format.
 1. Submit at the same time as the preliminary schedule.
 2. Coordinate with Contractor's construction schedule and schedule of values.
 3. Format schedule to allow tracking of status of submittals throughout duration of construction.
 4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
 5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.10 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data
 2. Shop drawings
 3. Samples for selection
 4. Samples for verification
- B. Submit to A/E for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals and Procedures.

3.11 SUBMITTALS FOR INFORMATION

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

- B. Submit for A/E's knowledge as contract administrator or for Owner.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Contractor's written Notice of Substantial Completion
- B. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals and Procedures:
 - 1. Project record documents
 - 2. Operation and maintenance data
 - 3. Warranties
 - 4. Copies of signed-off permits
 - 5. Other types as indicated
- C. Submit for Owner's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit 1 electronic copy in PDF format; an electronically marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Documents for Review:
 - 1. Small Size Sheets, Not Larger Than 11 by 17 inches: Submit the number of copies that the Contractor requires, plus 2 copies that will be retained by A/E.
 - 2. Larger Sheets, Not Larger Than 36 by 48 inches: Submit the number of opaque reproductions that the Contractor requires, plus 2 copies that will be retained by A/E.
- C. Documents for Information: When original documents are necessary, submit 2 copies.
- D. Samples: Submit the number specified in individual specification sections; 1 of which will be retained by A/E.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Provide a single submittal package, with transmittal, for each specification section. Include all required submittal elements.
 - a. If for any reason, a full and complete submittal cannot be provided, clearly indicate the reason on the submittal transmittal, the items excluded and explanation why. The Architect reserves the right to reject any partial submittals without review if explanation is considered to be frivolous.
 - 2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
 - 3. Transmit using approved form.
 - a. Use Contractor's form, subject to prior approval by A/E.
 - 4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.

5. Identify: project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without the Contractor's stamp will not be acknowledged, reviewed, or returned.
 7. Deliver each submittal on date noted in submittal schedule unless an earlier date has been agreed to by all affected parties and is of the benefit to the project.
 - a. Deliver submittals to A/E at business address.
 - b. Send submittals in electronic format via email to A/E.
 8. Schedule submittals to expedite the project, and coordinate submission of related items.
 - a. For each submittal for review, allow 14 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving A/E's consultants, Owner, or another affected party, allow an additional 7 days.
 - c. For sequential reviews involving approval from Authorities Having Jurisdiction (AHJ), in addition to A/E's approval, allow an additional 30 days.
 9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 10. Provide space for Contractor and A/E review stamps.
 11. When revised for resubmission, identify all changes made since previous submission.
 12. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 13. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work and have received prior approval for their use.
 14. Submittals not requested will be recognized and will be returned "Not Reviewed".
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.
 3. Submit concurrently with related shop drawing submittal.
 4. Submit (Material) safety data sheets for materials or products.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Do not reproduce Contract Documents to create shop drawings.
 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:

1. Transmit related items together as single package. If approved by the A/E, maintenance and operation information may be deleted until preparation of Maintenance and Operations manuals.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval.

3.15 SUBMITTAL REVIEW

- A. A/E's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- B. Submittals for Review: A/E will review each submittal, and approve, or take other appropriate action.
 1. A/E's and consultants' actions on items submitted for review:
 - a. Authorizing purchasing, fabrication, delivery, and installation:
 - 1) "Approved"
 - 2) "Approved as Noted, Resubmission not required"
 - a) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - 3) "Approved as Noted, Resubmit for Record"
 - a) Resubmit corrected item, with review notations acknowledged and incorporated.
 - b. Not Authorizing fabrication, delivery, and installation:
 - 1) "Revise and Resubmit"
 - a) Resubmit revised item, with review notations acknowledged and incorporated.
 - b) Non-responsive resubmittals may be rejected.
 - 2) "Rejected"
 - a) Submit item complying with requirements of Contract Documents.
 - C. Submittals for Information: A/E will acknowledge receipt and review. See below for actions to be taken.
 1. A/E's and consultants' actions on items submitted for information:
 - a. Items for which no action was taken:
 - 1) "Received" - to notify the Contractor that the submittal has been received for record only.
 - b. Items for which action was taken:
 - 1) "Reviewed" - no further action is required from Contractor.

END OF SECTION 01 30 00

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary progress schedule, to be submitted at time of contract. Scheduler to have 3 to 5 years' experience.
- B. Construction progress schedule. The project size and type will determine schedule form, from Critical Path to a bar chart type with approval of Owner and AE.
- C. Construction progress schedule, with network analysis diagrams and reports. Schedule to reflect sequencing of work and Owner may request a 3 week look ahead and a recovery schedule if changes have been executed.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including the General Conditions 3.02, for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.
- B. Section 01 1000 Summary showing sequencing
- C. Section 01 3000 Administrative Requirements

1.03 REFERENCE STANDARDS

- A. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2015

1.04 SUBMITTALS

- A. Within 7 days after date establish in Notice to Proceed, submit complete Progress Schedule to A/E review and comment.
 - 1. If revisions are requested by the A/E, submit the revised Project Schedule within 7 days after receipt of requested revisions.
- B. Submit updated schedule with each Application for Payment.

1.05 SCHEDULE FORMAT

- A. Submit two files of the construction progress schedule. One file shall be in Portable Document Format (pdf) and the other file shall be the native scheduling software format.
- B. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- C. Diagram Sheet Size: 22 x 34 inches.
- D. Scale and Spacing: Must be legible when reduced and printed half-size 11 x 17 inches.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTENT

- A. Show complete sequence of construction by activity, milestones and with dates for beginning and completion of each element of construction. Note long lead items.
 - 1. Construction Progress shall be developed using any Work Sequence stages if identified in specification section 01 1000.
 - 2. No less than 10% of the Specified Contract Time duration shall be specifically reserved for Project Float time.

- B. Identify each item by specification section number.
- C. Identify work of separate stages and other logically grouped activities.
- D. Provide sub-schedules to define critical portions of the entire schedule.
- E. Include critical conferences and meetings in schedule, i.e., pre-construction and pre-installation meetings.
- F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- G. Provide separate schedule of submittal dates for shop drawings, product data, and samples, and dates reviewed submittals will be required from A/E. Indicate decision dates for selection of finishes.
- H. Coordinate content with schedule of values specified in Section 01 2000 - Price and Payment Procedures.
- I. Provide legend for symbols and abbreviations used.

3.02 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first workday of each week.

3.03 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with A/E at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.04 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of work.
- D. Indicate changes required to maintain Date of Substantial Completion.
- E. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

3.05 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, A/E, Owner.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals
- B. Quality assurance
- C. References and standards
- D. Testing and inspection agencies and services
- E. Control of installation
- F. Mock-ups
- G. Tolerances
- H. Manufacturers' field services
- I. Defect Assessment

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including the General Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.
- C. Section 01 4216 - Definitions

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Project Quality Plan (PQP): Submit within 14 days of the Notice to Proceed a written plan detailing the organization and procedures proposed to achieve quality assurance and quality control so that materials, products, workmanship, on-site and off-site fabrication, construction, and operations are both in total compliance with the Contract Documents and within generally accepted quality standards for similar work. Demonstrate a thorough knowledge of Contract requirements. The PQP is intended to function as a "living document," anticipating requirements and documenting results. At minimum, the PQP shall include the following:
 - 1. Qualification Data: For Quality Assurance Manager (QAM) and any Contractor-provided testing agencies, to demonstrate their capabilities and experience. For testing agencies, include proof of qualifications in the form of a recent agency inspection report performed by a recognized authority.
 - 2. A letter, signed by an officer within the Contractor's organization, summarizing the responsibilities of the QAM, including the authority and obligation to stop nonconforming work, and specifically acknowledging that the QAM's performance is continuously subject to Architect and Owner approval.
 - 3. Schedule and Log of Tests and Inspections: For all (Owner and Contractor) required tests and inspections. Prepare in tabular form and include the following:
 - a. Identify if the test/inspection is being provided by Owner or Contractor.
 - b. Specification Section number and title.
 - c. Description of test or inspection.
 - d. Identification of applicable standards.

- e. Identification of test and inspection methods.
 - f. Number/frequency of tests and inspections required.
 - g. Time schedule (or time span) for tests and inspections.
 - h. Entity responsible for performing tests and inspections.
 - i. Requirements for obtaining samples.
 - j. Unique characteristics of each quality control service.
- C. QAM Daily Reports: Submit at weekly intervals.
- D. Permits, Licenses, and Certificates: For Architect's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.04 QUALITY ASSURANCE

- A. Quality Assurance Organization: The umbrella for the Contractor's quality assurance and quality control activities is the Quality Assurance Organization. This organization consists of the Quality Assurance Manager, supported by additional staff as necessary to perform the activities described in this Section.
- B. Quality Assurance Manager (QAM): An individual, may be the project Superintendent, Project Manager, or other identified personnel, with complete authority to take actions necessary to ensure compliance with the Contract Documents. The QAM's authority shall include the ability and obligation to stop nonconforming work and direct all corrective measures. The QAM's responsibilities shall be to manage the Contractor's Project Quality Plan and to review all submittals in accordance with Section 01 3000 - Administrative Requirements and continuously monitor construction activity.
- C. Basic Quality Assurance Qualifications: Wherever the Specifications refer to installers, manufacturers, fabricators, specialists, or factory-authorized service representatives, provide entities with the following qualifications:
- 1. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
 - 2. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
 - 3. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
 - 4. Specialists: Certain sections of the Specifications require that specific construction activities be performed by recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - a. Requirements for specialists shall not supersede building codes and regulations governing the Work.
 - 5. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of

manufacturer's products similar in material, design, and extent to those indicated for this Project.

1.05 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from A/E before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of A/E shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.09 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform specified testing.
 - 1. Contractor shall coordinate performance of all testing and inspections unless otherwise indicated.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from A/E before proceeding.
- D. Comply with specified standards for quality of the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from A/E before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Responsibilities (Contractor provided and Owner provided):
 - 1. Provide qualified personnel at site. Cooperate with A/E and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify A/E and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by A/E.
 - 6. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 - 1. Provide access to Testing Agency to the designated location to obtain adequate samples of materials that require testing as required by the contract documents.
 - 2. Cooperate with Testing Agency personnel and provide access to the Work.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify A/E and Testing Agency [48] hours prior to expected time for operations requiring testing/inspection services unless prior arrangements are made and agreed to.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by A/E.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.
- G. Costs for testing visits not provided by the Testing Agency due to failure of the Contractor to schedule properly shall be paid by Contractor.

3.04 MANUFACTURERS' FIELD SERVICES

- A. When required in individual specifications sections, or by product manufacturer as part of warranty, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
 - 1. Submit report to Contractor and A/E.

3.05 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of the A/E the Work is not complying with specified requirements, the A/E will issue a Notice of Nonconformance.
 - 1. Contractor's QAM shall be responsible for providing a response to Notice of Nonconformance within seven days of its issue indicating corrective measures to be undertaken.
 - 2. If, in the opinion of the A/E, it is not practical to remove and replace the work, A/E will direct an appropriate remedy or adjust payment.
 - 3. QAM shall maintain a Nonconformance log of all deficiencies, tracking them from identification to acceptable resolution.

3.06 QUALITY ASSURANCE MANAGER (QAM) DAILY REPORTS

- A. Write daily reports for each calendar day where work was performed on-site, beginning with the date of the Notice to Proceed, on forms(s) approved by the Architect. QAM Daily Reports shall be factual records quantifying the Work and identifying quality assurance and control activities. Identify deficiencies as they occur and as they are resolved. Do not address production issues unless they impact quality assurance or quality control.
- B. QAM shall sign and date all reports. Verification shall include a statement that all materials and products incorporated into the Work are in compliance with the terms of the Contract except as noted otherwise.

END OF SECTION 01 40 00

PART 1 GENERAL

1.01 SUMMARY

- A. This section supplements the definitions contained in the General Conditions.
- B. Other definitions are included in individual specification sections.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including the General and Supplemental Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.

1.03 DEFINITIONS

- A. Authorities Having Jurisdiction (AHJ): Any public agency or review body having authority to approve, inspect, and review the work on behalf of the public. (i.e., Code Officials, Fire Department, Health Department, etc.)
- B. Contract: The construction agreement between the Owner and the Contractor.
- C. Furnish: To supply, deliver, unload, and inspect for damage.
- D. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- E. PM \ Project Manager: The DES Project Manager assigned by the Department of Enterprise Services is responsible for managing and oversight of the contract on behalf of the Owner.
- F. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never used, or re-used materials or equipment.
- G. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.
- H. Provide: To furnish and install.
- I. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities
- C. Sanitary facilities
- D. Temporary Controls: Barriers, enclosures, and fencing
- E. Security requirements of the job site
- F. Vehicular access and parking for Contractor's operations
- G. Waste removal facilities and services
- H. Project Signs
- I. Field offices

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including the General Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.

1.03 TEMPORARY UTILITIES

- A. General: Cost or use charges for temporary facilities (all electrical power, lighting, water, heating and cooling, and ventilation), shall be included in the Contract Sum. Allow Owner's other entities to use temporary services and facilities without cost, including but not limited to, Owner construction forces, A/E consultants, occupants of the project, testing agencies and authorities having jurisdiction.
- B. Contractor may make use of existing utilities available at the existing site. This includes electrical power and water. All costs associated with preparing these utilities and temporary connection for project use is the sole responsibility of the Contractor, as noted in GC 5.14 B.
 - 1. Provide temporary construction lighting to all areas of the work to permit a safe and secure work environment for all contractors.
- C. Owner will provide the following:
 - 1. Electrical power. Contractor responsible for temporary connections associated with the removal and relocation of existing electrical meter.
 - 2. Water supply, consisting of connection to existing facilities.
 - 3. The Owner will not charge the Contractor usage fees for these utilities, per GC 5.14.A.
- D. Usage costs for existing utilities will be provided by the Owner. Contractor is to take measure to conserve these resources. The Owner reserves the right to rescind this agreement if the Contractor fails to take appropriate conservation measures. The decision to rescind is solely the Owners. Contractor may install submeters to observe usage during construction.

1.04 SANITARY FACILITIES

- A. Provide temporary sanitary facilities for construction personnel.
- D. Maintain daily in clean and sanitary condition.
- E. At end of construction, return facilities to same or better condition as originally found.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

- A. Provide 6-foot-high approved construction fencing around construction site; equip with vehicular and pedestrian gates with locks.

1.07 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 INTERIOR ENCLOSURES

- A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
- B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:
 - 1. Insulated to R-19
 - 2. STC rating of 35 in accordance with ASTM E90
 - 3. Maximum flame spread rating of 75 in accordance with ASTM E84

1.09 SECURITY OF THE JOBSITE

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program for physical or electronic security measures.

1.10 VEHICULAR ACCESS AND PARKING FOR CONTRACTOR'S OPERATIONS

- A. Comply with regulations (AHJ), relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles. Coordinate with Owner to determine hours of operation.
- B. Coordinate access and haul routes with Authorities Having Jurisdiction (AHJ) and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets. Contractor to follow GC 5.07 E, Safety Precautions for Hazardous or Harmful substances and disposal methods.

- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
- F. Existing parking areas located at Birch Bay Library may be used for construction parking. See site plan for location.
- G. Contractor is responsible for all vehicular related costs including ferry fares.

1.11 WASTE REMOVAL

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site weekly.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.14 PROJECT SIGNAGE

- A. No signs are allowed without Owner permission except those required by law.

1.15 FIELD OFFICES

- A. Office: Contractor may provide their own temporary office on site during construction.

1.16 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 50 00

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the protection and trimming of trees and vegetation that interfere with, or are affected by, execution of the Work, whether temporary or new construction. This Section includes stump grinding, arborist wood chips and wood chips for wood chip trails.
- B. The Contractor shall hire an Arborist to be present during all construction around trees to be retained, perform removal, pruning, dead branch removal, and thinning of trees as required.
- C. Related work in other sections:
 - 1. Section 01 57 13 – Temporary Erosion and Sedimentation Control.

1.02 DEFINITIONS

- A. Dbh: Diameter at breast height.
- B. Interior Critical Root Zone (ICRZ): defined as the radius around the trunk of the tree within which the tree will suffer irreparable damage. ICRZ is determined by multiplying the dbh of the tree in inches by 6. E.g., the interior crz of the 12" dbh tree would be a 6' circle around the trunk or a 12' diameter circle centered around the tree.
- C. Critical Root Zone (CRZ): defined as the radius around the trunk of the tree that is 2 times the ICRZ. E.g., the ICRZ of the 12" dbh tree is 12-foot diameter; therefore, the CRZ is $12' \times 2 = 24$ feet.
- D. Tree Failing to Fully Foliate: defined as 60% or more of the tree not having healthy leaves.
- E. Tree Protection Area: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- F. Invasives: Any plant found on the King County Noxious Weed List (most recent edition) or the WSDA Noxious Weed Lists A, B, C.
<http://www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds/laws/list.aspx>;
<http://www.nwcb.wa.gov/printable.htm>

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- C. Product Data: For each type of product indicated.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Certification: From a Registered Consulting Arborist (ASCA) that trees indicated to remain have been protected during construction according to recognized standards and that the trees were promptly and properly treated and repaired when damaged.
- F. Maintenance Recommendations: from a qualified arborist for care and protection of trees affected by construction during and after completing the Work.

- G. Submit report identifying location, size, and type of trees to be removed and replaced that are within tree protection areas. Provide photos of each tree to be removed showing damage that requires removal. Describe reasons for tree removal.

1.04 QUALITY ASSURANCE

- A. Tree Service Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site on a full-time basis during execution of the Work.
- B. Arborist Qualifications: A Registered Consulting Arborist certified by American Society of Consulting Arborists, licensed in the jurisdiction where Project is located.
- C. Tree Pruning Standards: Comply with ANSI A300, "Trees, Shrubs, and Other Woody Plant
- D. Maintenance - Standard Practices," unless more stringent requirements are indicated.
- E. Pre-construction Conference: Conduct conference at Project site to review tree protection requirements with Owner's representative.
 - 1. Before starting tree protection and trimming, meet with representatives of authorities having jurisdiction, Owner, Architect, Landscape Architect, Owner's Arborist, Contractor's Arborist, and other concerned entities. Review tree protection and trimming procedures and responsibilities. Notify participants at least three working days before convening conference. Record discussions and agreements and furnish a copy to each participant.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Filter Fabric: Manufacturer's standard, non-woven, pervious, geo-textile fabric of polypropylene, nylon, or polyester fibers.
- B. Chain Link Protection-Zone Fencing: Metallic-coated steel chain link fence fabric, 2-inch opening or smaller; 0.120-inch-diameter min. wire size; 6' high; line posts, 1.9 inches in diameter min.; terminal and corner posts, 2-3/8 inches in diameter min.; top rail, 1-5/8 inches in diameter min.; bottom tension wire, 0.177 inch in diameter min.; with tie wires, hog ring ties, and other accessories for a complete fence system.

2.02 TREE PROTECTION MULCH

- A. Materials acceptable for use as tree protection mulch:
 - 1. Imported Arborist Wood Chips
 - a. For each delivery truck load of imported chips, provide a letter of verification that ensures the load meets the following requirements:
 - 1) Material consists of chipped tree branches, leaves, and stumps,
 - 2) size: 2-5" x 1/2-3/4" thickness maximum,
 - 3) Free of noxious weeds per WSDA Noxious Weed Lists A, B, C, including, but not limited to, holly, blackberry, ivy, and scotch broom, (See: <http://www.nwcb.wa.gov/printable.htm>)
 - 4) No foreign material such as construction debris or household waste,
 - 5) No turf / sod.
 - 6) Identification of tree service company, contact name and number.
 - 2. Site Generated Wood Chips

- a. Material shall be made from trees designated to be removed from the site and consist of shredded bark, wood including vegetative matter, and shall be ground so that a minimum of 95 percent of the material will pass through a 5-inch sieve and no more than 45 percent will pass through a 3/4-inch sieve.
- b. It shall contain no material that would be deleterious to equipment or plants and shall not contain resin, tannin, or other compounds in quantities that would be detrimental to animals, plant-life, or water quality.
3. Animal Friendly Hog Fuel:
 - a. Ground brush / stump of Fir, Hemlock, Pine, and Alder chips, 3" - 5".

PART 3 - EXECUTION**3.01 PREPARATION**

- A. Review the tree protection limits and fencing. Fencing shall be in place and visible. Do not relocate the clearing limit fence at any time without written approval from the Owner.
 1. Identify trees that may have their CRZ extending outside of the clearing limit line.
 2. Notify the Owner immediately as to those trees that are of concern to request a determination from the Owner for protection or removal.
- B. Refer to Tree Protection Detail and Tree Protection Plan on contract drawings.
- C. Temporary Fencing: coordinate locations with limit of work limit. Confirm that fencing along limit of work line is outside the critical root zone of trees to protect and remain.

3.02 TREE AND VEGETATION REMOVAL

- A. Remove trees, shrubs, and other vegetation to permit installation of new construction.
 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 2. Trees, shrubs, and other ornamental vegetation located inside the tree protection fencing are to remain.
 3. Weeds located inside tree protection fencing are to be removed including but not limited to Himalayan blackberry, English ivy, Scotch broom, and holly.
 4. Grind down stumps and remove roots, obstructions, and debris to a depth of 18" (450 mm) below exposed subgrade.
 5. Use only hand methods for grubbing within protection zones.
- B. Trees and shrubs removed may be chipped on site to produce site generated wood chips for use in as tree protection mulch or in sheet mulching. Weeds shall not be chipped.

3.03 SIGNAGE

- A. Post all of Part 3 of this section on the fence in a watertight bag or other waterproof container that allows all text to be clearly visible. Post every 50' on a post along the clearing limit fence.

3.04 PROTECTION DURING CONSTRUCTION

- A. Protect tree root systems from damage due to noxious materials caused by runoff or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations. Protect root systems from damage due to removal of adjacent trees, see Stump Grinding below.
- B. Do not store construction materials, debris, or excavated material within the critical root zone of remaining trees. Do not permit vehicles or foot traffic within the critical root zone; prevent

soil compaction over root systems. Do not store construction materials, debris, or excavated material within the critical root zone of remaining trees.

- C. Do not permit vehicles, equipment, or foot traffic within the critical root zone of trees to remain or beyond the tree protection areas, whichever is greater.
- D. Do not allow fires under or adjacent to trees to remain or other plants.
- E. Maintain protection zones free of weeds and trash.
- F. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
- G. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
 - 1. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist and installed per tree protection detail "Surface Protection Measures". Maintain surface protection measures for as long as access is permitted.

3.05 EXCAVATION

- A. Install shoring or other protective support systems to minimize sloping or benching of excavations.
- B. Do not excavate within the interior critical root zone of trees, unless otherwise indicated. Contact the Owner's representative immediately if excavation is required within the critical root zone.
- C. Where excavation for new construction is required within the interior critical root zone of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.
- D. Relocate roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and relocate them without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots (only with arborist's approval) approximately 3 inches back from new construction. See paragraph 3.5G for root pruning requirements.
- E. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
- F. Where utility trenches are required within the critical root zone of trees, tunnel under or around roots by air spading, drilling, auger boring, pipe jacking, or digging by hand.
- G. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots (2-inches and smaller) that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop. Severance of roots larger than 2-inches requires Arborist's approval.

3.06 REGRADING

- A. Grade Lowering or Raising adjacent to trees: Where new finish grade is indicated below or above the existing grade around trees, slope grade beyond the critical root zone of trees. Maintain existing grades within the critical root zone of trees.

3.07 MULCHING AT EXISTING TREE STANDS

- A. Tree Protection Mulch shall be placed in areas left bare by invasive weed removal or other construction activity that may occur within the tree protection areas. Depth = 3 inches.
- B. Do not bury any native understory shrubs or groundcover.
- C. Do not place mulch within 6 inches of trunks. Do not place mulch within 3 inches of stems of shrubs or groundcover to remain.

3.08 STUMP GRINDING

- A. All trees to be removed that are located within the critical root zone of trees to remain shall NOT be ripped, pulled, or pushed over. Trees are to be cut near the ground. Stumps are to be ground to a minimum of 6" below finished grade, unless the documents specifically call out for the stump to remain.

3.09 TREE PRUNING

- A. Prune trees and vegetation to remain that are affected by temporary and new construction only if directed by owner's representative.
- B. Pruning Standards: Prune trees according to ANSI A300.
- C. Cut branches per arborist's instructions with sharp pruning instruments; do not break or chop.
- D. Chip branches removed from trees. Spread chips where indicated or as directed by Architect.
- E. Snag Trees: Where a tree is designated to be pruned and reduced in height to function as a natural habitat tree, a certified arborist shall be employed to perform all cutting and pruning.
- F. Cabling: Where a tree is designated to be cabled or guyed for safety, a certified arborist shall be employed to perform all work. The cable shall be steel. All work shall meet ANSI A300 (Part 3) standards.

3.10 TREE REPAIR AND REPLACEMENT

- A. Trees that are damaged, as determined by the Owner's arborist, and that are located beyond the tree protection fencing as identified in contract documents shall be replaced by the contractor at no cost to the Owner.
 - 1. Trees that fail to fully foliate in the spring following completion of construction operations shall be presumed to have been lost due to construction operations.
- B. Replacement:
 - 1. Provide new trees of 6-inch caliper size and matching species when trees more than 6 inches in caliper size, measured 12 inches above grade, are damaged by construction activity and are beyond the tree protection areas shown in plans.
 - 2. Locate and install replacement trees in accordance with the instructions of the Owner. Location of replacement trees may be anywhere within the Project.
 - 3. All areas that are impacted due to construction activity of any kind, including vehicle access, storage of material or clearing shall receive full subgrade preparation per Section 32 91 00 – Soil and Subgrade Preparation or shall be repaired per Owner's arborist's recommendations.
 - 4. Place approved mulch over all bare soil exposed during construction activity.
- C. Removal or replacement of dead and damaged trees requires Owner approval.

1. Remove and replace dead and damaged trees the Owner's arborist determines to be incapable of restoring to a normal growth pattern.
2. Promptly repair trees damaged by construction as directed by the Owner's arborist within 24 hours of receipt of instructions from the Arborist. Treat damaged trunks, limbs, and roots according to written instructions of a qualified arborist.
3. Proceed with removal per Owner's arborist's recommendations. Limit construction activity within the tree protection area based on Arborist's recommendations or limit all vehicular access or construction machinery from the tree protection area during repair activities.

3.11 DAMAGES FOR LOSS OR INJURY TO TREES WITHIN TREE PROTECTION AREAS

- A. In lieu of replacement it is Owner's option to require monetary compensation from the Contractor for trees identified to be protected that are damaged by the Contractor.
- B. The amount of damages to be paid by the Trade Contractor to the Owner for each tree lost or irreparably damaged shall be (1) a sum equal to the value of each lost tree as determined on the Tree Appraisal Value List prepared by the Owner's Arborist, OR 2) a sum of \$8,000, whichever is larger. The Tree Appraisal Value List is based on the latest edition of the Trunk Formula Method established by the Council of Tree and Landscape Appraisers. The GC shall deduct such payments from the monthly progress payments submitted by the Trade Contractor.
- C. In the event of injuries to the crown, trunk or root system of any tree to remain that are the result of the Trade Contract's failure to protect and/or maintain such tree, the Owner's Representative may elect to retain the tree and still hold the Trade Contractor liable for compensation. The just value of the damaged tree shall be determined by the Trunk Formula Method established by the Council of Tree and Landscape Appraisers, latest edition, or \$1500, whichever is greater.
- D. At Trade Contractor's expense, completely remove and dispose of any tree killed or irreparably damaged as a result of the Trade Contractor's failure to protect or maintain trees to remain.

3.12 SHEET MULCHING

- A. Install Sheet Mulching in areas designated on plans immediately upon installation of tree protection fencing.
- B. Remove roots and growth of invasives and non-native plants, including, but not limited to, blackberry, holly, scotch broom, ivy by hand within the tree protection area.
- C. Cut grass with weed whip or mower set as low as possible to scalp grass down to the soil.
- D. Place one inch of organic compost per 32 91 00 – Soil and Subgrade Preparation evenly across the entire area within tree protection fencing.
- E. Use tined fork to break up the turf and aerate. Do not turn soil.
- F. Cover entire area with corrugated cardboard with seams overlapping a minimum of 6 inches.
- G. Apply 6" depth tree protection mulch.
- H. Water weekly during summer months.

3.13 DISPOSAL OF WASTE MATERIALS

- A. Burning is not permitted.
- B. Disposal: Remove excess excavated material, and displaced trees from Owner's property.

END OF SECTION 01 56 39

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Silt control measures.
- B. Temporary stormwater runoff control.
- C. Measures to keep streets clean.
- D. Polyethylene (PE) sheeting cover for exposed soil.
- E. Maintaining, monitoring, and supplementing silt control and stormwater runoff control measures.
- F. Dewatering.

1.02 REFERENCE STANDARDS

- A. Comply with applicable provisions of the following specifications and documents:
 - 1. Whatcom County Development Standards.
 - 2. WSDOT Standard Specifications – Washington State Department of Transportation 2026 Standard Specifications for Road, Bridge, and Municipal Construction.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Submittals: Product catalog cuts for filter fabric and silt sac inserts.
- C. Aggregate Materials: Coarse aggregate for gravel construction entrance.

1.04 REGULATORY REQUIREMENTS

- A. All Work and material shall be in accordance with WSDOT Standard Specifications.
- B. Comply with Whatcom County standards.

1.05 SEQUENCING AND SCHEDULING

- A. Install erosion control measures in work areas prior to clearing, grubbing, demolition, general site grading, or other construction in area. Erosion control items shall be installed and removed at various times throughout duration of project.

1.06 QUALITY ASSURANCE

- A. Site Inspection of Erosion and Sediment Control: Certified as Certified Erosion and Sediment Control Lead (CESCL).

1.07 MAINTENANCE

- A. Maintain erosion control through duration of project.
- B. Maintain erosion control after substantial completion per this section.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Filter Fabric Fence: WSDOT Standard Specifications Section 9-33, Table 6, Geotextile for Temporary Silt Fence.
- B. Compost Socks: WSDOT Standard Specifications Section 9-14.5(6).

- C. Orange Protective Fence: Minimum 3 feet tall, heavy plastic, with readily visible mesh, minimum mesh width 0.4 inches.
- D. Polyethylene (PE) Sheeting: WSDOT Standard Specifications Section 9 14.5(3).
- E. Quarry spalls: WSDOT Standard Specifications Section 9-13.6.

PART 3 EXECUTION**3.01 PREPARATION**

- A. Locate existing utilities; avoid damage or disturbance. For aid in utility location call "Dial Dig 1 800 424 5555," 48 hours (two working days) prior to beginning construction. There are utilities on site that Dial Dig will not locate. Employ and pay for locator service to locate and mark utilities in addition to "DIAL DIG" service.
- B. Survey limits of Work to install orange construction and silt fence.
- C. Perform clearing or other work required to install erosion control.
- D. Survey/layout sediment.

3.02 CONSTRUCTION

- A. Filter Fabric Fence: Field-adjust location to perimeter of clearing and stripping. Location shown on Drawings is schematic. Cast trench excavation soils from fence installation to Construction side of fence. Overlap filter fabric fence joints minimum 1 foot prior to backfilling trench.
- B. Polyethylene Sheeting: Overlap joints minimum 28 inches. Overlap in direction of drainage and prevent water from draining onto material being protected. Secure in place to prevent movement and damage. Provide sandbags at 2.5 feet spacing and tie sand bags together with rope on slopes greater than 3:1. Minimize driving stakes through plastic.
- C. Compost Socks: Apply compost socks on exposed soils not protected by other means.
- D. Disposing of Silty Water Off Site:
 - 1. Provide pump and tanker trucks to load and haul silty water.
 - 2. Dispose of silty water in accordance with local, state, and federal codes.

3.03 FIELD QUALITY CONTROL

- A. Site Inspection: Comply with WSDOE requirements.

3.04 ADJUSTMENTS AND REVISIONS

- A. Adjust or move swales, berms, pipes, pumps, bales, and silt fences as necessary during construction to direct site runoff to vegetative areas.

3.05 PROTECTION AND MAINTENANCE

- A. Protection:
 - 1. Where possible, maintain natural vegetation for silt control.
 - 2. Prevent silt-laden water from leaving site or from entering off-site storm sewer systems.
 - 3. Stabilize slope, cut, or fill areas where Work is stopped for more than 30 days by mulching, polyethylene sheeting, or other method to prevent erosion and sediment transport.

4. Keep off-site parking areas, fire access, sidewalks and streets clean from construction activities. Keep paved surfaces clean using mechanical sweeping equipment, hand shovels, brooms, or other accepted methods suitable for removing dirt, rock, silt, and sand. No street washing will be allowed.
- B. Supplementary Measures: Provide additional silt control and temporary erosion control measures required to protect soils and prevent silt-laden runoff from leaving project site.
- C. Maintenance: Monitor and maintain silt control measures. Maintain temporary erosion control facilities until need for each facility is superseded by other stabilization methods or until Architect authorizes removal.
- D. Inspect and repair temporary erosion control facilities. Inspect entire system to ensure proper operation minimum of once per week, during and after storms, and prior to weekends and holidays.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements
- B. Sustainable design-related product requirements
- C. Re-use of existing products
- D. Transportation, handling, storage and protection
- E. Product option requirements
- F. Substitution limitations
- G. Maintenance materials, including extra materials, spare parts, tools, and software

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including the General Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.
- B. Section 01 1000 - Summary: Lists of products to be removed from existing building and for Owner-supplied products
- C. Section 01 2500 - Substitution Procedures: Substitutions proposed during procurement and/or construction phases.
- D. Section 01 4000 - Quality Requirements: Product quality monitoring

1.03 REFERENCE STANDARDS

- A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.
- B. ASTM D6866 - Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis; 2016.
- C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.
- D. EN 15804 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products; 2013.
- E. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action; www.greenscreenchemicals.org.
- F. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; www.greenscreenchemicals.org.
- G. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures; 2006.
- H. ISO 21930 - Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services; 2017.

1.04 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1. Submit within 14 days after date of Notice to Proceed.
2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
 2. New product presentations to Owner or provide Mock-ups or pre-installations information.
 3. Inform Owner of material/product origins and provide a list of proposed products.

1.05 QUALITY ASSURANCE (DEFINITIONS AND CERTIFICATIONS REFERENCED THROUGHOUT THE CONTRACT DOCUMENTS)

- A. Bio-Based Content: Of vegetable or animal origin, not including products made by killing the animal.
 1. Determine percentage of bio-based content in accordance with ASTM D6866.
 2. Bio-based content must be sourced from a Sustainable Agriculture Network certified farm.
- B. CAL (CDPH SM) v1.1: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1–2010, for the emissions testing and requirements of products and materials.
- C. Chain-of-Custody (COC): A procedure that tracks a product from the point of harvest or extraction to its end use, including successive stages of processing, transformation, manufacturing, and distribution.
- D. Chain-of-Custody Certificates: Certificates signed by manufacturers and fabricators certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.
- E. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.
- F. Corporate Sustainability Report: A third-party verified report that outlines the environmental impacts of extraction operations and activities associated with the manufacturer's product and the product's supply chain.
- G. Cradle-to-Cradle Certified: End use product certified Cradle-to-Cradle v2 Basic or Cradle-to-Cradle v3 Bronze, minimum, as evidenced by C2C (DIR).
- H. Environmental Product Declaration (EPD): Publicly available, critically reviewed life cycle analysis having at least a cradle-to-gate scope.

1. Good: Product-specific; compliant with ISO 14044.
 2. Better: Industry-wide, generic; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
 3. Best: Commercial-product-specific; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
 4. Where demonstration of impact reduction below industry average is required, submit both industry-wide and commercial-product-specific declarations; or submit at least 5 declarations for products of the same type by other manufacturers in the same industry.
- I. GreenScreen Chemical Hazard Analysis: Ingredients of 100 parts-per-million or greater evaluated using GreenScreen (METH).
1. Good: GreenScreen (LIST) evaluation to identify Benchmark 1 hazards; a Health Product Declaration includes this information.
 2. Better: GreenScreen Full Assessment.
 3. Best: GreenScreen Full Assessment by GreenScreen Licensed Profiler.
 4. Acceptable Evidence: GreenScreen report.
- J. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using one of the HPDC (HPD-OLT) online tools.
- K. Leadership Extraction Practices: Products that meet at least one of the responsible extraction criteria, which include: extended producer responsibility; bio-based materials; FSC wood products; materials reuse; recycled content; and other programs approved by sustainability certification system used for the project.
- L. Manufacturer's Inventory of Product Content: Publicly available inventory of every ingredient identified by name and Chemical Abstract Service Registration Number (CAS RN).
1. For ingredients considered a trade secret or intellectual property, the name and CAS RN may be omitted, provided the ingredient's role, amount, and GreenScreen Benchmark are given.
- M. Rapidly Renewable Materials: Made from agricultural products that are typically harvested within a 10-year or shorter cycle.
- N. Recycled Content: Determine percentage of post-consumer and pre-consumer (post-industrial) content separately, using the guidelines contained in 16 CFR 260.13.
1. Previously used, reused, refurbished, and salvaged products are not considered recycled.
 2. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
 3. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of materials in the item.
 4. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.
 5. Acceptable Evidence:
 - a. For percentage of recycled content, information from manufacturer.

- b. For cost, Contractor's cost data.
- O. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles from the Project site.
- P. Reused Products: Materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
 - 1. Wood fabricated from timber abandoned in transit after harvesting is considered reused, not recycled.
 - 2. Acceptable Evidence: Information about the origin or source, from Contractor or supplier.
- Q. Source Location: Location of harvest, extraction, recovery, or manufacture; where information about source location is required to be submitted, give the postal address:
 - 1. In every case, indicate the location of final assembly.
 - 2. For harvested products, indicate location of harvest.
 - 3. For extracted (i.e., mined) products, indicate location of extraction.
 - 4. For recovered products, indicate location of recovery.
 - 5. For products involving multiple manufacturing steps, provide a description of the process at each step, with location.
 - 6. Acceptable Evidence:
 - a. Manufacturer's certification.
 - b. Life Cycle Analysis (LCA) performed by third-party.
- R. Sustainably Harvested Wood: Solid wood, wood chips, and wood fiber certified or labeled by an organization accredited by one of the following:
 - 1. The Forest Stewardship Council, The Principles for Natural Forest Management; for Canada visit <http://www.fsccanada.org>, for the USA visit <http://www.fscus.org>.
 - 2. Acceptable Evidence: Copies of invoices bearing the certifying organization's certification numbers.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner and follow procedures as per Dept. of Archaeology & Historic Preservation, <https://dahp.wa.gov>.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is noted in the Contract Documents.
 - 1. See Section 01 1000 – Summary for list of items required to be salvaged for reuse and relocation.

2. If reuse of other existing materials or equipment is desired, submit substitution request.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. See Section 01 4000 - Quality Requirements, for additional source quality control requirements.
- C. Use of products having any of the following characteristics is not permitted:
 1. Made using or containing CFC's or HCFC's
 2. Made of wood from newly cut old growth timber
 3. Containing lead, cadmium, or asbestos
- D. Where other criteria are met, Contractor shall give preference to products that:
 1. Are extracted, harvested, and/or manufactured closer to the location of the project.
 2. Have longer documented life span under normal use.
 3. Result in less construction waste. See Section 01 7419 - Construction Waste Management and Disposal.
 4. Are made of vegetable materials that are rapidly renewable.
 5. Are made of recycled materials.
 6. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.
 7. If bio-based, other than wood, are or are made of Sustainable Agriculture Network certified products.
 8. Are Cradle-to-Cradle Certified.
 9. Have a published Environmental Product Declaration (EPD).
 10. Have a published Health Product Declaration (HPD).
 11. Have a published GreenScreen Chemical Hazard Analysis.
 12. Have a published Manufacturer's Inventory of Chemical Content.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 2500 - Substitution Procedures

3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Do not store products directly on the ground.
- I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

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

END OF SECTION 01 60 00

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Construction Waste Management.
- F. Daily Cleaning and protection.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including the General Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.
- B. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- C. Section 01 7800 - Closeout Submittals and Procedures: Project record documents, operation and maintenance data, warranties, and bonds.
- D. Section 01 9113 - General Commissioning Requirements: Contractor's responsibilities regarding commissioning.
- E. Individual Product Specification Sections

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
 - 6. Include in request:
 - a. Identification of Project.
 - b. Location and description of affected work.

- c. Necessity for cutting or alteration.
- d. Description of proposed work and products to be used.
- e. Alternatives to cutting and patching.
- f. Effect on work of Owner or separate Contractor.
- g. Written permission of affected separate Contractor.
- h. Date and time work will be executed.

1.04 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
 - 1. Minimum of five years of documented experience.

1.05 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Perform dewatering activities, as required, for the duration of the project to protect site from puddling or running water.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. Follow AHJ Requirements for Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
 - 2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- F. Follow AHJ Requirements for Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- G. Follow AHJ Requirements for Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations. Noise control plan to be reviewed and approved by Owner.
 - 1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers, pneumatic hammers, and air-operated nail guns.
 - 2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.

3. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am. Contractor must factor in this cost for after hours.
- H. Pest, Wildlife and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
 1. Pest Control Service: Weekly treatments.
- I. Follow AHJ Requirements for Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

- A. See Section 01 1000 - Summary for occupancy-related requirements.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
- H. Give at least 72 hours prior notice to Owner of any utility shutdown.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 2500 - Substitution Procedures.
- D. Quality Requirements 01 4000 to follow construction quality standards.

PART 3 EXECUTION

3.01 EXAMINATION

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

- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or to prevent quantity errors in fabrication.
- E. Verify that utility services are available, that all utilities have available capacity to service the project, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify A/E seven days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation, and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to A/E, Owner, participants, and those affected by decisions made as per preconstruction checklist.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.

2. Report discrepancies to A/E before disturbing existing installation.
3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 - Temporary Facilities and Controls in locations indicated on drawings.
 2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Remove existing work as indicated and as required to accomplish new work.
 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 2. Remove items indicated on drawings.
 3. Relocate items indicated on drawings.
 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. See Section 01 1000 for other limitations on outages and required notifications.
 - c. Provide temporary connections as required to maintain existing systems in service.
 4. Verify that abandoned services serve only abandoned facilities.

5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- F. Protect existing work to remain.
 1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
- G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
 1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to A/E.
 2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
 3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for A/E review and request instructions.
 4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.
- H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- I. Refinish existing surfaces as indicated:
 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- J. Clean existing systems and equipment.
- K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- L. Do not begin new construction in alterations areas before demolition is complete.
- M. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 1. Complete the work.
 2. Fit products together to integrate with other work.
 3. Provide openings for penetration of mechanical, electrical, and other services.
 4. Match work that has been cut to adjacent work.
 5. Repair areas adjacent to cuts to required condition.

6. Repair new work damaged by subsequent work.
 7. Remove samples of installed work for testing when requested.
 8. Remove and replace defective and non-complying work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air-tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of the penetrated element.
- I. Patching:
1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 2. Match color, texture, and appearance.
 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 DAILY CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

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EXECUTION REQUIREMENTS

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- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Prohibit traffic from landscaped areas.
- H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

END OF SECTION 01 70 00

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
 - 1. Any material proposed for reuse on-site, must be reviewed and approved by the Architect. Architect may require additional testing/engineering review and approvals. Any costs associated with additional testing/engineering shall be provided by the Contractor at no additional costs to the project. See Part 2 below for Substitution procedures to be used when requesting material reuse.
 - 2. Aluminum and plastic beverage containers
 - 3. Corrugated cardboard
 - 4. Wood pallets
 - 5. Clean dimensional wood
 - 6. Land clearing debris, including brush, branches, logs, and stumps; see Section 01 1000 - Site Clearing for use options
 - 7. Concrete
 - 8. Bricks
 - 9. Concrete masonry units
 - 10. Precast concrete panels
 - 11. Asphalt paving
 - 12. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - 13. Glass
 - 14. Gypsum drywall and plaster
 - 15. Plastic buckets
 - 16. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed and include conduct for reclamation programs.
 - 17. Asphalt roofing shingles
 - 18. Paint
 - 19. Plastic sheeting
 - 20. Rigid foam insulation

21. Vinyl siding
 22. Windows, doors, and door hardware
 23. Plumbing fixtures
 24. Mechanical and electrical equipment
 25. Fluorescent lamps (light bulbs)
 26. Acoustical ceiling tile and panels
- E. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- F. The following sources may be useful in developing the Waste Management Plan:
1. Washington State Department of Ecology at <https://ecology.wa.gov/>.
 - a. Reducing & recycling waste: <https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste>
 - b. Construction and demolition: <https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Dangerous-waste-guidance/Common-dangerous-waste/Construction-and-demolition>
- G. Methods of trash/waste disposal that are not acceptable are:
1. Burning on the project site
 2. Burying on the project site
 3. Dumping or burying on other property, public or private
 4. Other illegal dumping or burying
 5. Incineration, either on- or off-site
- H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including the General Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.
- B. Section 01 1100 - Summary of Hazardous Materials Work: Procedures for handling and disposal of hazardous materials.
- C. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- D. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- E. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- F. Section 01 7000 - Execution Requirements Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

G. Section 01 7800-Closeout Submittals and Procedures.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Waste Management Plan: Include the following information:
 - 1. Submit Waste Management Plan within 14 days after date established in Notice to Proceed.
 - 2. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.

3. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 4. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the local market for each material.
 - c. State the estimated net cost, versus landfill disposal.
 5. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 6. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 7. Transportation: Identify the destination and means of transportation of materials to be recycled, i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
- C. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 2. Submit Report on a form acceptable to Owner.
 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 4. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

- e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
- 5. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
- 6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION**

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and A/E.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Job safety meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. As a minimum, provide:
 - a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
 - b. Separate dumpsters for each category of recyclable.
 - c. Recycling bins at worker lunch area.
 - 2. Provide containers as required.
 - 3. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 4. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility to prevent contamination of recyclable materials.

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- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 01 74 19

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Closeout
- B. Project Record Documents
- C. Operation and Maintenance Data
- D. Warranties
- E. System Startup
- F. Demonstration and Instruction
- G. Final Cleaning

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including the General Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.
- B. Section 01 3000 - Administrative Requirements: Submittal procedures, shop drawings, product data, and samples
- C. Section 01 7000 - Execution Requirements
- D. Individual Product Sections: Specific requirements for operation and maintenance data
- E. Individual Product Sections: Warranties required for specific products or work
- F. Section 01 9113 General Commissioning Requirements

1.03 CLOSEOUT PROCEDURES

- A. Make any submittals requested by AHJ or any other regulatory agencies.
 - 1. Provide copies to A/E
 - 2. Include copies in Record Documents
- B. A/E will conduct a Construction Closeout Meeting when the work is approximately 75% complete. A/E will issue the Substantial Completion Checklist to the Contractor for use in project closeout.
- C. Contractor shall submit a written Notice of Substantial Completion certifying that the work has been inspected, and that work is complete in accordance with the Contract Documents and ready for A/E Punch List Inspection. Prior to submitting Contractor's Notice of Substantial Completion, the Contractor shall complete the following.
 - 1. Submit all outstanding Field Authorization's (FA) and Change Order Proposals (COP) for review.
 - 2. LEED submittals and reports completed and uploaded to USGB (if applicable).
 - 3. Submit written notice of substantial completion with list of remaining incidental corrective work (punch list)
 - 4. Submit all required permits (occupancy, elevator, boiler, fire marshal, Dept of Health, etc.)
 - 5. Submit final Operations and Maintenance Manuals
 - 6. Staff training and provide training materials
 - 7. Submit final warranties
 - 8. Submit all specified spare parts, tools, and extra stock
 - 9. Submit keys and key schedules
 - 10. Submit all specified required test reports

11. Accompany A/E and Owner on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List.
 12. All work other than incidental corrective or punch list work.
 13. Provide draft As-Built markup of contract documents
- D. Upon receipt of Contractor's Notice of Substantial Completion, A/E will schedule and prepare punch list. If the A/E deems remaining punch list work to be incidental they will issue the Final Correction Punch List and the Certificate of Substantial Completion.
- E. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- F. Final Acceptance: After receipt of Certificate of Substantial Completion, the following must be completed by the contractor before the project will be considered complete and closed out by DES.
1. Submit written notice that all incomplete work noted on the Certificate of Substantial Completion has been completed.
 2. All work shall be complete and acceptable to A/E and Owner's Representatives prior to Final Acceptance.
 3. Confirm all FAs resolved, approved, and all change orders processed.
 4. Confirm any and all claims and/or disputes are resolved.
 5. Provide final "As-Built" project record documents.
 6. Confirms affidavit of wages paid, approved by L&I, for the contractor and subcontractors, all tiers, that performed work on the project.
 7. Confirm all payments to subcontractors have been accurately reported via B2GNow.
 8. Submit retainage invoice.

1.04 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Submit documents to A/E a minimum of 14 days prior to Contractor's anticipated Notice of Substantial Completion.
1. When electronic Record Documents are permitted by the Owner, they shall receive submittals in PDF format for review, unless otherwise approved by the Owner.
- B. Operation and Maintenance Data:
1. When electronic Operations and Maintenance manuals are permitted by the Owner, they shall be provided as a single PDF document following the same procedures as noted in Part 3 Execution.
 2. Submit 2 copies of DRAFT Operation and Maintenance Manuals to A/E when project is deemed 75% complete (per submitted application for payment). Revise content as required prior to final submission. The revision will be provided to the Owner for use until receipt of final documents.
 3. Contractor shall submit final Operation and Maintenance Manuals properly tabbed in PDF format and 2 hard copy binders to A/E two weeks prior to substantial completion. Subject to Owner's format preference.
- C. Warranties:
1. When electronic Warranties are permitted by the Owner, they shall be provided as a single PDF document following the same procedures as noted in Part 3 Execution. A hard copy of all warranties with original documents will also be required.
 2. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 14 days after acceptance.
 3. Contractor shall submit DRAFT Warranties at the Construction Closeout meeting when construction is approximately 75% complete..

4. Submit FINAL Warranties to A/E prior to substantial completion.
- D. Staff Training:
 1. Completion of specified operations and maintenance training of Client Agency facility representatives no later than two weeks prior to substantial completion.
 2. Submit training materials to the A/E.

PART 2 DOCUMENTATION

2.01 PROJECT As-Built DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the work:
 1. Drawings
 2. Specifications
 3. Addenda
 4. Change Orders and other modifications to the Contract
 5. Reviewed shop drawings, product data, and samples
 6. Manufacturer's instruction for assembly, installation, and adjusting
 7. Tests and Inspections Log and Reports
 8. LEED submittal documentation
 9. Commissioning Report
 10. Post Construction Survey (when required by other sections of the Project Manual)
 11. Permits
 12. Progress Photographs
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store As-Built documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
 4. Changes made by executed Change Orders.
- F. As-Built Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 1. Measured depths of foundations in relation to finish first floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Field changes of dimension and detail.
 4. Details not on original contract drawings.
 5. Changes made by Addenda and modifications.
 6. Changes made by executed Change Orders.
- G. Permits
 1. Include copies of all signed off permits with Project Record Document Submittal.
 2. Provide original versions of all signed-off permits to the Owner.
 3. Any other submittal required or requested by AHJ.

PART 3 OPERATIONS AND MAINTENANCE

3.01 OPERATION AND MAINTENANCE DATA

- A. Provide data as indicated by individual specification sections.
- B. Source Data: For each product or system, list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.02 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. Provide data as indicated by individual specification sections.
- B. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.
- C. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- D. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- E. Additional information as specified in individual product specification sections.
- F. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.03 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. Provide data as indicated by individual specification sections.
- B. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- D. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- E. Include color coded wiring diagrams as installed.

- F. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.
- G. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- H. Provide servicing and lubrication schedule, and list of lubricants required.
- I. Include manufacturer's printed operation and maintenance instructions.
- J. Include sequence of operation by controls manufacturer.
- K. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- L. Provide control diagrams by controls manufacturer as installed.
- M. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- N. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- O. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- P. Include test and balancing reports.
- Q. Additional Requirements: As specified in individual product specification sections.

3.04 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11-inch three D side ring binders with durable plastic covers; 2-inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of A/E, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20-pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text, fold larger drawings to size of text pages.

- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory
 - 2. Table of Contents, of all volumes, and of this volume
 - 3. Operation and Maintenance Data: Arranged by system, then by product category
 - a. Source data
 - b. Product data, shop drawings, and other submittals
 - c. Field quality control data
 - d. Photocopies of warranties

3.05 WARRANTIES

- A. All warranties shall start from date of Substantial Completion.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11-inch three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

3.06 SYSTEM STARTUP

- A. Coordinate with requirements of Section 01 9113 - General Commissioning Requirements.
- B. Coordinate schedule for start-up of various equipment and systems.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification sections, require manufacturer to provide authorized representative to be present at the site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.07 DEMONSTRATION AND INSTRUCTION

- A. See individual specification sections for specific demonstration and instruction requirements.
- B. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
 - 1. Owner will prepare a Change Order to address demonstration provided outside of the Contract Time. No additional compensation will be due the Contractor for work associated with the Change Order.
- D. Provide a qualified person who is knowledgeable about the project to perform demonstration and instruction of Owner's personnel.

3.08 ADJUSTING

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

3.09 FINAL CLEANING

- A. Execute final cleaning prior to submitting Contractor's Notice of Substantial Completion.
 - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- B. Use cleaning materials that are nonhazardous.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Replace filters of operating equipment.
- F. Clean site: sweep paved areas, remove stains, spills and any foreign deposits, rake clean landscaped surfaces. Reseed ground areas damaged by construction activity.
- G. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

END OF SECTION 01 78 00

PART 1 GENERAL

1.01 SUMMARY

- A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
 - 1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
 - 2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Agent are utilized to achieve this.
 - 3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
 - 4. Verify that the formal training, as required by the Contract Documents, has been presented to the Owner's operating personnel. Formal training conducted by Contractor is utilized to achieve this.
- B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.
- C. The Commissioning Agent directs and coordinates all commissioning activities; this section describes some but not all the Commissioning Agent's responsibilities.
- D. The Commissioning Agent is employed by Owner.

1.02 SCOPE OF COMMISSIONING

- A. The following are to be commissioned:
- B. Building envelope:
 - 1. Thermal and moisture integrity
 - 2. Air tightness
- C. Structural systems
- D. Elevating and conveying systems
- E. Fire Protection Systems
- F. Plumbing Systems:
 - 1. Water heaters
 - 2. Booster pumps
 - 3. Laboratory gas systems
 - 4. Medical gas systems
 - 5. Landscape irrigation
- G. HVAC System, including:
 - 1. Major and minor equipment items
 - 2. Piping systems and equipment
 - 3. Ductwork and accessories
 - 4. Terminal units
 - 5. Control system
 - 6. Sound control devices
 - 7. Vibration control devices

- 8. Variable frequency drives
- H. Special Ventilation:
 - 1. Fume hoods
 - 2. Laboratory pressurization
 - 3. Specialty fans
 - 4. Egress pressurization
- I. Electrical Systems:
 - 1. Power quality
 - 2. Grounding and bonding
 - 3. Emergency standby power systems
 - 4. Uninterruptible power systems
 - 5. Lighting controls other than manual switches
 - 6. Circuit breaker trip settings where electrical equipment includes adjustable settings
- J. Electronic Safety and Security:
 - 1. Security system, including doors and hardware
 - 2. Fire and smoke alarms
 - 3. Distributed Antenna Systems (DAS)
- K. Communications:
 - 1. Voice and data systems
 - 2. Public address/paging
- L. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.
- M. Sound Transmission Class-rated interior partitions

1.03 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including the General Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.
- B. Section 01 3216 - Construction Progress Schedule: For incorporating Commissioning Schedule..
- C. Section 01 7800 - Closeout Submittals and Procedures: Scope and procedures for operation and maintenance manuals and project record documents.

1.04 REFERENCE STANDARDS

- A. ANSI/RESNET/ICC 380 - Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems; 2016.
- B. ASHRAE Std 202 - Commissioning Process for Buildings and Systems; 2018.
- C. ASTM E336 - Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings; 2019.
- D. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization; 2010 (Reapproved 2018).
- E. ASTM E1827 - Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door; 2011 (Reapproved 2017).

- F. CSI/CSC MF – Master Format; 2016.
- G. NEBB S110 - Whole Building Technical Commissioning Of New Construction; 2018.
- H. ANSI/NETA ATS-2017 Standard Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
- B. See Section 01 9114 - Commissioning Agent Responsibilities for other submittal requirements.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Provide all standard testing equipment required to perform building envelope air tightness testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- C. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
 - 1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degrees F and resolution of plus/minus 0.1 degrees F.
 - 2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
 - 3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.
- D. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

- A. Commissioning Agent will prepare the Commissioning Plan.
 - 1. Attend meetings called by the Commissioning Agent for purposes of completing the commissioning plan.
 - 2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.
- B. Contractor is responsible for compliance with the Commissioning Plan.
- C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.
- D. Commissioning Schedule:

1. Commissioning Schedule is to be included as a discreet component of Construction Progress Schedule.
2. Submit anticipated dates of startup of each item of equipment and system to Commissioning Agent within 60 days after award of Contract.
3. When equipment or systems required seasonal operation or cannot be fully commissioned due to seasonal conditions during the Contract Time, provide a separate commissioning schedule for all work necessary after Substantial Completion.
 - a. Owner will prepare a Change Order to address commissioning work provided outside of the Contract Time. No additional compensation will be due the Contractor for work associated with the Change Order.
4. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
5. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
6. Provide sufficient notice to Commissioning Agent for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.02 STARTUP PLANS AND REPORTS

- A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.
- B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.
- C. Submit directly to the Commissioning Agent.

3.03 PREFUNCTIONAL CHECKLISTS

- A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
 1. No sampling of identical or near-identical items is allowed.
 2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
- B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Agent is not required unless otherwise specified.
 1. Submit completed Checklists to Commissioning Agent within two days of completion.
- C. Commissioning Agent is responsible for furnishing the Prefunctional Checklists to Contractor.
- D. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
 1. If difficulty in correction would delay progress, report deficiency to the Commissioning Agent immediately.

3.04 FUNCTIONAL TESTS

- A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.
- B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

- C. Commissioning Agent is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.
- D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Agent will document the deficiency and the Contractor's stated intentions regarding correction.
 - 1. Contractor shall bear the cost of Owner and Commissioning Agent personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.
- E. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.05 SENSOR AND ACTUATOR CALIBRATION

- A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

3.06 TEST PROCEDURES - GENERAL

- A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

3.07 BUILDING ENVELOPE COMMISSIONING

- A. General: Comply with the following procedural requirements:
 - 1. NEBB S110 Whole Building Technical Commissioning of New Construction.
 - 2. ASTM E779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
 - 3. ASTM E1827 Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door.
 - 4. ANSI/RESNET/ICC 380 Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems.
- B. Verify that the building envelope has been sufficiently completed for testing to commence.
- C. Conduct ongoing inspections as construction progresses to document satisfactory installation conditions. related to thermal and moisture integrity of the building envelope that become concealed upon completion of construction.

3.08 FIELD TESTING AND COMMISSIONING OF PARTITIONS FOR NOISE ISOLATION

- A. Conduct testing of partitions requiring a specific STC class indicated on drawings and/or in various specifications sections. Comply with ASTM E336 for testing methods, including requirements of Annex A1 for reduction of flanking sound transmission.
- B. Confirm that the FSTC values are not less than 67 percent of design STC values.
- C. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

1. If difficulty in correction would delay progress, report deficiency to the Commissioning Agent immediately.

3.09 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01 7800 - Closeout Submittals and Procedures for additional requirements.
- B. Add design intent documentation furnished by A/E to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Agent for review; make changes recommended by Commissioning Agent.
- D. Commissioning Agent will add commissioning records to manuals after submission to Owner.

END OF SECTION 01 9113

PART 1 GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Demolition of two (2) existing pole building structures, including concrete slab-on-grade.
 - 2. Selective demolition of built site elements as indicated in the drawings.
 - 3. Selective demolition of interior building elements for alteration purposes.
 - 4. Removal and disposal of furnishings, fixtures, and appliances indicated on the drawings.
 - 5. Abandonment and removal of existing utilities as indicated in the drawings.
 - 6. Coordination of Archaeological Monitoring and preservation of on-site cultural artifacts.
 - 7. Abatement and removal of hazardous materials identified in Section 01 11 00.
 - 8. Salvage of items designated by the Owner.
- B. Related work in other sections:
 - 1. Section 01 10 00 - Summary of Work.
 - 2. Section 01 11 00 – Summary of Hazardous Materials.
 - 3. Section 01 21 00 – Allowances.
 - 4. Section 01 50 00 – Temporary Facilities and Controls.
 - 5. Section 01 56 39 – Tree and Plant Protection.
 - 6. Section 01 74 19 - Construction Waste Management and Disposal.
 - 7. Section 02 41 13 – Site Demolition.
 - 8. Section 02 82 13 – Asbestos Abatement.
 - 9. Section 02 83 13 – Lead Related Activities.
 - 10. Section 26 00 10 – Basic Electrical Requirements.
- C. Additional Available Project Information included in the Project Manual:
 - 1. Good Faith Hazardous Materials Survey conducted by Apex Companies.
 - 2. Cultural Resources Survey Report conducted by Drayton Archaeology.
 - 3. Archaeological Site Excavation and Disturbance Permit Application.

1.02 CULTURAL RESOURCES

- A. General: Significant cultural resources including intact and disturbed archaeological deposits have been previously identified on the project site. Contractor shall comply with all requirements of the Site Disturbance and Excavation Permit issued by the Department of Archaeology and Historic Preservation (DAHP).
- B. Archaeological Monitoring: The Archaeological Monitor will ensure the proper treatment of all cultural materials discovered during the monitoring of ground disturbing activity.

1. The Monitoring Archaeologist shall document excavation with photographs recording progress, with special attention to the emergence of pilings or other structural elements within the fill. Archaeologist shall be present for all ground-disturbing activity.
2. Any identified shell matrix shall be screened and analyzed on-site and sorted as directed by the Monitoring Archaeologist. All disturbed and excavated soils are to remain on-site.
- C. Refer to Section 01 21 00 – Allowances for costs to be included in the Base Bid to account for archaeological monitoring impacts. Payment will be adjusted to reflect actual efforts incurred.

1.03 DEFINITIONS

- A. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.
- C. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.
- D. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.04 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Site Demolition Plan:
 1. Indicate areas used for temporary construction and field offices.
 2. Identify areas of anticipated excavation and ground disturbance for coordination with the Monitoring Archaeologist.
 3. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
- C. Schedule: Submit for approval demolition schedule, including schedule and methods for capping utilities to be abandoned and maintaining existing utility service.
- D. Salvaged Items: Submit a list confirming all items to be salvaged for the Owner.
- E. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.06 QUALITY ASSURANCE

- A. Codes and Regulations: Comply with governing codes and regulations.
- B. Use experienced demolition workers.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMOLITION – GENERAL

- A. Demolition Operations: Do not damage building elements and improvements indicated to remain. Items of salvage value, not included on schedule of salvage items to be returned to Owner, shall be removed from structure. Storage or sale of items at project site is prohibited.
- B. Utilities: Locate, identify, disconnect, and seal or cap off utilities in buildings to be demolished.
- C. Shoring and Bracing: Provide and maintain interior and exterior shoring and bracing.
- D. Occupied Spaces: Do not close or obstruct streets, walks, drives or other occupied or used spaces or facilities without the written permission of the Owner and the authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the Owner and authorities having jurisdiction. If necessary, provide temporary utilities.
- E. Operations: Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.
- F. Security: Provide adequate protection against accidental trespassing. Secure project after work hours.
- G. Restoration: Restore all existing finishes noted to remain that are impacted by the work.
 - 1. At the contractor's option, existing lathe and plaster finishes noted to remain may be replaced with new gypsum board sheathing along the entire wall area.
 - 2. Repair impacted lathe and plaster finishes to a level acceptable to the Architect.

3.02 DEMOLITION SCHEDULE

- A. Items to be Protected During Demolition and Construction:
 - 1. Existing trees, and plantings noted to remain on the landscape drawings.
 - 2. Existing landscaping including lawn areas and planting beds noted to remain.
 - 3. Site fencing along the North and South property lines.
 - 4. All disturbed and excavated soils and cultural artifacts are to remain on-site.
- B. Items to be Salvaged for Reinstallation:
 - 1. Outdoor book collection bin.
 - 2. Other items identified by Owner during the pre-construction meeting.
- C. Items to be Salvaged for Delivery to Owner:
 - 1. Existing building signage.
 - 2. Other items identified by Owner during the pre-construction meeting.
- D. Utilities Requiring Interruption, Capping, or Removal:
 - 1. Interrupt and relocate existing electrical service.

2. Remove all existing heating and ventilation systems.
 3. Remove domestic water distribution piping, maintain service point of connection.
 4. Remove all gas piping and natural gas meter. Cap existing gas service at meter.
 5. Remove all sanitary sewer piping, maintain existing point of connection.
 6. Remove all existing telecom wiring, maintain existing point of connection.
- E. Structures to be Demolished:
1. Demolish the two existing pole buildings complete as indicated on the drawings.
 - a. Include the deconstruction and removal of all framing, siding, doors, furnishings, equipment, and stored materials not salvaged by the Owner.
 - b. Remove existing electrical meter, transfer switch, and other equipment as indicated on the electrical drawings.
 - c. Demolish and crush existing concrete slab-on-grade for placement in the crawlspace. Sort and screen all demolished materials as directed by the Monitoring Archaeologist.
 2. Demolish the existing wood framed deck complete at the East elevation of the residence.
- F. Selective Building Demolition:
1. First Floor: Demolish all existing finishes including flooring, plaster wall finishes, windows, doors, appliances, cabinetry, plumbing fixtures, light fixtures, heating vents, ducts, and piping unless noted otherwise on the drawings.
 2. Second Floor: Demolish existing flooring, windows, cabinetry, plumbing fixtures, light fixtures, and piping unless noted otherwise on the drawings.
- G. Site Demolition:
1. Remove paving and curbs required to accomplish new work.
 2. Remove all other paving and curbs as indicated on drawings.
 3. Remove concrete slabs on grade as indicated on drawings.
 4. Remove fencing as indicated on the drawings.
 5. Remove existing pole mounted site lighting including support poles.

3.03 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
1. Obtain all required permits.
 2. Coordinate required archaeological monitoring prior to any ground disturbing activity.
 3. Use of explosives and burning of materials on-site is not permitted.
 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.

5. Provide, erect, and maintain temporary barriers and security devices.
 6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 7. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 8. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring as required to complete the work.
 2. Prevent movement or settlement of existing structures to remain.
 3. Stop work immediately if existing structures appear to be in danger.
- E. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- F. Hazardous Materials:
1. If hazardous materials not identified in the Good Faith Survey are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.
 2. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.
- G. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Comply with Section 01 74 19 - Construction Waste Management and Disposal.
 2. Dismantle existing construction and separate materials.
 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.
- H. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.04 EXISTING UTILITIES

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities noted to remain from damage during construction.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.05 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - 1. Verify construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- C. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
 - 2. Remove items indicated on drawings.
- D. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems to remain in operation and maintain access to equipment and operational components.
 - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - 3. Verify that abandoned services serve only abandoned facilities before removal.
 - 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
- E. Protect existing work to remain.
 - 1. Prevent movement of structure. Provide shoring and bracing as required.
 - 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch to match new work.

Division 02 Specifications

Whatcom County Library System

Birch Bay Vogt Library Express

02 41 00

DEMOLITION

7 of 7

3.06 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 41 00

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Demolition and removal of site improvements and pavements.
- B. Disconnecting, capping or sealing, and abandoning site utilities in place.
- C. Disconnecting, capping or sealing, and removing site utilities.
- D. Salvage of existing utilities and improvements.

1.02 RELATED REQUIREMENTS

- A. Section 312000 - Earth Moving
- B. Division 26 - Electrical

1.03 REFERENCES

- A. WSDOT Standard Specifications - Washington State Department of Transportation 2026 Standard Specifications for Road, Bridge, and Municipal Construction.
- B. Whatcom County Development Standards.

1.04 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- B. Existing to Remain: Protect construction to remain against damage and soiling during demolition. When permitted by Architect, items may be removed to suitable, protected storage location during demolition then cleaned and reinstalled in original locations.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

1.06 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with Whatcom County Standards.

1.07 MATERIAL OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, stockpiled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Structural Fill: Per Section 312000 - Earth Moving.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify erosion control is in place and operating properly.
- B. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.02 PREPARATION

- A. Salvage items indicated on the plans or as directed by the owner.

- B. Protect elements surrounding Work of this section from damage or disfiguration.
- C. Protect existing utilities from damage and disturbance. Provide shoring to support existing utilities and their support prism or remove and replace utilities where shoring is not practical. Removing and replacing to be performed per utility Owner's standards.
- D. Erect barriers and barricades to direct and protect adjacent traffic.
- E. Locate existing utilities, avoid damage or disturbance. For aid in utility location call "Dial Dig 1 800 424 5555," 48 hours (two working days) prior to beginning construction. Employ and pay for a locator service to locate and mark utilities in addition to the "DIAL DIG" service.
- F. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

3.03 DEMOLITION

- A. Salvage items indicated on the plans or as directed by the Owner.
- B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Architect. Provide alternate routes around closed or obstructed traffic ways if required.
- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.
- D. Explosives: Use of explosives will not be permitted.
- E. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.
- F. Utilities:
 - 1. Locate, identify, disconnect and seal or cap off utilities as shown on Drawings.
 - 2. Disconnect power per Division 26.
- G. Pavement Demolition:
 - 1. Saw cut pavement at edge of sections to remain. Construct neat, straight lines.
 - 2. Break up and remove pavement. Dispose of material off site.
- H. Filling and Grading:
 - 1. Filling and grading per Section 312000 - Earth Moving.
 - 2. Collect and stockpile on-site topsoil. Remove and dispose of topsoil to a Contractor-provided, off-site disposal location.
- I. Hydroseed disturbed area per Section 312000 - Earth Moving.

3.04 FIELD QUALITY CONTROL

- A. Comply with Section 014000 - Work Restrictions.
- B. Comply with Whatcom County requirements.
- C. Tests: Owner will provide for compaction testing.
 - 1. Subgrade, prior to filling.
 - 2. Filling and grading as work progresses.
- D. Inspection: Architect will observe the Work at the following milestones:
 - 1. After completion of demolition and stockpiling of topsoil, and before grading.
 - 2. After completion of grading.

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SITE DEMOLITION
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3.05 CLEANING

- A. Dispose of surplus or unsuitable material.
- B. Dispose of waste, surplus, and unsuitable materials according to laws, regulations, and ordinances off site at a site obtained by Contractor.
- C. Dispose of all waste material in accordance with project's Waste Management Plan in accordance with Section 017419 - Construction Waste Management and Disposal.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division-01 Specification sections, apply to work of this section.

1.02 SCOPE

- A. This section covers the removal and disposal of asbestos-containing materials (ACMs) from the project site, as defined by these specifications:
- Remove ACM tape around HVAC metal ducts in basement (250 linear feet). ACM is assumed in wall/ceiling cavities associated with metal ducts.
 - Remove ACM Vinyl sheet backing and mastic – 1st floor bathroom (100 square feet).
 - Remove ACM Black window putty – 1st and 2nd floor interior of windows (900 linear feet) and remove assumed ACM on the exterior of windows.
 - Remove ACM White sink undercoat – 1st floor utility room (one sink).
 - Remove ACM cement asbestos board (CAB) – exterior siding skirt of the structure on north and northwest sides (300 square feet).
- B. Refer to the asbestos and lead survey report associated with this project.
- C. Abatement Subcontractor shall coordinate with Demolition Subcontractor and all other jobsite trades for the proper removal of all ACM's. The contractor shall have a "competent person" (WAC 296-62-07703) onsite at all times during all demolition to monitor the work.
- D. Contractor shall provide all labor, materials, equipment, services, permits and insurance required to complete asbestos abatement procedures as indicated in this Specification.
- E. The Hazardous Materials Summary Report lists suspect materials sampled at the project site, the laboratory analysis for asbestos content, and general locations of the materials.
- F. Less than 1% of Asbestos: Texture on walls and ceilings found to contain asbestos in trace concentrations throughout the project areas. All impact of referenced materials that were identified to contain less than 1% of asbestos shall be undertaken according to WISHA Regional Directive (WRD) 23.30. Refer to project plans for location of wall penetration and wall demolition, and other associated impacts. Requirements include, but are not limited to, the following:
1. Worker training must include asbestos awareness and hands-on training per WAC 296-62-07722(5).
 2. Work must be supervised by a Competent Person per WAC 29-62-07728.
 3. Provide worker/personnel exposure assessment to determine PEL.
 4. Worker respiratory protection is to be based on overall dust levels and comply with WAC 296-62 including the provision of personnel exposure assessment and monitoring during work.
 5. Use of wet, non-aggressive techniques and prompt cleanup with HEPA-equipped vacuums.

6. All dust remaining in the work areas must be cleaned-up following impact of wall system using vacuums with HEPA filters and wet-wiping. Protect finishes, equipment and items remaining in work areas as necessary.

- G. The owner reserves the right to collect environmental asbestos air samples from the work areas related to wall assembly impacts

1.03 RELATED WORK

- A. Work performed under this specification section shall be governed by all related specification sections, including, but not limited to, the following:

Division 00: Condition of the Contract
Division 01: General Requirements
Division 02: Existing Conditions:

1.04 DEFINITIONS

- A. Authorized Visitor: The Owner or designated representative, or a representative of any regulatory or other agency having jurisdiction over the project, and having required training, medical, fit test, etc.
- B. Environmental Consultant: Consultant to the Architect specializing in asbestos abatement—Apex —or any subcontractor designated by Apex (PBS).
- C. Independent Testing Laboratory: A laboratory financially independent from and hired by the Owner or Contractor which is either AIHA accredited for asbestos with demonstrated proficiency via the AIHA PAT program or has analysts proficient in the AIHA AAR program for air sample analysis.
- D. Owner: Representatives designated by the Owner, or designated employees of the Owner.
- E. Work Area: An area where asbestos abatement activities are performed; isolated from non-work areas by negative pressure, containment barriers, decontamination enclosure systems and warning signs.

1.05 DOCUMENTS INCORPORATED BY REFERENCE

- A. The current issue of each document shall govern. Where conflict among requirements or with these Specifications exists, the most stringent requirements shall apply.
 1. U.S. Environmental Protection Agency National Emissions Standards for Hazardous Air Pollutants (NESHAPS). (Code of Federal Regulations Title 40, Part 61, Subparts A and B.)
 2. U.S. Environmental Protection Agency Office of Toxic Substances Guidance Document, *Guidance for Controlling Friable Asbestos-Containing Materials in Buildings*, EPA Report Number 560/5-85-024 ("Purple Book").
 3. U.S. Department of Labor Occupation Safety and Health Administration (OSHA):
 - a. Title 29 Code of Federal Regulations Section 1910.1001 – General Industry Standard for Asbestos.

- b. Title 29 Code of Federal Regulations Section 1910.134 – General Industry Standard for Respiratory Protection.
- c. Title 29 Code of Federal Regulations Section 1910 *et al.* – Occupational Exposure to Asbestos; Final Rule.
- d. Title 29 Code of Federal Regulations 1926.1101 – Construction Standard for Asbestos.
- e. Title 29 Code of Federal Regulations Section 1910.2 – Access to Employee Exposure and Medical Records.
- f. Title 29 Code of Federal Regulations Section 1910.1200 – Hazard Communication.
- g. Environmental Protection Agency 40 CFR Part 763, AHERA, Asbestos-Containing Materials in Schools.
- h. National Institute for Occupational Safety and Health (NIOSH), 30 CFR, Part II, Respirators.
- i. American National Standards Institute (ANSI) NY; ANSI Standard Z 88.2-1980 *American National Standards Practice for Respiratory Protection*, latest edition.
- j. CERCLA, Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601 *et. seq.*)
- k. RCRA, Resource Conservation and Recovery Act.
- l. Washington State General Occupational Health Standards, WISHA Chapter 296-62 Washington Administrative Code (WAC); Chapter 296-65 WAC Asbestos Removal & Encapsulation; Chapter 296-155 WAC Safety Standards for Construction Work.
- m. Local air pollution agency regulations (Northwest Clean Air Agency).
- n. Washington Industrial Safety and Health Act (WISHA).
- o. International Building Code (I.B.C.), latest edition, regulations as applicable.
- p. Electrical work shall be performed in accordance with the National Electrical Code.
- q. All local ordinances, regulations, or rules pertain to asbestos, including its storage, transportation, and disposal.

1.06 SUBMITTALS AND NOTICES

- A. No asbestos-related work will be permitted prior to submittals being processed by the Environmental Consultant. Allow fifteen (15) days to review prior to the commencement of abatement.
- B. Additional requirements for submittals are described in the contract documents. The requirements in this section pertain to asbestos-containing materials removal.
- C. Submit the "Contractor Acknowledgment of Asbestos Hazard Training, Respirator Training and Agreement to Undertake All Required Precautions", Form 02 82 00-1 (attached to this Section). completed and signed by the Abatement Contractor in conjunction with pre-job submittals.
- D. Contractor shall submit to the Owner the following information prior to beginning work on the project:
 - 1. Work Plan: Include a detailed plan of the procedures proposed for use in complying with the requirements, including the following:
 - a. A description of all equipment, techniques, and methods to be used to remove and dispose of each asbestos-containing material identified in the Project, including schematic drawings of work area layout(s) showing entries/exits, HEPA exhausts, decon units, waste loadouts, any scaffolding and access plan for over height asbestos-containing materials, etc.

- b. A specific schedule indicating proposed start dates/times and completion dates/times for individual regulated areas as configured in the proposed Work Plan.
 - c. Specific information relating to storage, handling, transport, and disposal of asbestos-containing waste. Provide name and address of the designated transporter and proposed disposal site at which any waste material generated during the project will be disposed and furnish evidence of all necessary regulatory approvals of disposal.
 - 2. Laboratory Qualification Information: Submit information pertaining to the proposed Air Monitoring Program for this project. Contractor's air monitoring shall include employee exposure monitoring. This information shall include the name(s) of personnel collecting air samples, types of equipment, sampling schedule, sampling procedures, calibration record keeping, name and address of proposed Independent Testing Laboratory, and evidence of analyst's NIOSH 582 course completion and AIHA PAT program participation.
 - 3. Worker Certification: Submit written proof that all employees performing asbestos-related work will have completed all necessary asbestos-related training in compliance with WAC Chapters 296-62 and 296-65. Written proof may be in the form of a notarized letter stating such intent and signed by an owner or principal of the appropriate firm(s). The Owner and/or the Environmental Consultant reserves the right to remove a certified asbestos worker from the work at any time during the project for any reason at no additional costs or schedule delays to the owner.
 - 4. Written Respirator Program and Fit Testing: Submit written proof that all employees requiring respiratory protection participate in a written respiratory protection program established and maintained in accordance with WAC 296-62-07715. The Contractor shall provide written proof of the existence of a respiratory protection program.
 - 5. Notifications and Policies: Submit copy of all required notifications and permits obtained by the Contractor (including but not limited to Washington State Department of Labor and Industries and NWCAA) and copies of all types of specified bonds and insurance. Submit upon receipt any approved amendments to notifications or re-notifications for multi-phase activities.
 - 6. Certified Asbestos Supervisor (CAS): Submit the name, Asbestos Supervisor Certification, and resume of experience of the assigned on-site CAS's. At a minimum, the foreman shall have successfully completed a supervisor training course in compliance with WAC Chapter 296-65-007. References and work on similar projects must be provided and will be reviewed. The CAS's working on this project must show a minimum of 5 years' experience as a CAS. The Owner and Environmental Consultant reserves the right to remove the CAS from the work at any time during the project for any reason. The Contractor shall then submit another on-site CAS for approval as described above at no additional costs or schedule delays to the owner.
- E. Daily Job Submittals
- 1. Personal Air Monitoring: Submit copies of all personal air monitoring data sheets, chain-of-custody and analytical results to the Contractor and Environmental Consultant on a daily basis within 24 hours following collection.
 - 2. Daily Field Logs: Submit copies of all field logs to the Contractor, Owner and Environmental Consultant daily, prior to the end of the next work shift. Daily logs shall indicate the date, time, identity, company or agency represented, and reason for entry of all persons entering the work area, and the type, amount and location(s) of all ACMs removed, and work stoppages/delays.

3. Entry/Exit Logs: Submit copies of regulated area entry/exit logs to the Contractor and Environmental Consultant on a daily basis prior to the end of the next work shift.
4. Periodic Submittals
 - a. Asbestos Training: Upon verbal request, immediately make available to the Environmental Consultant proof of Asbestos Worker Certification or Asbestos Supervisor Certification. Provide copies of worker training certification to the Owners representative upon request.
 - b. Work Plan modification/clarification: In the event that on-site activities will require departure from any and all aspects of the information outlined in the pre-approved Work Plan, submit written clarification/modification of proposed changes to the Owner and Environmental Consultant for review and approval prior to performing that work.
 - c. Disposal Manifests: Submit copies of all asbestos waste transportation and disposal manifests including signed receipts from the landfill, and/or chain of custody.
 - d. A copy of the disposal information for asbestos waste shall be submitted within 5 days of leaving the project site. The intent of this requirement is to track the disposition of the asbestos waste at all time. No progress payments will be approved without proper documentation of asbestos transportation and disposal
5. Post-Job Submittals shall be delivered to the Contractor within 15-days of completion of asbestos-related work as specified by these Contract Documents and shall include the following:
 - a. Certification: Provide written certification from the Abatement Subcontractor's Project Manager or Supervisor that the Abatement Subcontractor has fully inspected the work area and completed work in strict accordance with the Specifications.
 - b. Air Monitoring: Submit documentation of all employee personal air monitoring results relative to OSHA and WISHA respiratory protection level compliance. Include copies of all air monitoring data sheets, chain-of-custody documentation, and analysis reports for sampling conducted at the site.
 - c. Project Record Documents: Provide project records including documentation of all contract changes, and copies of worksite entry logs, work area entry/exit logs, safety logs, safety meeting sign-in sheets, and supervisor's daily field reports.
 - d. Disposal Manifests: Submit copies of all asbestos waste transportation and disposal manifests including signed receipts from the landfill, and/or chain of custody. A copy of the disposal information for asbestos waste shall be submitted within 5 days of leaving the project site. The intent of this requirement is to track the disposition of the waste at all time. No progress payments will be approved without proper documentation of asbestos transportation and disposal.

1.07 PERSONNEL PROTECTION'

A. Training and PPE

1. Prior to commencement of work, ensure all workers have been trained as specified in WAC Chapter 296-65.
2. Provide and post decontamination, respirator, and work procedures to be followed by the workers.
3. Provide protective clothing and equipment per WAC 296-62.

AIR MONITORING BY CONTRACTOR

- A. Industrial Hygienist: An Independent Testing Laboratory shall be retained by the Abatement Subcontractor for PCM sample analysis. All analysis shall be performed by an Industrial Hygienist. The Hygienist must be experienced and trained in asbestos sampling and analysis. At a minimum, documentation of prior asbestos sampling and analysis experience, plus satisfactory completion of the NIOSH 582 course or equivalent will be required. Air sample collection may be performed by an Industrial Hygienist or the Abatement Contractor's foreman. Perform sampling and analysis of air samples for asbestos in compliance with WAC Chapter 296-62-07735, Appendix A-WISHA reference method.
- B. Sample Documentation: Documentation shall be kept for each filter sample procured as to worker sampled, social security number, activity, work area location, date and time taken, volume of air drawn through filter, pump identification number and calibration. Documentation shall indicate in what areas tests were taken and shall clearly indicate the specified maximum allowable fiber levels for each area tested. Report all data within 48 hours. Submit chain of custody records along with all samples.
- C. Analysis Procedures: The samples shall be collected on 25 mm filters and analyzed within 12 hours using the membrane filter method at 400 500x magnification with phase contrast illumination—NIOSH Analytical Method No. 7400—for laboratory and field analysis. The analyst shall sign and submit permanent records of all samples analyzed directly to the Environmental Consultant. The Independent Testing Laboratory shall seal the unused portion of all filters in airtight containers so that individual samples can be re-analyzed at a later date if necessary. The containers shall be clearly labeled with Project Name and Sample Number and shall become property of the Owner at work completion at the Owner's request.
- D. Controls: The Contractor's testing laboratory shall submit sample analysis results, chain of custody and equipment calibration records to the Environmental Consultant within 24 hours from the time of collection.
- E. Contractor's Sampling During Abatement
 1. Sample Collection: Air monitoring shall be performed to determine worker exposure during the period of asbestos abatement in each work area. Begin sampling when asbestos removal commences. Samples are to be taken where Class I or II work is being conducted during each 8-hour work shift until abatement is complete.
 2. Most Contaminated Worker: The Contractor shall determine which worker(s) in each work area is probably experiencing the most severe exposure. This is the "Most Contaminated Worker(s)." 8-hour TWA and 15-minute excursion samples shall be collected on this worker(s). This worker shall wear a personal sampling pump and the sample shall be drawn from the breathing zone of the worker.

3. The number of air samples collected shall be in accordance with the Contractor's approved work plan; however, a minimum of one sample per work area must be collected daily.

1.08 AIR MONITORING BY OWNER

- A. Industrial Hygienist: The Architect/Owner will retain an experienced Industrial Hygienist/Environmental Consultant to collect and analyze asbestos air samples prior to abatement, inside the work area, outside the work area, at HEPA exhaust and after visual inspection. Any airborne asbestos concentrations in excess of regulatory limits will be reported. Documentation of sample results will be forwarded to the Contractor as appropriate.
- B. Sampling and analysis of asbestos samples shall be performed in compliance with WAC Chapter 296-62-07735, Appendix A--WISHA reference method and 40 CFR Part 761 AHERA. Laboratory analysis of TEM post-abatement air sampling will be performed on a 24-hour turnaround time. Samples will be delivered to the lab within eight (8) hours of completion of sampling. Any expedited after "hours" analysis or weekend analysis is subject to the approval by the Owner of resulting additional costs.
- C. The Owner reserves the right to monitor Contractor's performance via air samples on abatement workers in addition to the Contractor's air monitoring.

1.09 WORKING HOURS

- A. Submit proposed work schedule to Owner prior to commencement of work. See Specification Section for Temporary Facilities and Controls for site work hours. Schedule and work hours must be pre-approved by the Owner.

1.10 PERMITS AND NOTIFICATIONS

- A. The Contractor is responsible for obtaining all permits and notifications as required for the completion of the work by the Washington State Department of Labor and Industries, the U.S. E.P.A., the Puget Sound Clean Air Agency and any other permitting agency involved with the completion of the work included herein. For each phase of the work the Contractor shall notify the Environmental Consultant in writing a minimum of 72 hours prior to commencing any hazardous material related work at the project site.

1.11 PERSONNEL TRAINING

- A. All personnel accomplishing removal of asbestos-containing materials shall have received the minimum training as required by the Washington State Department of Labor and Industries for the work to be performed. At a minimum, the Abatement Contractors Foreman shall be the bearer of a current "Certified Asbestos Supervisor Certificate" issued by the Washington State Department of Labor and Industries.

1.12 LIABILITY

- A. The Contractor is an independent contractor and not an employee of the Owner, Architect or Environmental Consultant. The Owner, Architect and the Environmental Consultant shall have no liability to the Contractor or any third persons for Contractor's failure to faithfully perform and follow the provisions of these Specifications and the requirements of the governing agencies. Notwithstanding the failure of the Owner, Architect or the Environmental Consultant to discover a violation by the Contractor of any of the provisions of these Specifications, or to require the Contractor to fully perform and follow any of them, such failure shall not constitute a waiver of any of the requirements of these Specifications which shall remain fully binding upon the Contractor.

1.13 SUBCONTRACTORS

- A. Subcontractors employed by the Contractor shall be bound to all the work and safety standards specified. Subcontractor's personnel shall meet requirements as specified, and shall be supervised by the Contractor during performance of this work.

1.14 QUALITY ASSURANCE

A. On-Site Observation

1. Post Removal: Environmental Consultant shall perform visual inspections after the removal of asbestos-containing materials is complete. The Abatement Subcontractor shall assist the Environmental Consultant with the visual inspection and provide the necessary equipment to conduct such inspections. The Abatement Subcontractors certified asbestos supervisor shall escort the Consultant on all such inspections, when requested. The Abatement Subcontractor shall give a minimum of 24 hour written notice for all visual inspections of regulated work areas. All weekend work requires 5 days prior notice.
2. Observation: Environmental Consultant shall perform observations regarding integrity of isolation barriers, decontamination facilities, worker protection, Contractor's air monitoring program, performance of abatement operations, and conformance to the Specification, EPA, OSHA, WISHA and NWCAA regulations.
3. Stop Work: Environmental Consultant shall notify the Contractor in writing to stop work if the Environmental Consultant determines that work practices are in violation of regulations, these Specifications or work is endangering workers or occupants of the building. The Contractor shall continue work when conditions and actions are corrected and when written authorization is received from the Environmental Consultant.
4. Environmental Consultant shall attend progress meetings as requested by Architect and Owner.

B. Air Monitoring

1. Notification: If, at any time during the work, analysis of an air sample taken by the Contractor, Owner, or Environmental Consultant, indicates a fiber concentration in excess of the applicable Maximum Allowable Fiber Concentration, the laboratory that analyzed the air sample shall immediately notify the Contractor, the Contractor's Superintendent, and the Environmental Consultant.

2. Maximum Allowable Fiber Concentrations:
 - a. Outside all Regulated Work Areas: 0.01 f/cc (fibers per cubic centimeter by PLM) or below pre-abatement.
 - b. Inside Isolated Regulated Work Area: 0.1 f/cc.
 - c. Inside Non-Isolated Regulated Work Area: 0.01 f/cc or below pre-abatement levels.
 - d. Post-Abatement: 0.01 f/cc by TEM or PCM analysis methods, whichever is appropriate.
 3. Procedures: Immediately upon being notified of fiber concentration in excess of the PEL, the Abatement Subcontractor shall perform the following steps in the order presented, at no additional cost to the Owner:
 - a. Stop abatement work.
 - b. Identify source of high fiber counts.
 - c. Corrective Actions: Immediately correct containment breaches, pressure differential changes and potential cause of high fiber counts. The Environmental Consultant will determine the affected area considered to be contaminated. The Environmental Consultant will determine the actions to be taken by the Abatement Subcontractor at no additional cost to the Owner.
 - d. Clean the affected area. Cleaning will include wet methods and HEPA vacuuming.
 - e. Re-sample air until fiber counts are determined to be below the specified maximum levels.
 - f. Secure and repair containment barriers, repair or add equipment.
 - g. Modify work procedures and make other changes to reduce fiber counts.
 4. Document these activities in writing in detail and provide to Owner for review.
 5. Resume work and air monitoring.
 6. Additional Costs: The Contractor shall be responsible for all costs of any testing and associated labor, cleanup, repair, down time loss, etc. that is a result of the Contractor's negligence, poor maintenance of isolated areas, improper procedures and or failed clearance inspections and testing.
- C. Performance: Work shall be performed in a skillful manner representing industry standards. Environmental Consultant shall require Contractor to remove from the work site employees and subcontractors the Environmental Consultant deems incompetent, careless or objectionable.

PART 2 - PRODUCTS

2.01 PROTECTIVE CLOTHING AND EQUIPMENT

- A. Protective Clothing: Provide approved clothing per WAC 296-62 for all workers and all official representatives of the Owner, State or other governmental entity, and the Environmental Consultant who may inspect or visit the project.

2.02 MATERIALS

- A. Encapsulants (Sealants): Encapsulants shall be rated as "Acceptable" using the test method described in the EPA document published as National Technical Information Service report PB 88-113 329/AS [available from NITS, 5825 Port Royal Road, Springfield, VA 22161.] (The report is summarized in EPA publication EPA/600/S-87/091 [available from Center for Environmental Research Information, EPA 26 Martin Luther King Drive West, Cincinnati, OH 45220-2242].)
- B. Use a colorant in all encapsulants to easily distinguish materials that have been encapsulated from those that have not been encapsulated.
- C. Ensure that any chemical used for removing mastics is compatible with all new products being installed, if appropriate.

PART 3 - EXECUTION

3.01 WORK AREA PREPARATION

- A. Performance: Contractor shall perform the following procedures in the order in which they are presented for work according to the approved work plan.
 - 1. Shut down HVAC systems. Seal openings with two separate layers of plastic sheeting.
 - 2. Restrict access to work area and post warning signs. Do not perform abatement work in an occupied area.
 - 3. Completely pre-clean visible accumulation of asbestos debris in work area using HEPA vacuum equipment or wet cleaning methods.
 - 4. Set up worker decontamination enclosure system satisfying requirements of WAC 296-62. Once this system is installed and abatement commences, it shall be utilized in the specified manner for the ingress and egress of only personnel. All personnel shall sign the Worksite Entry Log Book each time they pass in or out of the modified decontamination enclosure system.
 - 5. Install HEPA air-purifying equipment pressure differential fan system. Discharge from air-purifying equipment shall be ducted outside the building.
 - 6. Cover floors, walls, and other objects below work area with plastic sheeting. Seal openings as directed by the Environmental Consultant.
 - 7. Have emergency cleanup equipment and supplies, including HEPA vacuum, amended water, disposal bags, mop, buckets, towels and sponges, on hand prior to start of abatement work.
- B. Compliance: No asbestos abatement work shall occur unless the work area has been found acceptable for Specification compliance by the Environmental Consultant. Notifications to perform asbestos abatement and a Good Faith Inspection report shall be posted at the work site. Abatement Subcontractor shall post asbestos warning signs at entrances to asbestos work areas and asbestos warning/danger tape shall be posted on fence barriers at construction boundaries.

- C. Isolated work area enclosure system maintenance. The Abatement Subcontractor shall be responsible for daily documentation of the following:
 - 1. Prior to the first use and at the beginning of each shift during abatement work, containments shall be given a complete visual inspection by the Abatement Contractor's CAS. This shall include inspection of the HEPA air purification system and associated filters. A smoke tube test by the shift foreman shall then be made of the worker decontamination enclosure system and other critical areas to verify that the isolated area is under negative air pressure. Work shall not begin until the inspection is completed, and all defects have been repaired.
 - 2. Periodic inspections shall be made before, during and after each shift to ensure the proper functioning of the enclosure and HEPA filtered differential pressure fan system to prevent potential contaminant migration. The Contractor shall make every effort to always ensure the integrity of the negative pressure enclosure.
- D. Contractor shall maintain a safe and uncluttered work site including staging area, work area, worker decontamination system, and waste load-out area at all times.
- E. Not Used - The gypsum wallboard systems throughout the project areas contain less than one percent (<1%) asbestos. Work impacting non-asbestos gypsum wallboard (GWB) with asbestos-containing joint compound is to conform to the requirements of applicable regulations, including, but not limited to Washington Administrative Code (WAC) Regional Directive 23.30. Requirements include, but are not limited to, the following:
 - 1. Work must be supervised by a Competent Person per WAC 296-62-07728.
 - 2. Worker training must include two-hour awareness and hands-on training per WAC 296-62-07722(5).
 - 3. Worker respiratory protection is to be based on overall dust levels and comply with WAC 296-62. Perform air monitoring as necessary to complete negative exposure assessment as required by WAC.
 - 4. Use of wet, non-aggressive techniques and prompt cleanup of all resulting dust and debris with HEPA-equipped vacuums.
 - 5. All dust and debris remaining in the work areas must be cleaned-up following asbestos-related work using HEPA vacuuming and wet wiping. Protect finishes and items remaining in work areas as necessary.
 - 6. Install isolation barriers at perimeters of work area to prevent migration of dust to adjacent workspaces. Any activity, which is determined to generate dust, must be performed within a poly-sheeting enclosure to prevent dust migration. Ensure proper cleaning of boots and equipment is performed prior to exiting such work areas.

3.02 SELECTIVE DEMOLITION TO ACCESS ASBESTOS MATERIALS

- A. Abatement Subcontractor shall perform selective demolition to access ACMs in concealed or limited access locations throughout the Project Site. The Abatement Subcontractor shall visit the site to become familiar with construction types that may require demolition. The Abatement Subcontractor is required to investigate all areas where suspect materials potentially occur.

3.03 DISPOSAL

- A. Regulations: Determine current waste handling, transportation, and disposal regulations for the work site and for each waste disposal landfill. Comply with these regulations and U.S. Department of Transportation, PSCAA Regulations and EPA requirements. Double bagged material in containers shall be delivered to the pre-designated disposal site.
- B. Transport: Remove decontaminated containers from site within ten calendar days after collection for disposal at a waste disposal site operated in accordance with the provisions of 40 CFR 61.156. Notify disposal site in advance of delivery to ensure immediate disposal. Maintain chain-of-custody until accepted by the landfill.
- C. Submit disposal receipts and chain-of custody for waste as specified. No monthly progress payments will be made without waste manifest documentation identifying the disposition of the waste. All waste manifest documents must be approved by the Environmental Consultant prior to approval of monthly progress payments.

END OF SECTION 02 82 00

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division-01 and 02 Specification sections, apply to work of this section.

1.02 SUMMARY OF WORK

- A. General work items include, but are not limited to:
1. Compliance: Activities requiring compliance with this Section include but are not limited to, manual demolition, cutting, sawing, sanding, welding, torch burning, and mechanical demolition of building components containing lead as defined in these specifications and the Hazardous Materials Survey report.
 2. Lead -containing paint was identified at the subject site:
 - Red paint on cement steps to front porch (**0.047% Lead**)
 - White paint on concrete wall in basement stairwell (**0.0072% Lead**)
 - White paint on wood window frame in 1st floor stairwell (**0.13% Lead**)
 - Varnish on wood base boards on stairs to 2nd floor (**0.21% Lead**)
 - Off-white paint on plaster walls on top of 2nd floor stairs (**0.027% Lead**)
 - Off-white paint on plaster walls 2nd floor near southern bedroom (**0.014% Lead**)
 - Pink paint on plaster wall in 2nd floor south bedroom closet (**0.022% Lead**)
 - Brown paint on metal wall of shed one (**0.031% Lead**)
 - Mint paint on wood door on shed two (**0.46% Lead**)
 - Red paint on metal wall on shed two (**4.1% Lead**)
 - Orange paint on wood door on shed two (**7.6% Lead**)
 3. Based on testing the Owner assumes all untested painted components to be Lead-containing.
 4. The Contractor shall perform activities involving lead-containing materials and other metals in compliance with current applicable state and federal regulations including, but not limited to, WAC 296-62-07521: "Lead"; WAC-296-155-176: 40 CFR Part 745.
 5. Waste Disposal: If the contractor chooses to segregate lead-containing components, the contractor is responsible for all costs associated with characterization, packing, transport and proper disposal of that waste, whether it is considered "dangerous" or not.
 6. Some building components may not be recyclable. Contractor is responsible for determining recycling options, procedures, and all associated costs.
 7. The Contractor is responsible for performing all final waste stream characterization.

8. Monitoring: Monitoring of airborne concentrations of lead shall be in accordance with WAC 296-155-176. Exposure monitoring of initial work activities on lead materials will provide information for the Environmental Consultant to determine effectiveness of engineering, work practice and administrative controls. This initial assessment will dictate future lead related activities. The intent of this section is to reduce and maintain employee exposure to lead at or below the permissible exposure limit.

1.03 RELATED SECTIONS

- A. Work performed under this specification section shall be governed by all related specification sections, including, but not limited to, the following:

Division 00: Condition of the Contract

Division 01: General Requirements

Division 02: Existing Conditions:

1.04 SUBMITTALS & REFERENCE STANDARDS

- A. Submit copies of the following "Pre-Work Submittals" at least 10 workdays prior to start of work. Electronic copies are acceptable. The Work may not proceed until complete Pre-Work Submittal package has been reviewed and approved by the Environmental Consultant.
 1. Lead Compliance Program and Work Plans: Submit a site-specific lead compliance program in accordance with WAC Chapter 296-155. The plan shall be developed and implemented to provide engineering, work practice and administrative controls to reduce and maintain employee exposure to lead at or below the permissible exposure limit. The plan will include at a minimum a description of activities; controls; personnel; procedures; equipment, method of compliance; technology used to meet compliance; air monitoring plan; detailed schedule; work practice program; administrative controls and other relevant information.
 2. Medical Program: Submit written proof that your medical exam program is in compliance with OSHA Lead Regulations 29 CFR 1910.2 and 1926.62, and WAC Chapter 296-155. Initial medical surveillance consisting of biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels shall be submitted for each employee performing lead related work.
 3. Worker Training Program: Submit written proof indicating that all employees impacting lead-containing materials have received training per 29 CFR 1926.62 and WAC Chapter 296-155 and 40 CFR Part 745. Proof shall include a signature from the Contractor's Principal indicating that all employees performing lead related activities have completed such a program.
 4. Respirator Program: Submit written proof indicating respirator program is in compliance with all parts of OSHA Lead Regulations 29 CFR 1910.134 and 1926.62, and WAC Chapter 296-155.

5. Should the lead waste stream characterization determine that it necessary to dispose as a dangerous waste the Contractor shall provide the method of transport, name and address of the waste transporter and waste acceptance facility 5 days prior to removal from the project site. No waste shall leave the site without this notification. The Contractor is responsible for tracking and documenting the disposition of this waste at all times and must provide written proof of such activities immediately, when requested. Progress payments can be withheld if this information is not provided as specified.

B. Final Submittals:

1. Post-Job Submittals: Submittal shall be delivered to the Environmental Consultant with 10-days of completion of work.
2. Project Record Documents: Provide record of lead control activities including disposition of each type of lead-contaminated item removed from the site.
3. Air Monitoring: Submit copies of all air monitoring data collected as part of the initial exposure assessment for workers impacting lead-containing materials. Submit documentation of all employee personal air monitoring results relative to OSHA and WISHA respiratory protection level compliance. Include copies of all air monitoring data and analysis reports conducted at the site.
4. Disposal Manifests: Submit copies of all lead waste transportation and or disposal/recycling manifests including signed receipts from the accepting facility, and chain-of-custody documentation. This documentation shall be delivered to the Owner within 5 days of leaving the project site. Final payments will not be made without this information.

1.05 AIR MONITORING

- A. Testing Laboratory: An Independent Testing Laboratory shall be retained by the Contractor for all lead air *analysis*. All exposure monitoring analysis shall be performed in accordance with 29 CFR Part 1926.62 and WAC Chapter 296-155. The laboratory must participate in the ELPAT Program and be a member of AIHA. Air sample collection may be performed by an Industrial Hygienist or the Abatement Subcontractor's trained supervisor at the Abatement Subcontractor's option.
- B. Sample Documentation: Documentation shall be kept for each filter sample procured as to worker sampled, social security number, activity, work area location, date and time taken, volume of air drawn through filter, pump identification number and calibration. Documentation shall indicate in what areas tests were taken and shall clearly indicate the specified maximum allowable levels for each area tested. Report and submit all air monitoring data within 48 hours, prepare laboratory chain of custody records along with all samples.
- C. Analysis Procedures: The samples shall be collected on 37 mm filters and analyzed within 24 hours using NIOSH Analytical Method No. 7105 or 7082. The containers shall be clearly labeled with project name and Sample Number and shall become property of the Owner at work completion at the Owner's request.
- D. Submittals: The Abatement Subcontractor's laboratory shall submit sample analysis results, chain of custody and equipment calibration records prior to application for payment.

E. Contractor's Sampling During Lead Related Activities:

1. Initial Exposure: Exposure monitoring shall be performed during impact of representative lead-painted building components and metals containing masonry mortar as required by WISHA regulations. It is the responsibility of the Contractor to determine potential exposures during the Work and provide exposure monitoring as needed.
2. Most Contaminated Worker: The Contractor shall determine which worker(s) in each work area is probably experiencing the most severe exposure. This is the "Most Contaminated Worker(s)". 8-hour time weighted average samples shall be collected on this worker(s). Representative worker shall wear a personal sampling pump and the sample shall be drawn from this worker's breathing zone.
3. Number of samples: The number of air samples collected shall be as defined in the approved Metals Compliance Program. Historical measurements may be used to satisfy continuing exposure assessment requirements.

F. Work Area Monitoring

1. Monitoring: The Owner reserves the right to monitor Contractor's performance via air, dust wipes and TCLP samples during lead related activities, in addition to the Contractor's exposure monitoring and testing. Sampling performed by the Environmental Consultant will not be available for use for the Contractor's Initial Exposure Assessment.
2. Quality Control
 - a. Maximum allowable airborne concentrations: Contractor shall ensure that at all times airborne concentrations of metals outside work areas are at or below the applicable employee's respiratory exposure limits for metals impacted by the Work as defined by WISHA and other applicable regulations.
 - b. Immediately upon being notified of concentrations exceeding the specified maximum allowable levels, the Contractor shall perform the following steps in the order presented, at no additional cost to the Owner: Stop lead/metals related activities work, identify source of high lead concentrations, develop plan with Environmental Consultant and Owner to complete lead related activities in a manner to prevent visible emissions and elevated lead levels.

1.06 SUBCONTRACTORS

- A. Subcontractors employed by the Contractor shall be bound to all the work and safety standards specified. Subcontractor's personnel shall meet requirements as specified, and shall be supervised by the Contractor during performance of this work.

1.07 LIABILITY

- A. The Contractor is an independent contractor and not an employee of the Owner, Architect or Environmental Consultant. The Owner, Architect and the Environmental Consultant shall have no liability to the Contractor or any third persons for Contractor's failure to faithfully perform and follow the provisions of these Specifications and the requirements of the governing agencies. Notwithstanding the failure of the Owner, Architect or the Environmental Consultant to discover a violation by the Contractor of any of the provisions of these Specifications, or to require the Contractor to fully perform and follow any of them, such failure shall not constitute a waiver of any of the requirements of these Specifications which shall remain fully binding upon the Contractor.

PART 2 - PRODUCTS

2.01 PROTECTIVE CLOTHING AND EQUIPMENT

- A. Personnel Protective Equipment for metals-related activities shall be provided per WAC 296-155.

PART 3 - EXECUTION

3.01 REMOVAL AND DISPOSAL PROCEDURES

- A. Demolition and Component Removal Procedures:
 - 1. Before beginning any lead related activities the Contractor shall provide the Environmental Consultant with 48 hours prior written notice.
 - 2. Set-Up Activities: Prior to removal of lead-containing painted components, the Contractor shall cover the ground below the work area with 6-mil plastic sheeting or equivalent. The drop-sheeting shall extend outward a minimum of 6 feet from the location of item(s) being removed. Any tears that occur in the drop-sheeting shall be immediately repaired with duct tape or other acceptable seal. Debris shall be collected with a wet/dry vacuum to avoid escape from the drop-sheeting. Wash water shall be retained on the drop-sheeting and removed by mops or wet/dry vacuums. The residue/debris and water shall be placed in storage drums for testing prior to disposal.
 - 3. Perform removal of lead-containing painted components in accordance with approved lead work plan. Use procedures and equipment required to limit occupational and environmental exposure to lead when lead-containing paint is impacted. The procedures employed by the Contractor shall not create the potential for contaminating surrounding areas or materials with lead-containing dust. Dust generation shall be minimized at all times.
 - 4. At completion of the above operations, HEPA vacuum drop-sheeting to remove any paint particles or debris. Wet wash plastic sheeting to remove all dust. Request area inspection by the Environmental Consultant.

5. Negative Exposure Assessment: The Contractor may waive the requirement of a negative pressure enclosure when using mechanical methods upon submittal of data to the Environmental Consultant indicating a negative exposure assessment has been completed per WAC 296-155 and paragraph 1.04, Air Monitoring.
- B. Housekeeping: Maintain all surfaces as free as practicable of accumulations of metals-containing dust and debris. Perform clean-up of work areas as necessary according to WAC 296-155-17617. No visible lead-containing dust or debris shall remain in non-regulated areas at the end of the work shift. No visible lead-containing debris shall remain in or on the site soils when demolition is completed.
- C. Water and Debris Testing
 1. It is recommended that the water collected with wet/dry vacuums be HEPA filtered to remove paint and debris chips. The paint and debris chips shall be placed in a separate drum for testing. No rise water shall be discharged without testing.
 2. Debris Testing: A representative sample from debris shall be collected for TCLP testing. The method/location of disposal will be established by test results.
 3. Water Testing: Stir the water in the drum and immediately obtain a 12-liter-size sample from each drum of water to be disposed of. If a laboratory test (EPA Lead 7241) indicates lead levels below 2.0 ppm discharge to the Sanitary Sewer is permitted. When tests show higher levels, dilute the water until tests show levels are acceptable for discharge.
- D. Disposal Procedures:
 1. Testing performed by the Owner on the anticipated general waste stream indicates that disposal of certain building components may be considered a dangerous waste in accordance with WAC 173-303. Components coated with lead-containing paint may be included in the general waste stream only upon passing the TCLP debris test for Lead leachate.
 2. The Contractor shall be responsible for disposal of all metals-containing debris produced by removal and surface preparation of lead-containing painted coatings according to applicable local, state, and federal regulations. The Contractor is responsible for all final waste stream characterization and shall provide testing data to Environmental Consultant prior to any offsite transport or disposal.
 3. The Owner reserves the right to perform quality control waste stream characterization at their sole discretion. In the event of conflicting test data obtained by the contractor and Owner, the Owner's test data will take precedence. Allow 48 hours for quality control sampling and analysis by the Owner at their sole discretion prior to transporting waste.
 4. Package, transport and dispose of demolished components as "dangerous" waste per WAC 173-303 as required by waste characterization data. Disposal of demolition debris as "dangerous" per WAC 173-303 related to lead is limited to disposal facilities pre-approved by the Owner.
 - a. The Contractor is responsible for the proper handling, transportation and disposal of any dangerous waste generated by elective segregation of waste constituents, or by disposal of painted coatings comingled with asbestos-containing materials, at no cost to the Owner.

END OF SECTION 02 83 00

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Concrete foundation walls.
- C. Concrete reinforcement.
- D. Joint devices associated with concrete work.
- E. Miscellaneous concrete elements, including equipment pads and light pole bases.
- F. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 321313 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- C. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- D. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.
- E. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.
- F. ACI PRC-308 - Guide to External Curing of Concrete; 2016.
- G. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2025.
- I. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2024.
- J. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- K. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.
- L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2024.
- M. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.
- N. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2024.
- O. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- P. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2023.

- Q. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes; 2023.
- R. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2025a.
- S. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2025.
- T. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2023.
- U. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.
- V. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.
- W. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.
- X. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2023.
- Y. COE CRD-C 572 - Handbook for Concrete and Cement Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.
- Z. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Mix Design: Submit proposed concrete mix design.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
- B. Follow recommendations of ACI PRC-305 when concreting during hot weather.
- C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS**2.01 FORMWORK**

- A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 2. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches (38 mm) of concrete surface.

2.02 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
 - 1. Type: Deformed billet-steel bars.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
 - 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 - 1. Acquire aggregates for entire project from same source.
- C. Lightweight Aggregate: ASTM C330/C330M.
- D. Fly Ash: ASTM C618, Class C or F.
- E. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ACCESSORY MATERIALS

- A. Non-Shrink Cementitious Grout: Premixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Grout: Comply with ASTM C1107/C1107M.
 - 2. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch (13.7 MPa).
 - 3. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch (13.7 MPa).
 - 4. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch (48 MPa).
- B. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, nonmetallic aggregate, and activator.
 - 1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
 - a. Maximum Height Change: Plus 4 percent.
 - b. Minimum Height Change: Plus 1 percent.
 - 2. Minimum Compressive Strength at 7 days, ASTM C579: 12,000 pounds per square inch (82.7 MPa).
 - 3. Minimum Compressive Strength at 7 days, ASTM D695: 12,000 pounds per square inch (82.7 MPa).

2.05 BONDING AND JOINTING PRODUCTS

- A. Epoxy Bonding System:
- B. Waterstops: PVC, complying with COE CRD-C 572.

2.06 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
- B. Normal Weight Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 pounds per square inch (20.7 MPa).
 - 2. Water-Cement Ratio: Maximum 40 percent by weight.
 - 3. Maximum Aggregate Size: 5/8 inch (16 mm).

2.07 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
- B. Transit Mixers: Comply with ASTM C94/C94M.
- C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Prepare existing concrete surfaces to be repaired according to ICRI 310.2R, _____.
- E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
- F. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.
- G. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.

3.05 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch (6 mm) or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch (6 mm) or more in height. Provide finish as follows:

3.06 CURING AND PROTECTION

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.07 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

END OF SECTION 03 30 00

PART 1 GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Repair and replacement of damaged stone units.
 - 2. Repointing of deteriorated mortar joints at existing cobblestone walls and chimney.
 - 3. Repair of damaged stone copings.
 - 4. Cleaning and removal of organic growth from all masonry and cobblestone surfaces.
- B. Related work in other sections:
 - 1. Section 05 50 00 – Metal Fabrications for new seismic bracing at cobblestone chimney.
 - 2. Section 09 96 00 – High Performance Coatings for new elastomeric coating at copings.
 - 3. Structural General Notes included in the project drawings.

1.02 REFERENCE STANDARDS

- A. ACI 530 – Building Code Requirements for Masonry Structures.
- B. ACI 503.1 – Specifications for Masonry Structures.
- C. ASTM C270 – Mortar for Unit Masonry.
- D. ASTM C1713 – Mortars for Repair of Historic Masonry.
- E. ASTM C67 – Sampling and Testing Brick and Structural Clay Tile.
- F. ASTM C144 – Aggregate for Masonry Mortar.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' product data for the following:
 - 1. Cement.
 - 2. Lime.
 - 3. Pigments.
 - 4. Sand.
 - 5. Cleaning compounds and solutions used for cleaning and removal of organic growth.
- C. Mortar Mix Design: Indicate the proportion of cement, lime, sand, and additives.
- D. Manufacturer's application instructions for the cleaning and removal of organic growth from existing masonry surfaces.
- E. Samples: Submit samples of masonry units to illustrate color, texture, and extremes of color range to match existing where replacements are necessary.

1.04 QUALITY ASSURANCE

- A. Contractor shall employ a qualified stonemason experienced in the repair and repointing of cobblestone and river rock materials.
 - 1. Mason shall demonstrate at least 3 years of successful masonry repair experience on projects of similar size and scope.
 - 2. All repointing must be performed by a craftsperson that is familiar with historic lime mortar formulations, curing conditions and performance characteristics.
- B. Complete mockups and samples for all repairs specified under paragraph 1.05 of this section.
- C. Source of Materials: Obtain materials for stone repair and mortar repointing from a single manufacturer source to ensure match quality, color, texture, and detailing.

1.05 MOCKUP

- A. Prior to start of general masonry restoration, prepare the following sample panels and sample areas on building where directed by Architect. Obtain Architect's acceptance of visual qualities before proceeding with the work:
 - 1. Mortar Repointing: Prepare 2 separate sample areas of approximately 3-feet high by 3-feet wide for each type of repointing required, one for demonstrating methods and quality of workmanship expected in removal of mortar from joints and the other for demonstrating quality of materials and workmanship expected in pointing mortar joints. Prepare, install and finish each sample according to specifications. Sample must be applied to the actual masonry. Samples to cure a minimum of 14 days prior to Architect approval.
 - 2. Stone Patching With Stone Repair Mortar: Prepare separate sample area of a masonry unit for each type of stone patch repair required (ornamental and face stone). Prepare, install and finish each sample according to specifications. Sample must be applied to the actual masonry. Samples shall cure a minimum of 14 days prior to Architect approval.
 - 3. Cleaning: Prepare 3 separate spot cleaning sample areas for each type required to determine the extent of cleaning, cleaning methods, dwell time, and cleaning products. One test sample must consist of a hot water wash at low psi using a flat 25-50 degree wide spray stainless steel tip. Record and note all dwell times, surface and air temperatures at the time of testing each possible solution. Architect to be present during mockup execution. Note cleaning detergent or chemical mix, psi, nozzle orifice distance from wall face, dwell times, and any other specific cleaning procedures.
- B. Rework all mockups, repairs, and samples until acceptable to the Architect and Owner.
- C. Acceptable mockups illustrating results of restoration and cleaning will establish the standard for all work and repairs completed under this section.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Complete repairs in accordance with all manufacturer recommendations and requirements. Do not perform work when:
 - 1. Air temperatures are at or below 40°F and falling.
 - 2. Air temperatures exceed 90°F without protection.

3. Rain is expected less than 6 hours after installation, or less than 24 hours after a rain.
4. Surfaces are frozen or have not yet fully thawed.
- B. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40°F.
- C. Do not use frozen materials or materials mixed or coated with ice or frost. Do not lower the freezing point of mortar by the use of admixtures or anti-freeze agents, and do not use chlorides in the mortar.
- D. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100°F or surface and ambient air temperature is greater than 90°F with wind velocity greater than 8 mph. Phase repointing during hot weather by completing process on the shady side of the building or schedule installation of materials during cooler evening hours to prevent premature evaporation of moisture the mortar.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry, stone, and all other materials neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.
- B. Store all mortar ingredients in manufacturer's packaging, or when delivered loose, with adequate weatherproof covering.
- C. Deliver materials to site in manufacturer's original unopened containers and packaging, bearing labels as to type and names of products and manufacturers.
- D. Deliver and store restoration material in manufacturer's original, unopened containers with the grade, batch and production data shown on the container or packaging.
- E. Protect restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with earth or other types of materials.
- F. Protect mortar and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect all components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.
- G. Comply with the manufacturers' written specifications and recommendations for mixing, application, and curing of repointing mortars and patching materials.

1.08 WARRANTY

- A. Provide 1-year workmanship warranty for all repairs completed under this section.
- B. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS**2.01 MORTAR MATERIALS**

- A. Portland Cement: ASTM C150, Type I or II.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Sand: ASTM C144 natural sand, clean and well graded.

- D. Water: Potable, clean and free from acids, alkalis or other dissolved organic materials.
- E. Pigments (if required): ASTM C979 mineral oxide pigments.

2.02 MORTAR MIX

- A. General: All repointing mortar shall match the original in color, grain size, and texture. The compressive strength of the repointing mortar shall be equal or less than the compressive strength of the original mortar and surrounding brick or stone. The replacement mortar shall contain approximately the same ingredient proportions of the original mortar.
- B. Pre-Blended Mortar Products: For existing cobblestone walls, use Type N lime-based mortar unless testing or field observation indicates otherwise.
 - 1. Saint-Astie; Limeworks NHL Mortar.
 - 2. Edison Coatings; E-NHL 3.5 Natural Hydraulic Lime Mortar.
 - 3. Spec-Mix; Lime Mortar Type N.
- C. Typical Mix: As reviewed and approved during mockup to match existing mortar.
 - 1. 1 part hydraulic lime.
 - 2. 2.5-3 parts washed sand.
 - 3. Compressive strength of at least 750 psi.

2.03 CLEANING MATERIALS

- A. General: Gentlest means necessary should be used. Products are listed in order of aggressiveness from least aggressive to most aggressive:
 - 1. Water: Clean, potable.
 - 2. Warm Water: Clean potable water heated to a temperature of 140°F - 160°F.
- B. Low-odor, non-fuming, concentrated restoration cleaner: concentrated acidic cleaner for cleaning atmospheric and carbon staining on masonry and stucco surfaces.
 - 1. Manufacturer/Product: Prosoco "Enviro Klean SafRestorer", or approved equal.
- C. Biological soiling remover: cleaner designed to remove mold, mildew, and atmospheric staining from masonry.
 - 1. Manufacturer/Product: Prosoco "Enviro Klean ReVive", or approved equal.
- D. Pointing Mortar Residue Cleaner: Prosoco "Enviro Klean Safety Klean", or approved equal.
- E. Equipment:
 - 1. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage terra cotta panels.
 - a. Use sprayer type recommended by cleaning product manufacturer.
 - b. Equip units with pressure gauges.

- c. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
 - d. Low-pressure water spray cleaning. High pressure spray cleaning not accepted.
 - e. For heated water-spray application, use equipment capable of maintaining temperature between 140 to 160 deg F at flow rates indicated.
2. Tools and Brushes: Use type of application tools and brush recommended by cleaner manufacturer for substrate.
- a. Do not use wire brushes or brushes that are not resistant to cleaner being used, or that may damage the substrates

2.04 ACCESSORIES

- A. Injection Crack Repair: Edison Coatings "Pump X53iL", Hydraulic Lime Injection Grout, or approved equal.
- B. Routed Crack Repair: Edison Coatings "Thin-Fill 55", or approved equal, set in routed cracks.
- C. Replacement Masonry Units: To match existing and as approved by the Architect.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions are satisfactory before proceeding with repairs. Do not proceed without Architect approval of all required mockups.

3.02 REPAIRS – GENERAL

- A. Match mock-ups and samples approved by Architect.
- B. Appearance Standard: Surfaces shall have a uniform appearance as viewed from 20 feet away by the Architect.
- C. Replace damaged or missing units with a new full unit in-kind to match existing.
- D. Replacement of masonry units to be confirmed by Project Architect prior to execution.

3.03 PREPARATION

- A. Protect elements surrounding work of this section from damage or disfiguration.
- B. Immediately remove stains, efflorescence, or other excess resulting from work of this section.
- C. Protect roof membrane and flashings from damage. Lay 1/2 inch plywood protection on roof surfaces over full extent of work area and traffic route.
- D. Provide waterproof dams to divert flowing water to exterior drains and catch basins.
- E. Carefully remove and store fixtures, fittings, finishing hardware, accessories.
- F. Close off, seal, mask, and/or board up areas, materials, and surfaces not receiving work of this section to protect from damage.

3.04 INSTALLATION

A. Replacement and Rebuilding:

1. Cut out damaged and deteriorated masonry with care in manner to prevent damage to adjacent remaining materials.
2. Shore or support structure in advance of cutting out units to maintain stability of remaining materials. Cut away loose or unsound adjoining masonry and mortar to provide firm and solid bearing for new work. Cut out full units from joint to joint and in a manner to permit the replacement of full-size units.
3. Ensure anchors, ties, reinforcing, stone cramps and dowels, and flashings are correctly located and built in.
4. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in openings, accessories and fittings.
5. Re-use masonry to the fullest extent possible. Integrate new replacement masonry in concealed areas or shielded from public view.
6. All new brick units to be solid, no voids, consisting of salvaged historic matching material.
7. Build new masonry to the full thickness as shown on drawings. Key brick or stone into existing structure wherever possible providing mortar as required.

B. Repointing:

1. Leave one intact and serviceable example of original mortar on the building; location and size to be determined with Architect.
2. All joints (unless otherwise noted) shall be raked back to sound, solid, back up material. All raking out should leave a clean, square face at the back of the joint to provide for maximum contact of pointing mortar with the masonry back up mortar. Shallow or feather edging shall not be permitted.
3. Existing mortar joints shall be raked out a minimum depth of 2.5 times the height of the existing mortar joints, however, so as not to compromise the structural stability of the wall, the joint should not be raked out more than half the width of the masonry unit.
 - a. 1/16" Mortar joints to be cut out to a depth of 3/16" minimum.
 - b. 1/8" Mortar joints to be cut out to a depth of 5/16" minimum.
 - c. 1/4" Mortar joints to be cut out to a depth of 5/8" minimum.
 - d. 1/2" Mortar joints to be cut out to a depth of 1-1/4" minimum.
 - e. 3/4" Mortar joints to be cut out to a depth of 1-7/8" minimum.
 - f. 1" Mortar joints to be cut out to a depth of 2-1/2" minimum.
4. Utilize hand tools and power tools only after test cuts determine no damage to masonry units results. Vertical joints (head joints) SHALL NOT be raked out using rotary power saws. All vertical head joints must be removed by hand in stonework unless a demonstration can be made that rotary use can be implemented without over cutting the joint, i.e. "over

running." Vertical joints exceeding 6" in height may be approved for cutting with rotary power saws pending a successful demonstration to the Project Architect.

5. Do not damage existing masonry units.
6. Existing horizontal mortar joints (bed joints) that are filled with a hard Portland mortar may be raked out using a diamond blade that is narrower than the joint width. The middle one-third of the mortar joint may be cut using a rotary power saw. The remaining mortar shall be removed from the masonry joints by hand using masonry chisels or pneumatic carving tools powered by air.
7. Existing historic mortar shall be removed using only small-headed chisels that are no wider than half the width of the existing masonry joints. Pneumatic air carving chisels are permitted.
8. Contractor shall not widen the existing masonry joints. The surrounding masonry edges shall not be spalled or chipped in the process of mortar removal. Damage to surrounding stone resulting from rotary blade over running shall not be permitted. Contractor shall replace all brick or stone damaged during mortar removal with replacement units that match the original exactly.
9. Brush, vacuum, blow out, or flush joints with water to remove dirt and loose debris, working from top to bottom of wall.
10. Exposed surface of masonry adjacent to joint shall be wet prior to repointing. Maintain a water sprayer on site at all times during the repointing process.
11. Walls should be pre-soaked with water 10 minutes prior to pointing.
12. Rinse masonry joint with water to remove dust and mortar particles. Time the rinsing application so that at the time of pointing excess water has evaporated or run off. Joint surfaces should be damp but free from standing water.
13. Mortar shall be mixed according to manufacturer recommendations. The mortar material shall resemble the consistency of brown sugar during installation. This drier consistency enables the material to be tightly packed into the joint and allows for cleaner work and prevents shrinkage cracks as the mortar cures.
14. Joints should be pointed in layers or "lifts" where the joints are deeper than one and one-quarter inch (1-1/4 inch or 9mm). Apply in layers not greater than 1/2 the depth but not more than 1-1/4 inch or until a uniform depth is formed. Compact each layer thoroughly and allow it to become thumbprint hard before applying the next layer.
 - a. 3/16" joint depth (1/16" joint existing) point in one lift.
 - b. 5/16" joint depth (1/8" joint existing) point in one lift.
 - c. 5/8" joint depth (1/4" joint existing) point in one lift.
 - d. 5/16" joint depth (3/8" joint existing) point in one lift.
 - e. 1-1/4" joint depth (1/2" joint existing) point in one lift.
 - f. 1-7/8" joint depth (3/4" joint existing) point in two lifts approx.-1" (each).
 - g. 2-1/2" joint depth (1" joint existing) point in three lifts approx.+3/4" (ea.).

- h. over 2-3/4 joint depth- point in lifts of no more than 1-1/4" (each).
- 15. When mortar is thumbprint hard the joints shall be finished to match the original historic joint profile.
- 16. Keep mortar from drying out too quickly. Protection from direct sun, high winds for the first 72 hours after installation. Thoroughly soak the wall after the mortar has set and the finish joint profile is complete. Water soaking the wall is to be carried out nine (9) separate times allowing the wall to dry out between applications. Protect freshly pointed areas with plastic sheeting for the first 24 hours after installation.
- 17. Nine (9) wet-and-dry cycles are required and can usually be completed immediately after installation by water soaking the repointing work three times per day for three days. Nine (9) wet-and-dry cycles may take two days or one week depending on the conditions of the wall and the environment.
- 18. Acceptable curing methods include covering the repointed wall with plastic sheeting, periodic hand misting, and periodic mist spraying using a system of pipes, mist heads, and timers.
- 19. Adjust curing methods to ensure that the pointing mortar is damp without eroding the surface of the mortar.
- 20. Rout, repair, patch and fill cracks, voids, defects, and damaged areas to satisfaction of the Architect. Allow all repair materials to cure completely.
- 21. Install sealant and backer at joints between masonry and dissimilar materials including at miscellaneous penetrations. Sealant color shall match adjacent material.

3.05 MASONRY CLEANING**A. Cleaning – General:**

- 1. Cleaning Appearance Standard: Cleaned surfaces shall have uniform appearance as viewed from 20 feet away by Architect. Like-new appearance not expected or desired.
- 2. Proceed with cleaning in an orderly manner; ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.
- 3. Protect windows and adjacent surfaces from contact with cleaning materials.
- 4. Pre-test each product on each surface before beginning the overall application, to confirm compatibility, coverage, and application requirements needed to achieve desired results.
- 5. Use gentlest means necessary, progressing to more aggressive methods only if necessary. Use low-pressure warm water, brushes and restoration cleaner for masonry. Refer to Preservation Brief #1: Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings.
 - a. Very Low-Pressure Spray: Less than 100 psi.
 - b. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.
 - c. Low-odor, non-fuming, concentrated restoration cleaner.
 - d. Biological soiling remover.

6. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging surfaces.
 7. Perform additional general cleaning, and spot cleaning of small areas that are noticeably different when viewed per the "Cleaning Appearance Standard" indicated, so that cleaned surfaces blend smoothly into surrounding areas.
- B. Pressure Wash, Equipment and Tools:
1. Pressure Wash: Use only low-pressure water spray (100 — 140 psi unless otherwise recommended by manufacturer of cleaning product) with a fan tip, and warm water (between 140 and 160 deg F), applied with equipment and tools recommended by manufacturer of cleaning product.
 - a. Apply standing off from the surface at least 12 inches.
 - b. Maintain an even distance and level position from the face of material to be cleaned to avoid uneven cleaning and future streaking.
 2. Tools: Use brushes and tools recommended by manufacturer of cleaning product.
- C. Concentrated Restoration Cleaner:
1. General: Comply with the chemical cleaner manufacturer's recommendations for protecting adjacent building surfaces against damage from exposure to their products.
 - a. Proceed with installation only after unsatisfactory conditions have been corrected.
 2. Application methods:
 - a. Prewet substrate with clean water applied working from bottom to the top.
 - b. Apply concentrate or diluted chemical cleaning system to prewet unit masonry surfaces that comply with chemical cleaner manufacturer's written instructions for dilution and recommended application instructions; use low pressure spray, acid resistant brush, or heavy nap roller methods. Do not spray apply at pressures exceeding 50 psi.
 - c. Let the cleaning solution stay on the wall 5 to 15 minutes. Reapply if it starts to dry.
 - d. Reapply the cleaning solution to heavily soiled areas. Scrub gently.
 - e. Working from the bottom to the top, thoroughly rinse treated surfaces with clean water. Make sure to flush all spent cleaner and dissolved soiling from the surface, surface pores and adjacent surfaces.
- D. Biological Soiling Remover:
1. General: Comply with chemical cleaner manufacturer's recommendations for protecting adjacent building surfaces against damage from exposure to their products.
 - a. Proceed with installation only after unsatisfactory conditions have been corrected.
 2. Proceed with cleaning of biological soiling if specified mild cleaner was tested and ineffective to blackened area. Apply in an orderly manner; work from bottom to top.
 3. Application methods:

- a. Dilute chemical cleaner based on testing and manufacturer's published.
- b. Apply diluted chemical cleaner to dry masonry surfaces. Comply with chemical cleaner manufacturer's written instructions until surface is thoroughly wet; use brush or spray application methods, at Contractor's option.
- c. Do not spray apply at pressures exceeding 50 psi.
- d. Let chemical cleaner dwell for 2 to 3 minutes. Reapply the cleaner to keep surface wet for allotted time period.
- e. Mist treated surface with water and gently scrub with non-metallic, short-fibered scrub brush to loosen biological soiling.
- f. Rinse thoroughly with clean water from bottom to top.
- g. Reapply, if necessary to achieve specified results. It may take several days for the full cleaning effect to be realized. When practical, allow two or more weeks for biological soiling to disappear.

3.06 FINAL CLEAN-UP AND ACCEPTANCE

- A. Clean all exposed surfaces of masonry using materials specified, so that resulting surfaces have a uniform appearance.
- B. When cleaning stains and tough dirt, test masonry for composition and select appropriate cleaner in accordance with manufacturer's instructions and recommendations; use cleaner and cleaning methods selected to minimize damage to surfaces and deterioration of appearance.
- C. Mockup testing will determine the most appropriate cleaning solution, treatment, dwell time, psi, and nozzle orifice distance from wall surface.
- D. Install and clean up as per manufacturer's recommendations and standards.
- E. Capture, store, and dispose of all cleaning products, overspray, wash, and after wash as per EPA and local government standards.
- F. Repeat all repair and cleaning procedures when required to produce the aesthetic established by the approved mockup, or as directed by the Architect.

END OF SECTION 04 01 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Concrete masonry units used to infill existing crawlspace openings.
 - 2. New cobblestone masonry units at monument signage.
 - 3. Mortar, grout, reinforcement, ties, anchors, and accessories as required for a complete installation.
- B. Related work in other sections:
 - 1. Section 03 30 00 – Cast in Place Concrete.
 - 2. Section 04 01 00 – Maintenance of Masonry.

1.02 REFERENCES

- A. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- B. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
- C. ASTM C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.
- D. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units).
- E. PCA - Concrete Masonry Handbook
- F. TMS 402 - Building Code Requirements for Masonry Structures
- G. TMS 602 - Specifications for Masonry Structures

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Shall have minimum of 10 years of experience manufacturing CMU of the type specified, that have never failed regardless of the length of service.
- B. Mason/Installer Qualifications: Installer shall have been regularly engaged in masonry work of comparable magnitude to work of this project for not less than 2 years.
- C. Source Limitations: Obtain each type of masonry unit from a single source manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry on pallets under protective cover; verify undamaged condition at site.
- B. Store pallets on elevated platform in dry location; do not stack. Protect from damage. Cover to protect from rain. If units become wet, do not install until they are dry.
- C. Store reinforcing bars in manner required to remain free of rust, dirt and loose scale.
- D. Store other materials in original unopened and labeled containers in dry location

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Installer Warranty: Warrant all work against defective materials and/or workmanship for two (2) years following Project Substantial Completion date.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS (CMU)

- A. CMU Units: Grouted and reinforced Standard hollow block units, ASTM C90 and TMS 602/ACI 530.1/ASCE6.
- B. Standard: Fully grouted and reinforced.
 - 1. Nominal Face Dimension: 8 inches high by 16 inches long.
 - 2. Nominal Depth: 8 inches.
 - 3. Faces: Standard smooth-faced.
 - 4. Density/Classification: Grade N or S, suitable to conditions.
 - 5. Aggregate Types: ASTM C33 normal weight aggregate.
 - 6. Integral Water-Repellent: Mutual Materials RainBloc, or manufacturer's standard.
 - 7. Color: To match existing.
- C. Manufacturing Tolerance (ASTM C90): +/- 1/8 inch from specified dimensions.

2.02 MORTAR AND GROUT

- A. Mortar and Grout - General:
 - 1. Refer to Drawings and Structural General Notes.
 - 2. Do not use calcium chloride; do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
- B. Mortar for CMU: ASTM C270, pre-blended mortar mix matching existing.
 - 1. Type as indicated on the Structural General Notes.
- C. Grout for CMU: ASTM C476.
 - 1. See Structural General Notes.
 - 2. Use grout of type and compressive strength that will comply with TMS 602/ASCE for dimensions of grout spaces and heights.
- D. Materials:
 - 1. Portland Cement: ASTM C150, Type I or II.
 - 2. Hydrated Lime: ASTM C207, Type S.
 - 3. Mortar Aggregate: ASTM C144.
 - 4. Grout Aggregate: ASTM C404.
 - 5. Water: Clean and potable.
 - 6. Accelerating Admixture: ASTM C494, non-chloride type for use in cold weather.
 - 7. Integral Water-Repellent Mortar Admixture: Liquid water repellent mortar admixture, approved by CMU manufacturer for use with CMU manufactured with water-repellent admixture.
- E. Equipment (mixes): Use mechanical batch mixer and comply with referenced standards.

2.03 REINFORCEMENT

- A. Reinforcement: Refer to the Structural Drawings and Structural General Notes.
 - 1. Uncoated Steel Reinforcing Bars, ASTM A615, Grade 60, fabricated per TMS 602/ACI 530.1/ASCE 6, for reinforcing bars in grouted cells.
 - 2. Reinforcing Bar Positioners: 0.148 inch hot-dip galvanized steel wire to hold bars in center of cells. Units designed for number of bars indicated.

2.04 TIES AND ANCHORAGE

- A. Manufacturers/Products:
 - 1. Hohmann & Barnard, Inc. (H&B).
 - 2. Wire Bond.
 - 3. Or approved equal.
- B. Standard CMU: Reinforced masonry.
 - 1. Ladder-type joint reinforcement.
 - 2. Material: Galvanized steel.
 - 3. Steel reinforcing bars in grouted cells, as indicated on Structural Drawings and Structural General Notes.

2.05 ACCESSORIES

- A. Precast Concrete Cap: As detailed.
- B. Miscellaneous Accessories: Dowels, angles, plates, and the like, as indicated and as required for complete installations.
- C. Masonry Cleaners: Non-acidic, commercial cleaner designed for removing mortar/grout stains from new masonry without damaging the masonry. Muratic acid not allowed.
- D. Provide isolation washers and the like as required to prevent corrosion of dissimilar metals

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.
- B. Verify installation conditions as satisfactory to receive work of this Section.
 - 1. Inspect units prior to installation. Reject/do not install chipped or cracked units.
 - 2. Field verify that reinforcing is properly placed in cells to be grouted.
- C. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory

3.02 PREPARATION

- A. Clean substrates by removing loose mortar and grout, mud, oil, or other materials that will adversely affect bond to mortar or grout.
 - 1. Reinforcement with rust and/or mill scale is acceptable provided attributes of a cleaned sample are in accordance with the applicable ASTM specification.
- B. Protection and Stain Prevention:
 - 1. Protect base of walls from mortar splatter. 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 surfaces.
 - 2. Protect other surrounding surfaces to preclude damage.

3.03 INSTALLATION

- A. Installation – General:
 - 1. Install Work in accordance with IBC, and provisions of the Contract Documents.
 - 2. Use full-size units without cutting if possible. Half masonry unit permitted at control joints and corners. Prevent broken masonry unit corners or edges.

3. If cutting is required 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 indicated. Install cut units with cut surfaces and with cut edges concealed.
 4. Coordinate placement of reinforcement, anchors, access gates and metal fabrications.
 5. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
- B. Laying Masonry Walls:
1. Lay out walls in advance for accurate spacing of joint patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Do not use less than half-size units.
 2. Establish lines, coursing, Running Bond, and patterns indicated.
 3. Lay straight, plumb, level courses. Break vertical joints to true, evenly spaced lines.
 4. Install units with square (90 degree) corners.
 5. Provide cleanouts at bottom course of each grout lift. Clean grout space prior to grouting; seal cleanouts after inspection and before grouting.
- C. Mortar Bedding and Jointing:
1. Lay hollow units as follows:
 2. Bed face shells in mortar and make head joints of depth equal to bed joints.
 3. Bed webs in mortar in grouted masonry, including starting course.
 4. Fully bed entire units, including areas under cells, at starting course where cells are not grouted.
 5. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
 6. Remove excess mortar and mortar smears as work progresses.
- D. Reinforcing:
1. Install vertical reinforcing prior to grouting of cells in compliance with requirements in IBC and TMS 602/ACI 530.1/ASCE 6.
 2. Install joint reinforcement embedded in mortar joints as masonry is laid.
 3. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 4. Comply with requirements in TMS 602 for cleanouts and for grout placement, including minimum grout space, and maximum pour height.
 5. Place and consolidate grout fill without displacing reinforcing. Maintain position within 1/2 inch of approved dimensioned position.
 6. Limit height of vertical grout pours to 60 inches, unless high-lift grouting is allowed.
- E. Control Joints: Install to accommodate movement in masonry walls.
- F. Construction Tolerances:
1. Maximum Variation from Location in Plan: Plus or minus 1/2 inch.
 2. Maximum Variation in Dimensions in Elevation: Plus or minus 1/4 inch.
 3. Maximum Variation from Plumb - Vertical Lines and Surfaces: 1/4 inch in 10 feet.
 4. Maximum Variation from Level Coursing: 1/4 inch in 10 feet, or 1/2 inch maximum.
 5. Maximum Variation from Unit Face to Adjacent Unit Face: 1/16 inch.
 6. Maximum Variation in Mortar Joint Thickness: Plus or minus 3/8 inch.

3.04 FIELD QUALITY CONTROL

- A. Structural Reinforced CMU: See Civil and Structural Drawings and Structural General Notes.
 - 1. Testing and Inspection: Verify work of this Section in accordance with Section 01 4000, Quality Requirements.
 - 2. Contractor shall begin masonry construction only after inspectors have verified proportions of mortar; place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement; and place grout only after inspectors have verified proportions of site-prepared grout.

3.05 REPAIRING AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Replace defective mortar.
- B. Clean soiled surfaces with cleaning solution. Use non-metallic tools in cleaning operations.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry surfaces to remove excess mortar, mortar droppings, splatter, stains, and other foreign matter as recommended by NCMA TEK-8-4A.
 - 1. Leave surfaces clean, free from mortar and other stains.
- D. Masonry Waste Disposal:
 - 1. Recycling: Return broken CMUs to manufacturer for recycling.
 - 2. Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, legally dispose of, off Owner's property.

END OF SECTION 04 20 00

PART 1 GENERAL**1.01 SUMMARY**

- A. Work in this section includes:
 - 1. Aluminum handrails.
 - 2. Glass railings.
 - 3. Stainless steel cable railings.
- B. Related work in other sections:
 - 1. Section 03 30 00 – Cast In Place Concrete.
 - 2. Section 04 01 00 – Maintenance of Masonry.
 - 3. Section 06 10 00 – Rough Carpentry.
 - 4. Section 06 73 00 – Composite Decking.
 - 5. Section 07 92 00 – Joint Sealants.
 - 6. Section 08 81 00 – Glazing.

1.02 REFERENCES

- A. ADAAG - Americans with Disabilities Act Accessibility Guidelines.
- B. ANSI/ASME B 18.6.4 - Mechanical and Quality Requirements for Tapping Screws.
- C. ASTM International (ASTM):
 - 1. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM A 269 - Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - 3. ASTM A 276 - Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
 - 4. ASTM A 312 - Specification for Seamless and Welded Austenitic Stainless Steel Pipe.
 - 5. ASTM B 26 - Standard Specification for Aluminum-Alloy Sand Castings.
 - 6. ASTM B 29 - Standard Specification for Refined Lead.
 - 7. ASTM B 179 - Standard Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes.
 - 8. ASTM B 26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2005.
 - 9. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 10. ASTM B 210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2004.
 - 11. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2005.
 - 12. ASTM B 247 - Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings; 2000.
 - 13. ASTM B 429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2002.
 - 14. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 1997.
 - 15. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink); 2002.
 - 16. ASTM E 488 - Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements; 1996.

1.03 SYSTEM DESCRIPTION

- A. Refer to definitions in ASTM E985 and ISO/TC 59 for railing-related terms that apply to this Section.
- B. Railing shall conform to pertinent sections of the following codes:
 - 1. OSHA.
 - 2. Applicable state and local building codes.
 - 3. ADAAG - Americans with Disabilities Act Accessibility Guidelines.
- C. Handrail for Ramps and Stairs:
 - 1. Ramps with a rise greater than 6 inches (152 mm) shall have handrails on both sides.
 - 2. Handrail will be installed at a height of 34 to 38 inches (864 to 965 mm) above ramp surface.
 - 3. A curb, rail, wall, or barrier shall be provided to serve as edge protection. Curb shall be minimum 4 inches (102 mm) in height. A barrier shall be constructed so as to prevent the passage of a 4 inches (102 mm) diameter sphere above ramp grade level.
 - 4. On circular cross sections, the gripping surface shall have a diameter of between 1-1/2 inches (38 mm) and 2 inches (51 mm).
 - 5. A clearance of a minimum 1-1/2 inches (38 mm) shall exist between the wall or post surface and the handrail.
 - 6. At the top and bottoms of handrail sections that stop at a landing, the handrail shall extend 12 inches (305 mm) horizontally beyond the top riser and 12 inches (305 mm) horizontally beyond the bottom tread.
 - 7. Ramps with a drop off of 30 inches (762 mm) or more to grade shall require guards.
 - 8. Handrail shall be continuous, without interruption by newel posts or other obstructions.
 - 9. Handrails shall return to a wall, guard or walking surface.
- D. Structural Performance: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections:
 - 1. Components and installation shall be in accordance with state and local code authorities.
 - 2. Components and installation shall follow current ADA and ICC/ANSI A117.1 guidelines.
 - 3. Top Rail: Shall withstand the following loads.
 - a. Concentrated load of 200 lbf (0.89 kN) applied at any point and in any direction.
 - b. Uniform load of 50 lbf-ft. (0.07 kN-m) applied horizontally and concurrently with uniform load of 100 lbf-ft. (0.14 kN-m) applied vertically downward.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
 - 4. Handrails Not Serving As Top Rails: Shall withstand the following loads.
 - a. Concentrated load of 200 lbf (0.89 kN) applied at any point and in any direction.
 - b. Uniform load of 50 lbf-ft. (0.07 kN-m) applied in any direction.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
 - 5. Guard Infill Area: Shall withstand the following loads.
 - a. Concentrated horizontal load of 200 lbf (0.89 kN) applied to 1 square foot (0.09 m²) at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area. Loads need not be assumed to act concurrently with loads on top rails in determining stress on guard.

6. Glass: Fully tempered glass in glass-supported handrails and railings requires a design with a safety factor of 3 applied to the applicable modulus of rupture listed in "Mechanical Properties" in AAMA Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass".
 - a. Refer to Section 08 81 00 – Glazing for additional requirements.
- E. Thermal Movement: Provide exterior railings that allow for thermal movement 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 degree F (49 degree C), ambient; 180 degree F (82 degree C), material surfaces.
- F. Control of Corrosion: Prevent galvanic action and other forms of corrosion by isolating metals and other materials from direct contact with incompatible materials

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including, but not limited to, the following:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
 4. Grout, anchoring cements and paint products.
- C. Shop Drawings: Submit shop drawings showing fabrication and installation of handrails and railings. Include plans, elevations, sections, details, and attachments to other work.
 1. Provide setting diagrams for installation of anchors, location of pockets, weld plates for attachment of rails to structure, and blocking for attachment of wall rail.
 2. Indicate all required field measurements to be held.
 3. Indicate materials, sizes, styles, fabrication, anchorage and installation details for railing system and infill.
 4. Signed and Sealed Shop Drawings to be provided by Registered Professional Engineer.
- D. Certifications
 1. Furnish certification that all components and fittings are furnished by the same manufacturer or approved by the primary component manufacturer.
 2. Furnish certification that components were installed in accordance to the manufacturer's engineering data to meet the specified design loads.
- E. Samples:
 1. Post and rail sections- minimum 4 inch (100 mm) long piece of each type.
 2. Color Selection: Submit manufacturer's color charts showing the full range of colors available for products with factory-applied color finishes.
 3. Verification Samples: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

- a. 6 inches (152 mm) long sections of each different linear railing member, including handrails and top rails.
- F. Quality Control Submittals:
 1. Certificates: Submit certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of aluminum handrails and railings of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 5 years.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.
- C. Installer Qualifications: Minimum 2 year experience installing similar products.
- D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 1. Install one complete railing including infill panel at location selected by Architect.
 2. Obtain Architect's approval prior to installing additional railings.
 3. Refinish mock-up area as required to produce acceptable work.
 4. Approved sample may remain as part of completed work.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
 1. Surface Finish Warranty.
 2. Material Integrity Warranty.

PART 2 PRODUCTS**2.01 MANUFACTURER**

- A. Acceptable Manufacturers:
 1. PRL Glass Systems, Inc. (<http://prlglass.com>);
 2. Feeney (www.feeneyinc.com);
 3. ViewRail (www.viewrail.com);
 4. Inkan Limited (www.inkan.ca);
 5. Or approved equal.

2.02 ALUMINUM HANDRAILS AND GUARDRAILS

- A. Aluminum Handrails:
 1. Basis of Design: DesignRail Railing System as manufactured by Feeney, Inc.
- B. Handrail Options:
 1. Frame Height: 34-38" above stair tread.
 2. Mounting: Square post, base mounted.
 3. Top Rail: Graspable Series 150, 2" x 1-1/4" by 1/16" extruded aluminum graspable profile.

- C. Infill Options: Aluminum pickets with intermediate rail.
 - 1. Aluminum Pickets: 3/4" square extruded aluminum.
 - 2. Intermediate Horizontal Rail: 1-11/16 by 1-3/4 inch by 1/16 thick extruded aluminum rounded channel profile.
 - 3. Include washers, nuts, end caps, and any accessory items as recommended by the manufacturer for installation conditions shown on Drawings.
- D. Finish: Factory powder-coated aluminum components in compliance with AAMA 2604.
 - 1. Color: To be selected by Architect from manufacturer's standard color offering.

2.03 GLASS RAILINGS

- A. Glass Railings: Tempered glazing set in extruded aluminum base shoe.
 - 1. Basis of Design: PRL Dry-Set Glazed Handrail System – Top Mount.
- B. Glass handrail systems consisting of 1/2 inch clear tempered glass mounted into a 2-1/2 inches x 4-1/2 inches (64 mm x 114 mm) aluminum base shoe and capped with a 2 inches (51 mm) round extruded aluminum rail and glazed with Rockite cement and anchored with 1/2 inch (13 mm) bolts on 12 inches (305 mm) centers and confirmed by test results.
 - 1. The performance of this design meets model design and code requirements with the following safety factors: 3.87 for uniform and concentrated loads per ASTM E 935-00.
- C. Glass guardrail system with "Mini-Rapid" 2-3/4 inches (70 mm) high aluminum base shoe.
 - 1. A safety factor of 4.0 was applied to in-fill test loads to account for Section 2407 of IBC 2009, Glass in Handrails and Guards.
 - 2. The performance of this design meets model design and code requirements with the following safety factors: 75% deflection recovery from 2.0 times design load and withstanding an ultimate load of 2.5 times design load (4.0 design load for in-fill load tests), per Chapter 17 of the IBC 200.
- D. Base Shoe Finish: Brushed stainless steel, #4 finish.
- E. Glass: Clear tempered, refer to Section 08 81 00 – Glazing.
- F. Accessories: Provide manufacturer's standard accessories for a complete installation, including fasteners, setting blocks, shims, and the like.

2.04 STAINLESS STEEL CABLE RAILINGS

- A. Horizontal Cables: 1/8-inch (3.2 mm) diameter, 1 by 19 construction, ASTM A 492, Type 316 stainless steel, polished finish, commercial, dry grade cable with fittings options fabrication.
 - 1. Threaded Terminal factory attached to one end of each cable and a stainless-steel Fixed Button End factory attached to the other end.
 - 2. Include washers, nuts, end caps, and any accessory items as recommended by the manufacturer for installation conditions shown on Drawings.

2.05 FABRICATION

- A. Fabricate members and assemblies in accordance with approved shop drawings.
- B. Assemble items to the largest extent practical to minimize field splicing. Disassemble as required for shipping. Clearly identify each unit for installation.
- C. Conceal fasteners and welds as much as the design will allow. Grind smooth all sharp angles and corners.

- D. Connect non-welded members using the manufacturer's standard concealed fasteners and fittings unless otherwise indicated.
- E. Close exposed ends of railing members with manufacturer's standard end fittings.
- F. Provide Manufacturer's standard brackets, fittings, flanges, and anchors for connection to other work unless otherwise indicated on the approved shop drawings

PART 3 EXECUTION**3.01 EXECUTION**

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- C. Do not begin installation until substrates have been properly prepared.
- D. Verify mounting conditions are in accordance with the manufacturer's recommendations.
- E. If substrate conditions are the responsibility of another installer, notify the Architect of unsatisfactory preparation before proceeding

3.02 INSTALLATION

- A. Install in accordance with the manufacturer's instructions.
- B. Provide anchorage devices and fittings to secure railings to in-place construction, including threaded fittings for concrete inserts, toggle bolts, and through bolts.
- C. Install railing system plumb, level, square, and rigid.
- D. Separate dissimilar materials with bushings, gaskets, grommets, washers, or coatings where required to prevent electrolytic corrosion.

3.03 PROTECTION

- A. Protect installed products until completion of the project.
- B. Replace defective or damaged components as directed by the Architect.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 05 52 00

PART 1 GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Structural dimension lumber framing.
 - 2. Non-structural dimension lumber framing.
 - 3. Rough opening framing for doors, windows, and roof openings.
 - 4. Sheathing.
 - 5. Subflooring.
 - 6. Preservative treated wood materials.
 - 7. Fire retardant treated wood materials.
 - 8. Communications and electrical room mounting boards.
 - 9. Concealed wood blocking and support backing.
- B. Related work in other sections:
 - 1. Section 02 40 00 – Demolition.
 - 2. Section 09 21 16 – Gypsum Board Assemblies.
 - 3. Structural General Notes included in the project drawings.

1.02 REFERENCES

- A. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2015.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- D. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017)
- E. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2018a.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- G. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.
- H. PS 1 - Structural Plywood; 2009.
- I. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- J. PS 20 - American Softwood Lumber Standard; 2015

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: For each type of product specified. Include:
 - 1. Component materials, dimensions and construction and installation details.
 - 2. Connectors.
 - 3. VOC content for composite wood products, treatments and adhesives.

- C. Delegated Design (Engineered Members): Where specified in the Structural General Notes, provide engineering calculations and Shop Drawings stamped by qualified engineer licensed in State of Washington.
 - 1. Shop Drawings: Include layout, design loads, details of member connections, stiffeners, bridging, blocking, web openings, and installation instructions.
 - 2. Engineering Calculations.
- D. Certificates:
 - 1. 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.
 - 2. Evidence of maximum moisture content per WWPA Rules, Section 4.00.
- E. Evaluation Reports: ICC-ES or Reports acceptable to code official, for the following:
 - 1. Treated wood.
 - 2. Engineered wood products.
 - 3. Anchors and powder-driven fasteners.
- F. Additional items specified in the Structural General Notes.

1.04 QUALITY ASSURANCE

- A. Source Limitations - Engineered Wood Products: Obtain each type of engineered wood product from single source from a single manufacturer.
- B. Grading and Marking:
 - 1. Lumber: Factory mark each piece of lumber with the grade stamp of grading agency indicated, or agency certified by ALSC Board of Review.
 - a. Framing Lumber: WCLIB Grading Rules #17, or WWPA Grading Rules.
 - b. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
- C. Plywood: Mark each sheet with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood, identifying the species group, exposure durability classification, grade, and compliance with PS1.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
 - 1. Store materials a minimum of 6 inches above ground on framework or blocking.
 - 2. Stack wood products flat with spacers beneath and between bundles for air circulation
 - 3. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
 - 4. Do not store seasoned materials in wet or damp portions of building.
 - 5. Maintain materials at or below maximum moisture content prior to installation

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Refer to the Structural Drawings and General Structural Notes for additional requirements.
- B. Performance/Design Criteria:

1. Current ICC-ES Evaluation Reports acceptable to AHJ showing compliance with IBC.
 2. Engineered Wood Products: Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated per manufacturer's published values determined from empirical data or by engineering analysis and demonstrated by testing performed by qualified independent testing agency, and the following:
 3. Metal Framing Anchors: Allowable design loads, as published by manufacturer, shall meet or exceed those indicated per manufacturer's published values determined from empirical data or by engineering analysis, and demonstrated by testing performed by qualified independent testing agency. Framing anchors shall be punched for fasteners to withstand same loads as framing anchors. Refer to the Structural Drawings and Structural General Notes.
- C. Moisture Content: Maximum moisture content of wood products to be as follows:
1. Framing lumber shall be S-DRY, KD, or M-19. Kiln-dry treated lumber after treatment.
 2. Maximum moisture content of wood products at the time of delivery to the job site:
 - a. Boards: 19 percent maximum.
 - b. Dimension Lumber: 15 percent maximum.
 - c. Engineered Wood Products: 12 percent maximum.
 - d. Plywood: 16 percent maximum at time of testing; 18 percent at time of shipment.
 - e. Materials Other Than Listed: Moisture content shall be in accordance with standard under which product is produced.
- D. Make provisions during construction to prevent moisture content of installed members from exceeding moisture content indicated. Monitor moisture content of in-place wood and take remedial action to lower unacceptable moisture content.
- E. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
- F. Species: Douglas Fir-Larch, unless otherwise indicated.
- G. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- H. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.02 DIMENSION LUMBER

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Stud Framing (2 by 2 through 2 by 6):
1. Species: Refer to Drawings; Douglas Fir-Larch No. 2 for concealed framing.
 2. Grade: Per Structural Drawings and Structural General Notes.
- D. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16): Per Structural Drawings.
1. Species: Douglas Fir-Larch.
- E. Miscellaneous Framing, Blocking, Backing, Nailers, Grounds, and Furring:
1. Lumber: S4S, No. 2 or Standard Grade.
 2. Boards: Standard or No. 3

2.03 CONSTRUCTION PANELS

- A. Subflooring: Any PS 2 type, rated Sheathing.
 - 1. Bond Classification: Exterior.
 - 2. Span Rating: Per Structural Drawings and Structural General Notes.
- B. Underlayment: APA Underlayment; plywood, Exposure 2, 1/2 inch thick. Fully sanded faces at resilient flooring.
- C. Wall Sheathing: Oriented strand board wood structural panel; PS 2.
 - 1. Bond Classification: Exposure 1
 - 2. Span Rating: Per Structural Drawings and the Structural General Notes.
 - 3. Edges: Square
 - 4. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
 - 5. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
- D. Communications and Electrical Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- E. Other Applications:
 - 1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 - 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
 - 3. Other Locations: PS 1, C-D Plugged or better.

2.04 ENGINEERED WOOD PRODUCTS

- A. Manufacturers:
 - 1. Weyerhaeuser, or accepted, with current Evaluation Report accepted by code official.
- B. Laminated Strand Lumber (LSL): Weyerhaeuser "TimberStrand LSL".
 - 1. Description: Prefabricated units. Wood strands oriented in a direction parallel to the length of the member and bonded together using an exterior tyoe structural adhesive.
 - 2. Structural Properties: Depths and design values not less than those indicated.
- C. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I- joists at bearing ends, complying with research or evaluation report for I-joists.
- D. Hangers: Hot-dip galvanized steel, sized to suit framing conditions, by Simpson Strong-Tie, as indicated on Drawings.
- E. Fasteners: As determined by engineering calculations for conditions, and in compliance with ICC ES Evaluation Report.

2.05 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153 M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

3. Anchors: Toggle bolt type for anchorage to hollow masonry.
- B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions. Refer to the Structural General Notes in the project drawings for additional requirements.
 1. For contact with preservative treated wood, provide minimum G185 (Z550) galvanizing complying with ASTM A653/A653 M.
- C. Metal Framing Connectors and Anchors:
 1. Manufacturers/Products: As indicated in Structural General Notes.
 - a. Metal framing anchors shall have a current ICC-ES report, acceptable to AHJ.
 2. Allowable design loads, as published by manufacturer, shall meet or exceed those of basis-of-design products indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
 3. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- D. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
- E. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.
- F. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.
- G. Weather Barrier: As specified in Section 07 25 00

2.06 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWP A U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWP A standards.
- B. Preservative Treatment:
 1. Preservative Pressure Treatment of Lumber Above Grade: AWP A U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with roofing, flashing, or waterproofing.
 - d. Treat lumber in contact with masonry or concrete.
 2. Preservative Pressure Treatment of Plywood Above Grade: AWP A U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
 3. Preservative Pressure Treatment of Lumber in Contact with Soil: AWP A U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
 - a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
 - b. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.
- B. Verify adequacy of backing and support framing.
- C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 PREPARATION

- A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal
- B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

3.03 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.04 FRAMING INSTALLATION

- A. Install in accordance with the Structural Drawings and Structural General Notes.
- B. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- C. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- D. Install structural members full length without splices unless otherwise specifically detailed.
- E. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.
- F. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- G. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- H. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.
- I. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.05 BLOCKING, BACKING, AND SUPPORTS

- A. Provide framing, backing, and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Provide the following specific non-structural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Wall paneling and trim.
 - 8. Joints of rigid wall coverings that occur between studs.
 - 9. Behind gypsum sheathing along the "Donor Wall" as indicated in the architectural plans.

3.06 INSTALLATION OF CONSTRUCTION PANELS

- A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.
- B. Subflooring: Glue and nail to framing; staples are not permitted.
- C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
 - 1. Place weather barrier horizontally over wall sheathing, weather lapping edges and ends.
- D. Communications and Electrical Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 2. Install adjacent boards without gaps.

3.07 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
- C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.08 CLEANING

- A. Waste Disposal: Comply with Section 01 74 19 – Construction Waste Management & Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.

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- 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co- generation facilities or “waste-to-energy” facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION 06 10 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Interior finish carpentry and millwork items including but not limited to:
 - a. Standing and running trim including wall base and chair rail.
 - b. Wood window sills, jamb liner extensions, and wood liners at openings.
 - c. Wood railings and handrails.
 - d. Custom solid wood frames at interior doors.
 - e. Custom wood paneling used to conceal mechanical ductwork.
 - f. Plywood wall paneling.
- B. Miscellaneous carpentry items, millwork, trim, fasteners, hardware and accessories.
- C. Installation of certain work specified in other sections, including but not limited to:
 - 1. Section 08 71 00 — Door Hardware.
- D. Related work in other sections:
 - 1. Section 06 10 00 – Rough Carpentry.
 - 2. Section 06 41 00 – Architectural Wood Casework
 - 3. Section 08 14 00 – Wood Doors.
 - 4. Section 08 52 13 – Aluminum Clad Wood Windows.
 - 5. Section 08 71 00 – Door Hardware.
 - 6. Section 08 81 00 – Glass Glazing.
 - 7. Section 09 91 00 – Painting.

1.02 REFERENCES

- A. ALSC: Americal Lumber Standard Committee.
- B. NAAWS (AWI): Architectural Woodwork Standards.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: For each material, process and product specified.
 - 1. Shop Drawings: Plans, sections, elevations, details and accessories for each type of finished carpentry item. Include:
 - 2. Materials, finishes and dimensions.
 - 3. Profiles of moldings and joint details including corners at scale 3"=1'-0".
 - 4. Method of attachment to and relationships with adjacent construction.
- C. Shop Drawings: For all custom milled trim profiles.
- D. Samples:
 - 1. Finishes: Up to three finishes on actual material, for each item, for approval by Architect. Do not fabricate without Architect's approval.
 - 2. Each material, trim and molding shapes, 12 inches long minimum.
 - 3. Each type of hardware and accessory.
- E. Qualifications Data: For manufacturer, fabricator and Finish Carpenter.

1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shall have a minimum of 5 years of experience fabricating woodwork of similar quality, scope and complexity as required for this project.
- B. Finish Carpenter Qualifications: Shall have a minimum of 5 years of experience with projects similar in quality, scope, and complexity including historic nature, as applicable.
- C. Comply with NAAWS, APA, WRLCA, NWWDA, WWPA and other referenced standards.
- D. Source Quality Control: Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - 1. Grading agency shall be certified by ALSC Board of Review.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Maintain the ambient relative humidity at the site, including storage and installation areas, between 25 percent and 55 percent prior to delivery and through installation.
- B. Maintain storage areas at minimum 60 deg F; installation areas at minimum 70 deg F.
- C. Provide a secure storage area within the building that is flat and level, clean, dry, well ventilated, protected from direct sunlight, dust, dirt and damage.
- D. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Remove from site materials with visible mold or mildew.

1.06 PROJECT SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not deliver, acclimate, or install interior finish carpentry until building is enclosed, thoroughly dry (wet work and finish work is complete), HVAC system is operating and maintaining temperature and relative humidity at occupancy levels and 25 to 55 percent relative humidity, during the remainder of the construction period.
 - 2. Allow no adhesive containers to be opened until potential sources of flame or spark have been shut down or extinguished and warnings have been posted.
 - 3. Refer to NAAWS Section 2, Care and Storage, for additional requirements.
- B. Field Measurements: Take dimensions necessary prior to fabrication and installation.

PART 2 - PRODUCTS

2.01 WOOD - GENERAL

- A. General:
 - 1. Materials and assemblies shall be in accordance with referenced NAAWS Manual for "Premium" Quality Grades for transparent finish and "Custom" for painted finish.
 - 2. Except as modified, conform to following listing (for items not shown, consult referenced NAAWS Document):
 - a. Lumber: Section 3 Grades I and II.
 - b. Sheet Products: Section 4.
 - c. Finishing: Section 5.
 - d. Standing and Running Trim: Section 6.
 - e. Miscellaneous: Section 6.

3. Comply with Standards as applicable:
 - a. Structural Plywood: PS 1.
 - b. Softwood Lumber: PS 20.
 - c. NLGA, WCLIB, WWPA standards as applicable.
- B. Moisture Content: Comply with manufacturer's recommendations and requirements of specified inspection and testing agencies.
 1. Interior Finish Woods: Kiln-dried or air-dried to not more than 9 percent upon delivery.
 2. Interior Blocking, Shims, and Nailers: 15 percent.
- C. Flammability for Interior Finish Materials: Minimum Class III or C fire rated per ASTM E84.

2.02 MATERIALS

- A. Lumber and Milled Sections: DOC PS 20.
 1. Hardwood for Clear Transparent Finish:
 - a. Hard Maple, Grade AA.
 2. Hardwood for Opaque Finish:
 - a. Yellow Poplar, Grade AA.
- B. Sheet Products:
 1. Plywood: DOC PS 1.
 - a. Hardwood Veneer Plywood: HPVA, Commercial Grade, Veneer Core.
 - 1) Species/Cut/Grade: Maple Hardwood Veneer, Face Grade AA (clear finish).
 - b. Plywood: APA PS 1, A-A where exposed both sides, A-C where exposed one side; provide hardwood veneers where indicated; other types as indicated.
 - 1) "A" face veneer for transparent finishes.
 - 2) Marine Grade Plywood (where indicated): B-B Exterior Marine Grade plywood.
 - 3) Fire rated and moisture-resistant panels where indicated.
 2. Thickness as indicated on Drawings.

2.03 STANDING AND RUNNING TRIM

- A. Interior Wall Base: NAAWS Section 6.
 1. Species/Grade: Hard Maple, Grade AA.
 2. Dimensions and Profiles: As indicated in the Drawings, NAAWS Profile BAS-1023.
 3. Finish: Clear finish.
- B. Interior Chair Rails: NAAWS Section 6.
 1. Species/Grade: Hard Maple, Grade AA.
 2. Dimensions and Profiles: As indicated in the Drawings.
 3. Finish: Clear Finish.
- C. Interior Crown Moldings: NAAWS Section 6.
 1. Species/Grade: Hard Maple, Grade AA.
 2. Dimensions and Profiles: As indicated in the Drawings, NAAWS Profile CRN-4036.
 3. Finish: Clear Finish
- D. Interior Window Sills: NAAWS Section 6.
 1. Species/Grade: Hard Maple, Grade AA.
 2. Dimensions and Profiles: As indicated in the Drawings.
 3. Finish: Clear Finish

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- E. Interior Jamb Liner Extensions and Liners at Openings: NAAWS Section 6.
 - 1. Species/Grade: Hard Maple, Grade AA.
 - 2. Dimensions and Profiles: As indicated on Drawings.
 - 3. Finish: Clear finish:

2.04 WOOD RAILINGS AND HANDRAILS

- A. Wood Handrails and Rail Caps: NAAWS Section 7.
 - 1. Species/Grade: Hard Maple, Grade AA.
 - 2. Dimensions and Profiles: As indicated on the drawings, NAAWS Profile HRL-5001.
 - 3. Finish: Clear finish.
- B. Handrail Wall Brackets: IVES 059, Brass, Satin Nickel finish, or approved equal.

2.05 WOOD DOOR FRAMES

- A. Door Frames: NAAWS "Premium" Grade, Section 6.
 - 1. Description: Custom solid wood frames at interior doors.
 - 2. Species/Grade: Hard Maple, Grade AA.
 - 3. Dimensions, Shapes and Profiles: As indicated on Drawings.
- B. Finish: Shop-applied clear finish as specified in Section 09 91 00 – Painting, and as accepted by Architect during the submittal phase.
- C. Coordination: Coordinate with doors specified in Section 08 14 00 – Wood Doors, and hardware specified in Section 08 71 00 - Door Hardware.

2.06 PLYWOOD PANELING

- A. Plywood Paneling: NAAWS "Premium" Grade.
 - 1. Species/Grade: Maple Hardwood Veneer, Face Grade AA.
 - 2. Panel Thickness, Dimensions and Conditions: As indicated on Drawings.
 - 3. Finish: Shop-applied clear finish as specified in Section 09 91 00 – Painting, and as accepted by Architect during the submittal phase.

2.07 ACCESSORIES AND HARDWARE

- A. Wood Filler: Oil base filler, color to match wood being filled.
- B. Glues/ Adhesives: NAAWS Type I or Type II, water-based contact adhesives, non-VOC, low odor, best quality for intended use. Waterproof for exterior and work subject to moisture.
 - 1. Free of solvents, alcohol, carcinogens, glycol, and ammonia; anti-microbial.
- C. Interior Blocking, Shims, and Nailers: Softwood or hardwood lumber. Provide fire-retardant-treated softwood lumber, where indicated or required by code.
- D. Rough Hardware:
 - 1. Provide necessary anchors, nails, spikes, screws, and bolts as required for conditions of installation to provide secure attachment, concealed where possible.
 - a. Type, material and finish suitable to substrates and requirements.
 - b. Sizes and Spacing: As required by IBC and suitable to requirements.
 - c. Rough hardware subject to moisture during installations to be hot-dipped galvanized except where stainless steel is indicated in the drawings.
 - d. Use recessed screws, finish or casing nails for exposed work, unless otherwise specified or indicated in the drawings.

- e. Expansion bolts for drilled in place anchorage.
- 2. Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.
- 3. Furnish as necessary whether indicated or not.
- E. Joint Sealants: ASTM C834, as recommended by sealant and substrate manufacturers for intended application. Refer to Section 07 92 00 - Joint Sealants.
- F. Miscellaneous Items: Review Drawings and provide miscellaneous items required for completion of architectural woodwork as indicated with quality consistent with that specified for related woodwork.
 - 1. Blocking for In-Wall Support: Wood and metal blocking for anchorage of wall-mounted items in walls where required for complete, secured installation.

2.08 FABRICATION

- A. General:
 - 1. Mill to detail of specified materials as scheduled and as required to complete the work.
 - 2. Take and verify job-site measurements as required for proper fabrication of the Work.
 - 3. Fabricate finish carpentry in accordance with specified quality standard. Refer to materials for additional fabrication requirements for specific materials such as glass, plastic, aluminum, stainless steel and fabrics.
 - 4. Coordinate installation requirements of custom supports.
- B. Workmanship: Shall be "First-Class Workmanship" in addition to the following:
 - 1. Shall be NAAWS Quality Grade as indicated.
 - a. Finish exposed surfaces smooth, free from tool and machine marks.
 - b. Use concealed fastenings wherever possible.
 - c. Joints: Make tight and form to conceal shrinkage, as far as possible.
- C. Fitting and Adjustment: Regardless of tolerances specified for individual components forming portions of working assemblies, make final fitting and adjustments as required.

2.09 FINISHING

- A. Finishes - General: Provide finishes as specified or indicated on the drawings.
 - 1. Match NAAWS Quality Grade specified.
 - 2. To the greatest extent possible, finish carpentry and millwork in the shop. Defer only final touch-up, cleaning, and polishing until after installation.
- B. Shop-Applied Finishes: Shop-apply finishes unless pre-approved by the Architect.
 - 1. Coordinate finish with submittal samples. Match mock-ups accepted by Architect.
 - a. Sand all work smooth.
 - b. Finish: As accepted by Architect through submittal samples and mock-ups.
 - c. Coat and treat surfaces in accordance with referenced NAAWS standard.
 - 2. Opaque Finishes: One coat of wood primer specified in Section 09 91 00 - Painting.
 - 3. Semi-Transparent (stain): As specified in Section 09 91 00 - Painting.
 - 4. Transparent (clear) Finishes: As specified in Section 09 91 00 - Painting.
 - 5. Priming and back finishing shall be shop-applied unless indicated otherwise.

- C. Field-Applied Finishes: Field finishing, when required for a proper installation, shall be approved by the Architect. Field finishing shall be the same process as shop finishing and provide the same appearance
 - 1. Finish coat products as specified in Section 09 91 00 – Painting.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section.
- B. Verify adequacy of backing and support framing.
- C. Verify mechanical, electrical, and buildings items affecting work of this Section are placed and ready to receive this work.
- D. Do not proceed with fabrication prior to approval of all required submittals and mockups.
- E. Do not start work until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 PREPARATION

- A. Preparation — General:
 - 1. Before installing interior finish carpentry, acclimate materials to average prevailing humidity in installation areas for minimum of 24 hours. See also, Article 1.07 above.
 - 2. Prepare as required by manufacturer for "First Class" installation.
 - 3. Prior to installation, back prime work as recommended by NAAWS.
 - 4. Clean substrates of projections and substances detrimental to installation.
- B. Protection: Protect surrounding areas and surfaces from damage. During application, keep surfaces clean. Immediately remove foreign matter and particles from cutting.

3.03 INSTALLATION – FINISH CARPENTRY

- A. Install work in accordance with referenced and NAAWS Quality Standard indicated.
- B. Install to Detail:
 - 1. Set and secure materials and components in place, level, plumb and true.
 - 2. Install material with tight joints.
 - 3. Carefully scribe work butting other components with maximum gaps of 1/32-inch.
 - 4. Prior to securing items, adjust to ensure proper matching at joints and correct alignment throughout their length. Shim as required, using concealed shims.
 - 5. Ease exposed edges of finish work to match existing adjacent or 1/8-inch minimum radius in other areas.
 - 6. Do not use additional overlay trim to conceal larger gaps, unless specifically accepted by Owner after review of conditions of installation.
 - 7. Miter casings and moldings where indicated or directed.
 - 8. Cut splices at 45 deg angles.
 - 9. Secure work to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.
 - 10. Use finish nails except where screws required.
 - 11. Countersink fasteners; fill recesses flush and lightly sand, unless otherwise indicated.
 - 12. Where screw attachment required, space screws at equal intervals.

13. Provide for thermal and building movements.
 14. Materials indicated to remain exposed: take care to keep clean during construction.
- C. Erection Tolerances:
1. Maximum variation from true positions: 1/16-inch.
 2. Adjoining Surfaces of Same Material: No variance permitted.
 3. Maximum offset from true alignment with abutting materials: 1/32-inch.
- D. Standing and Running Trim:
1. Install with minimum number of joints practical (from maximum length of lumber available) using full-length pieces in single, unjointed lengths for openings and for runs less than 10 feet. Do not use pieces less than 60 inches long except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - a. Miter at corners; cope at returns. Stagger end joints in adjacent and related members; use scarf joints for end-to-end joints;
 2. Fill gaps, if any, between top of trim and wall with plastic wood filler; sand smooth; and finish same as wood trim.
 3. Use concealed fasteners. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand. Fasten to prevent movement or warping.
 4. Install without splitting; drill pilot holes before fastening where necessary.
 5. Wall Base: Glue in place.
 6. Installation Tolerances (maximum variation from straight line): 1/8 inch in 96 inches.
- E. Miscellaneous Items: Install other items necessary to complete normal finish carpentry.

3.04 PREPARATION FOR FIELD FINISHING OF WOODWORK

- A. Preparation for Field-Finishing (where approved by Architect):
1. Sand work smooth and set exposed nails and screws.
 2. Apply wood filler in exposed nail and screw indentations and leave ready to receive site-applied finishes.
 3. Transparent (clear) and Semi-Transparent (Stained) Finishes: Comply with manufacturer's instructions and match sample finish approved by Architect.
 4. Opaque Finishes: Seal concealed and semi-concealed surfaces; brush apply only, using primer consistent with finish coats specified under Section 09 91 00 – Painting.

3.05 COORDINATION WITH OTHER WORK

- A. Finish Hardware: Finish hardware as specified in Section 08 71 00 - Door Hardware. Perform installation by skilled mechanics to Architect and Owner's satisfaction. Conform strictly to manufacturer's templates and directions. Conform to referenced IBC and UL requirements.
1. Hardware Placement: Refer to Section 08 71 00 and approved submittals.
 - a. All other items per manufacturer's instructions or as directed.
 2. Where more stringent requirements are indicated by building code regulations for disabled persons, comply with it.
 3. Make mortises accurately to exactly receive hardware. Depth of mortises shall be such that hardware is flush with finish surfaces.
 4. Screws and similar: Drill appropriate size guide holes for wood screws.
 5. Ensure that door hardware does not touch trim. Do not notch trim.

6. Place door stops and holders to allow maximum swing. Doors and door hardware shall not contact anything but stop.
 7. Lubricate moving parts with lubricant recommended by manufacturer. Replace hardware that cannot be lubricated and adjusted to operate freely and smoothly.
 8. Thresholds:
 - a. Install thresholds only after installation of flashings as shown on Drawings.
 - b. Cut and fit to profiles of door jambs with mitered corners and precision joints. Join units with concealed welds or concealed mechanical devices. Cut smooth openings for spindles, bolts and similar items.
 9. At exterior doors, set thresholds in bed of sealant, completely fill voids to exclude moisture. Take care not to plug drainage holes or block weeps. Remove excess sealant.
 10. Hardware Final Inspection and Adjustment:
 - a. Adjustment: After erection and glazing, check operating hardware and clean interior and exterior metal surfaces of mortar, paint, and other contaminants.
 - b. Replace hardware which has been damaged by use when damage is caused by faulty installation.
 - c. At completion of work, factory representatives for door closers and locksets are required to inspect and adjust their materials.
 - d. Make Final Adjustment and check of hardware during the week immediately prior to Final Acceptance, unless otherwise directed by the Owner.
 - 1) Clean and relubricate operating items as necessary.
 - 2) Make final adjustment of locksets and closers to compensate for operation under the supervision of manufacturer's representative.
 - e. Turn over to Owner one copy of template and installation instructions for each type of hardware.
- B. Miscellaneous Items: Install other items necessary to complete finish carpentry work.
- C. Protect exposed surfaces and hardware finishes from damage during construction.

3.06 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements.
1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
- B. Adjust joinery for uniform appearance.

3.07 CLEANING AND PROTECTION

- A. Remove dirt and foreign materials from architectural woodwork upon completion of installation. Clean interior and exterior surfaces; clean and polish hardware.
- B. Repair or replace architectural woodwork damaged, stained, scratched or otherwise disfigured prior to final completion; repairs to match undamaged work. Replace items where repairs are noticeable from a 12-inch distance, or as determined by the Architect in the field.

END OF SECTION 06 20 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Custom casework at upper and lower kitchenette cabinets, locking storage cabinets.
 - 2. Hardwood veneer-faced plywood with hardwood end panels, edges, and slats.
 - 3. High-pressure decorative laminate countertops and check-out station.
 - 4. Wood furring, blocking, shims, hanging strips, hardware, and accessories as required.
- B. Related work in other sections:
 - 1. Section 06 10 00 – Rough Carpentry.
 - 2. Section 06 20 00 – Finish Carpentry.
 - 3. Section 22 40 00 – Plumbing Fixtures.

1.02 REFERENCES

- A. Reference Standards: Applicable provisions of the most recent adopted editions of the following standards shall apply to the work of this Section:
 - 1. Accessible Design - 2010 Standards for Accessible Design (ADA).
 - 2. ANSI/BHMA - American National Standard for Cabinet Hardware.
 - 3. APA PS 1 - Construction and Industrial Plywood with APA Trademark.
 - 4. ANSI/HPVA HP-1 - Voluntary Standard for Hardwood/ Decorative Plywood.
 - 5. NAAWS - North American Architectural Woodwork Standards.
 - 6. NEMA LD 3 - High-Pressure Decorative Laminates.
 - 7. NHLA - Manuals for Lumber and Veneers.
 - 8. WWPA - Western Lumber Grading Rules.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Product data for each item specified.
- C. Shop Drawings: Include large scale plans, sections, elevations, details, and following:
 - 1. Materials and finishes.
 - 2. Dimensions, tolerances, and clearances.
 - 3. Assembly methods, joint details, attachment details, furring, blocking and hanging strips, concealed blocking and reinforcement and adjacent construction.
 - 4. Items requiring cutouts, holes, and coordination, including utilities.
 - 5. Accessories, manufactured items, and hardware.
- D. Samples:
 - 1. High Pressure Laminate: 8 inch square sample for each color, applied to MDF core.
 - 2. Edgebanding: Color chain for color selection; 6 inch length in color selected.
- E. Certifications: Mill Test certificates as indicated below.
- F. Qualifications Data: For casework fabricator and solid surfacing installer

1.04 QUALITY ASSURANCE

- A. Fabricator/Installer Qualifications: Shall have a minimum 5 years of experience fabricating woodwork of the quality and type required for this project.

- B. Single Source Responsibility: Fabricate and install work of this Section by or under direction of one woodwork manufacturer/fabricator/installer.
- C. Conform to the requirements of the NAAWS Quality Standards indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver shop-fabricated items until painting, wet work, grinding, and operations that could damage, soil or deteriorate casework is completed in installation areas.
- B. Storage: Store in areas meeting requirements for installation areas.
- C. Protection: Protect from damage and dampness at all times. Cover finished surfaces with polyethylene film during handling and installation to protect against dirt and dust.

1.06 PROJECT SITE CONDITIONS

- A. Field Measurements: Field verify dimensions and indicate on Shop Drawings.
- B. Environmental Requirements: Before casework or countertops are placed in it, building shall be enclosed, thoroughly dry, finish work shall be completed, HVAC system shall be in operation maintaining ambient temperature intended for occupancy, and relative humidity shall be between 25 and 55 percent during the remainder of the construction period.
 - 1. Refer to NAAWS Section 2 for additional requirements

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Installer Warranty: Warrant all work against defective materials and/or workmanship for two (2) years following Project Substantial Completion date.

PART 2 - PRODUCTS**2.01 CASEWORK – GENERAL**

- A. General:
 - 1. Grading rules of referenced associations and standards apply to materials furnished under this Section.
 - 2. Moisture Content: MDF: 4 to 7 percent when delivered to building.
 - 3. Urea Formaldehyde Content in Manufactured Cellulose Based Products: No added urea formaldehyde (NAUF) allowed in glues, adhesives, binders, and other additives.
- B. Quality Standards: Comply with NAAWS "Premium" Grade for Transparent finish hardwood veneer-clad wood work, and Custom" Grade standards for plastic laminate-clad wood work.
 - 1. Casework: Section 10.
 - 2. Countertops: Section 11.
 - 3. Shelving: Conform to referenced NAAWS Section 10, and APA Plywood Design Manual/Shelving.

2.02 MATERIALS

- A. Hardwood:
 - 1. Species/Cut: Quarter-sawn Oak.
 - a. Grade: Grade AA at exposed surfaces; Grade A at semi-exposed surfaces.
 - 2. Solid hardwood, matching face veneer, flush with adjacent surfaces, edges eased.
- B. Plywood: APA and PS 1.

1. Veneer Core Plywood (hardwood): HPVA HP-1.
 - a. Veneer Thickness: Minimum 1/50 inch.
 2. Plywood for use under Plastic Laminate: Crossband no-void plywood for clean, uniform appearance at exposed plywood edge conditions.
 - a. Marine Grade Plywood (for use at sinks): APA B-B or better, Exposure 1.
 3. Exterior glue and fire-resistant plywood where required.
- C. Plastic-Laminates: NEMA LD 3, grades as indicated. Low glare with fine textured finish.
1. Acceptable Manufacturers:
 - a. Abet Laminati
 - b. Formica
 - c. Nevamar
 - d. WilsonArt.
 2. High-Pressure Decorative Laminate (HPDL):
 - a. HGS: General Purpose Horizontal Grade: 0.050 inch thick.
 - b. VGS: General Purpose Vertical Grade: 0.030 inch thick.
 - c. CLS - Cabinet Liner: 0.020 inch thick.
 - d. BKL - Cabinet Backer: 0.020 inch thick.
 3. Colors: Up to four colors as selected by Architect from full range of manufacturer's color options. See Drawings for locations.

2.03 ARCHITECTURAL CASEWORK

- A. Construction Type: Flush Overlay door and drawer front, unless otherwise indicated.
- B. Hardwood Veneer-Faced Casework:
1. Construction/Framework: Hardwood veneer core plywood.
 2. Exposed Plywood Surfaces: Hardwood veneer, Grade AA (Grade A at semi-exposed surfaces, and as allowed by NAAWS at concealed surfaces).
 3. Veneer Matching: Book match adjacent veneer components.
 4. Solid Wood: Solid hardwood matching face veneer.
- C. Plastic Laminate-Faced Casework:
1. Construction/Framework: Plywood construction.
 2. Exposed Exterior and Interior Surfaces: HGS plastic laminate, where indicated.
 3. Semi-Exposed Surfaces: VGS and CLS plastic laminate and as indicated.
 4. Concealed Surfaces: As allowed by NAAWS Grade indicated.
- D. Countertops: As indicated on Drawings. Comply with NAAWS Section 11.
1. Description: High-pressure decorative laminate (HDPL) sheet laminated to plywood substrate, with hardwood edge as detailed.
 2. Subtops:
 - a. Minimum 3/4 inch thick plywood, conforming to NAAWS Grade.
 - b. Moisture resistant at sink countertops and where subject to moisture.
- E. Hardware: Hinges, pulls, standards, drawer slides, and the like, as indicated and specified.

2.04 MISCELLANEOUS ACCESSORIES

- A. Framing: Framing, strapping and bracing specified in Section 06 10 00 – Rough Carpentry.

- B. Wood Furring, Blocking, Shims, and Hanging Strips: Softwood lumber, kiln dried to less than 15 percent moisture content. See Section 06 10 00 Rough Carpentry and Framing.
- C. Fasteners and Anchors: Material, type, size and finish as recommended by fabricator for each substrate for secure anchorage.
 - 1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
 - 2. Material: Non-corrosive. Use non-ferrous metal or hot-dipped galvanized anchors and inserts at inside face of exterior walls and at floors. Match finish of hardware item being fastened.
 - 3. Do not use case hardened drywall screws.
- D. Adhesives, Glues and Sealants: VOC compliant with limits indicated, water-resistant, NAAWS Type I or Type II adhesives applicable for intended use.
- E. Plastic Laminate Accessories:
 - 1. Adhesives: VOC compliant, and as instructed by manufacturer.
 - 2. Sink Mounting Hardware: Provide manufacturer's standard bowl clips, panel inserts and fasteners for attachment of sinks.
 - 3. Conductive Tape: Provide manufacturer's standard aluminum foil tape, in required thickness, for use with cutouts near heat sources.
- F. Miscellaneous auxiliary materials and accessories as required for complete installation.

2.05 FINISH HARDWARE

- A. General: NAAWS Grade 1.
 - 1. Include necessary devices required for complete installations whether specifically noted or not. Submit for review and acceptance any not indicated.
 - 2. Ship direct to millwork manufacturer for installation.
 - 3. Install at mill in accordance with requirements of this Section.
 - 4. Where not otherwise indicated, comply with BHMA A156 Series standards.
- B. Door and Drawer Pulls:
 - 1. Manufacturers: Sagutsune or Mockett.
 - 2. Material/Finish: Stainless steel, Satin finish.
- C. Frameless Concealed Hinges (European Type): Grade 2, tested to BHMA A156.9, with minimum 160-degree opening angle, soft-close, screw mount.
 - 1. Manufacturers:
 - a. Blum.
 - b. Häfele.
 - c. Or approved equal.
 - 2. Other Hinge Types: Review locations with Architect.
- D. Extension Drawer Slides: BHMA A156.9, rail mounted type, ball bearing rollers, with minimum load ratings indicated, soft close.
 - 1. Manufacturers:
 - a. Accuride.
 - b. Knappe & Vogt.
 - 2. Medium-Duty (standard drawers):

- a. Maximum 16 Inch Drawer Width: Lever disconnect side mounting, 90 pound load rating, 1 inch over travel extension slides.
 - b. Maximum 24 Inch Drawer Width: Rail disconnect side mounting, 100 pound load rating, 1 inch over travel extension slides.
- 3. Heavy-Duty (file drawers up to 24 inches wide):
 - a. Up to 24 inch Drawer Width: rail disconnect side mounting, 150 pound load rating, 1-1/2 inch over-travel extension slides.
 - b. Up to 42 Inch Drawer Width: rail disconnect side mounting, 200 pound load rating, 1-1/2 inch over-travel extension slides.
- E. Magnetic Catch: Match color of edge banding. Use star washers under screw heads to hold latch tight without distorting the plastic.
 - 1. Manufacturers/Products:
 - a. Stanley "CD41" and "CD42" to suit conditions.
 - b. Or approved equal.
- F. Shelf Clips: Stainless steel clip to lock shelf in place, suitable for 3/4 inch and 1-inch thick shelves, 300 pound load capacity.
- G. Adjustable Shelf Standards and Supports: Wall-mounted or flush-mounted in cabinet.
 - 1. Manufacturers/Products:
 - a. Knap&Vogt "No. 255 with No. 256" support,.
 - b. Or approved equal.
- H. Cabinet Locks: Where indicated on Drawings.
 - 1. Type: Slide bolt, re-keyable 5 pin tumbler locks, 2 keys each.
 - 2. Keying: Locks master keyed alike, coordinate with Owner's keying system.
- I. Silencer/Bumpers: 3/8 inch diameter clear plastic, self-adhesive.
- J. Wire Access Grommet: 2 1/2 inch diameter molded plastic with slotted "Flip-Top" caps designed to accommodate plugs up to 2-1/8 inches.
- K. Manufacturers/Products: Doug Mockett & Company, Inc. "EPD Flip-Top", or accepted.
 - 1. Colors: As selected from manufacturer's options to color-match counter.
- L. Phone Charging Station: UL-listed Power Strips with USB ports.
- M. Hardware Finishes:
 - 1. Exposed Hardware: As indicated; if not indicated, as selected by Architect.
 - 2. Concealed Hardware: Provide manufacturer's standard finish which complies with the product class requirements of ANSI/BHMA A156.9.

2.06 FABRICATION

- A. General: Fabricate straight and curved casework complying with NAAWS Quality for Quality Grade indicated.
 - 1. Shop assemble and finish material at the mill under dry, heated conditions ready for delivery to site in units easily handled and to permit passage through building openings. Disassemble components only as necessary for shipment and installation.
 - 2. CNC machine parts for precision fit. Where fitting at the site required, provide allowance for scribing, trimming, and fitting.
 - 3. Construct casework to true dimensions, square, level and plumb.

4. Construct items to sustain service loads.
 5. Reinforce casework and tops as needed for cantilevered tops, heavy materials, thin profiles and other unusual loading conditions.
 6. Shop-cut openings to maximum extent possible, to receive hardware, appliances, electrical work, and similar items, in accordance with Drawings. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. No joint shall occur within 24 inches of a sink cutout.
 - a. Rout and finish component edges with clean, sharp returns. Rout cutouts, radii and contours to template. Smooth edges.
 7. Build in detail work furnished under other specified Sections and as indicated.
- B. Hardwood Veneer-Faced Casework:
1. Construction Joints: As allowed by NAAWS for "Premium" Grade Quality work.
 2. Core: 3/4 inch thick plywood panels.
 3. Door Hardware:
 - a. Pulls: One pull per door, mount as indicated on Drawings.
 - b. Hinges: Two hinges per door; three hinges on doors 36 inch high and over.
 4. Drawers:
 - a. Construction: Assemble drawer joints true and square with doveled, lock-shoulder, or rabbeted joints.
 - b. Drawer Slides: Mount with positive in and out stops for permanent alignment.
 - c. Pull: One pull for each drawer, mounted as indicated on Drawings.
 5. Adjustable Shelving: Hardwood veneer-faced plywood with solid hardwood edge. Cover surfaces of core with plastic laminate where indicated.
 6. Base and Toe Kicks: See Drawings for height and depth of toe kick. Use moisture-resistant plywood at front and open ends of base cabinets.
 7. End Panels and Other Conditions: As detailed.
- C. Plastic Laminates:
1. Cutting and Fitting: As recommended by laminate manufacturer.
 2. Apply plastic laminate in full uninterrupted sheets; fit corners and joints to hairline; apply laminate backing to reverse side of laminate-faced surfaces.
 3. Ensure that core and laminate profiles coincide to provide continuous support and bond over entire surface.
 4. Cap exposed edges with plastic laminate of same pattern, color and finish.
 5. Applied plastic or metal edging not permitted.
- D. Countertops:
1. HDPL Countertops: HPDL sheet laminated to plywood with adhesive specified or recommended by linoleum manufacturer. Fabrication requires balancing laminated sheet with same material on opposite surface, or use of a backing paper more than 230 grams per square meter, or backing with HPL 0.8 mm thick.
 - a. Edges: Solid Hard Maple hardwood edging of dimensions indicated on Drawings.
 - b. Splashes: As detailed.
 2. Subtop: Minimum 3/4 inch thick and conforming to NAAWS Grade.
 - a. Marine grade or moisture resistant plywood at sink countertops and where subject to moisture.

3. Countertops with Sinks: No joint shall occur in linoleum within 24 inches of sink cutout.
4. Countertop Support: Fabricate and coordinate work with plywood substrate, plate steel, and other brackets and support as indicated, for a complete installation.

2.07 FINISHES

- A. Shop-Finishing Wood Veneer-Clad Casework and Built-In Wood Work:
 1. Sand work smooth and set exposed nails and screws.
 2. NAAWS System 5, Conversion Varnish, matching sample approved by Architect, and meeting Quality Standard specified.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Verify lines, levels, and dimensions before proceeding with work of this section.
- B. Verify installation conditions as satisfactory to receive work of this Section.
 1. Verify adequacy of backing and support framing in place for support of wall mounted and wall supported casework and millwork of this Section.
 2. Verify that services and outlets are installed in proper locations.
 3. Verify other building items and systems affecting work of this Section are in place and ready to receive this work.
- C. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 PREPARATION

- A. Comply with environmental requirements per paragraph 1.06. Allow materials to acclimate to temperature and humidity conditions as recommended by NAAWS for minimum of 48 hours prior to installation. Maintain same conditions during and after installation.
- B. Before installing casework, examine shop-fabricated work for completion and complete work as required, including removal of packing.
- C. Protect finishes and surrounding work from installation of custom casework.

3.03 INSTALLATION

- A. Install Work of this Section in accordance with NAAWS requirements for "Premium" and "Custom" Grade as indicated, and for "First Class" installation.
 1. Install work level, plumb, true, straight and aligned. Install work without distortion so doors and drawers fit openings properly and are accurately aligned.
 2. Shim as required, with concealed shims.
 3. Installation Tolerances: Maximum 1/16 inch at any position, and maximum 1/8 inch in any 10 foot length. Offset with Abutting Materials: Maximum 1/32 inch.
- B. Scribe and fit casework to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts. Close exposed joints, spaces, and openings to make tight hairline joints against adjacent construction to prevent papers and other materials from falling behind cabinets. Scribes and fillers shall be of same material and finish as casework.
- C. Secure work to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.
 1. Attach securely in place providing for thermal and building movements.

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ARCHITECTURAL WOOD CASEWORK
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2. Install wall-hung cabinets with sufficient fasteners and devices as needed to support weight of loaded cabinets and comply with seismic requirements.
 3. Fasten adjoining cabinet with sufficient fasteners to meet tightly at top, middle, and bottom side panels. Place fasteners inconspicuously inside cabinets.
- D. Provide toe space indicated. Install base and other trim with minimum number of joints.
- E. Countertop Installation: Refer to Division 12 sections for countertops.
1. Install splashes and aprons as indicated on Drawings.
 2. Caulk space between backsplash, sidesplash, or apron and wall with clear sealant specified in Section 07 92 00, Joint Sealants.
- F. Door and Drawer Hardware: Mount hardware using manufacturer's templates. Hardware shall be aligned, plumb, square and true between adjacent doors and drawers, and evenly spaced. Clean, lubricate and adjust hardware to act smoothly without binding.
- G. Coordinate with requirements for plumbing, data, wire management, and as indicated

3.04 CLEANING AND PROTECTION

- A. Protection During Installation: Keep faces and surfaces clean. Immediately remove particles resulting from cutting and other foreign matter.
- B. Leave work free from defects and ready for use. Touch up finishing work. Repair damaged and defective work where possible to eliminate defects functionally and visually; where not possible to repair, replace work.
- C. After installation, clean casework on exposed and semi-exposed surfaces.
- D. Upon completion of application, adjusting and cleaning, apply protective covering to faces where other trades will be working adjacent to installation.
1. Remove temporary strippable coatings after other work is completed.

END OF SECTION 06 41 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Simulated wood trim profiles as detailed in the drawings, including:
 - a. Exterior door trim and window surrounds.
 - b. Corner boards and miscellaneous trim at fiber-cement siding.
 - c. Crown moldings at porch soffit.
 - 2. PVC beadboard plank soffits.
 - 3. One-piece PVC column wraps.
 - 4. PVC planking at manufactured trash enclosure.
 - 5. Structural plastic lumber framing.
 - 6. Concealed fastening.
 - 7. Special finishing of PVC trim members.
- B. Related work in other sections:
 - 1. Section 06 10 00 – Rough Carpentry.
 - 2. Section 06 73 00 – Composite Decking.
 - 3. Section 07 46 46 – Fiber Cement Siding.
 - 4. Section 07 62 00 – Sheet Metal Flashing and Trim.
 - 5. Section 08 16 13 – Fiberglass Doors.
 - 6. Section 08 41 13 – Aluminum Framed Entrances.
 - 7. Section 08 52 13 – Aluminum Clad Wood Windows.
 - 8. Section 08 91 00 – Louvers.
 - 9. Section 09 96 00 – High Performance Coatings.
 - 10. Section 32 31 32 – Composite Fences.
 - 11. Section 32 35 00 – Site Screening Devices.

1.02 REFERENCES

- A. ASTM D792 - Density and Specific Gravity of Plastics by Displacement.
- B. ASTM D570 - Water Absorption of Plastics.
- C. ASTM D638 - Tensile Properties of Plastics.
- D. ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastic Materials.
- E. ASTM D1761 - Mechanical Fasteners in Wood.
- F. ASTM D5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by means of a Striker Impacted by a Falling Weight.
- G. ASTM D256 - Determining the Pendulum Impact Resistance of Plastics.
- H. ASTM D696 - Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer.
- I. ASTM D635 - Rate of Burning and/or Extent/Time of Burning of Plastics in Horizontal Position.
- J. ASTM E84 - Surface Burning Characteristics of Building Materials.
- K. ASTM D648 - Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
- L. ASTM D3679 - Standard Specification for Rigid Poly Vinyl Chloride (PVC) Siding.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions and methods.
 - 4. Code compliance reports.
- C. Samples: For each product specified, two samples, minimum size 6 inches long, representing actual product, color, finish.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with a minimum of 15 years producing PVC trim products.
- B. Installer Qualifications: Installer with a minimum of 3 years experience with the installation of PVC trim products.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designed by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by architect.
 - 3. Refinish mock-up area as required to produce acceptable work.
 - 4. Accepted mock-ups shall be comparison standard for remaining work.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Trim materials should be stored on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners.
- B. Cover materials to prevent dirt and residue from collecting on the boards.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer's Limited Lifetime warranty against defects in manufacturing that cause the products to rot, corrode, delaminate, or excessively swell from moisture.
- C. Contractors Warranty: Provide 1 year warranty on the workmanship of the installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering materials that may be incorporated into the work include:
 - 1. AZEK Exteriors, www.azekexteriors.com.
 - 2. TimberTech, www.timbertech.com.
 - 3. Wolf Home Products, www.wolfhomeproducts.com.
 - 4. Or approved equal in accordance with Section 01 25 00 – Substitution Procedures.

2.02 PVC MATERIALS

- A. Material: free foam cellular PVC material with small cell microstructure and an average density of .60 grams/cm³.
 - 1. Provide materials made from free foam cellular PVC that is homogeneous and free of excessive voids, holes, cracks, foreign inclusions and other defects. The edges must be square and top and bottom surfaces shall be flat with no convex or concave deviation.
 - 2. Materials shall have a uniform surface free from cupping, warping and twisting.
- B. Performance and Physical Characteristics: Materials shall have the following minimum physical and performance properties:
 - 1. Density: 0.60 g/cm³, ASTM D 792
 - 2. Water Absorption, 24 hrs: <0.3%, ASTM D 570
 - 3. Water Resistance: No Penetration (Pass ICC AC227), ASTM D 570 & AATCC 127
 - 4. Surface Burning:
 - a. Flame Spread Index: 25, ASTM E 84
 - b. Burning Rate: No burn when flame removed, ASTM D 635
 - 5. Gardener Impact Resistance: 629 in-lbf, ASTM D 5420 (3/4" thick trim)
 - 6. Coefficient of Linear Thermal Expansion: 3.5 x 10⁻⁵ inch /inch /degree F, ASTM D 696
 - 7. Strength:
 - a. MOR (Flexural Strength): 3,600.0 psi, ASTM D 790
 - b. MOR (Flexural Modulus): 144,000.0 psi, ASTM D 790
 - 8. Weathering
 - a. MOR Change: +2.4%, (Pass ICC AC 227),. ASTM G 155 & D 790
 - b. MOE Change: +0.7%
 - 9. Freeze-Thaw
 - a. MOR Change: +0.1% (Pass ICC AC 227), ASTM D 6662 & D 790
 - b. MOE Change: +0.9%
 - 10. Termite Resistance: 9.2 (Pass ICC AC 227), ASTM D 3345
 - 11. Mechanical Fastener, Allowable Load: 151 lbf (8d nail and 1" thick trim), ASTM D 1761
 - 12. Negative Transverse Wind Load: 72 psf, ASTM E 330.
 - 13. Heat Deflection Temperature: 146 °F @ 264 psi, ASTM D 648
 - 14. Corrosion by Preservative Treated Wood: No Wt. Loss (Pass ICC AC227), AWAP E 12
 - 15. Izod Impact, Notched: 0.37 ft-lb/in, ASTM D 648
 - 16. Heat Conductivity: 0.50 btu-in/hr-ft²-°F, ASTM C 177
- C. Allowable Tolerances:
 - 1. Variation in component length: - 0.00 / + 7/8"
 - 2. Variation in component Width: - 0 / + 1/16"
 - 3. Variation in component thickness: ± 5%
 - 4. Variation in component edge: ± 2°
 - 5. Density range: .58-.62
 - 6. Shore-D hardness: 45
- D. PVC materials and trim shall not require painting for protection.

2.03 SIMULATED WOOD TRIM

- A. PVC Trim: Simulated PVC trim, profile as indicated on the drawings.

1. Basis of Design: AZEK Trimboards.
 2. Or approved equal.
- B. Trim Profiles:
1. Nominal Width: As indicated in the Drawings.
 2. Nominal Thickness: 4/4 and 5/4 as indicated in the Drawings.
 3. Finish: Factory prefinished.
 - a. Traditional "Smooth" Finish.
 - b. Color: To be selected by Architect from manufacturer's standard color offering.
 4. Profile rabbeted and slotted profiles per drawings.

2.04 BEADBOARD PLANK SOFFIT

- A. PVC Beadboard Soffit: Tongue and groove beaded planks with textured woodgrain finish.
1. Basis of Design: AZEK Alpine Collection.
 2. Profile: Beadboard 1/2" x 6"
 3. Finish: Harbor Ash, confirm with Architect during submittal phase.

2.05 ACCESSORIES

- A. Fasteners:
1. Concealed: Cortex for Trim
 2. Use fasteners design for wood trim and wood siding (thinner shank, blunt point, full round head).
 3. Use a highly durable fastener such as stainless steel or hot-dipped galvanized.
 4. Staples, small brads and wire nails must not be used as fastening members.
 5. The fasteners should be long enough to penetrate the solid wood substrate a minimum of 1-1/2".
 6. Use 2 fasteners per every framing member for trimboard applications. Trimboards 12" or wider, as well as sheets, will require additional fasteners.
 7. Fasteners must be installed no more than 2" from the end of each board.
 8. Pre-drilling is typically not required unless a large fastener is used or product is installed in low temperatures.
 9. 3/8" and 1/2" sheet product is not intended to be ripped into trim pieces. These profiles must be glued to a substrate and mechanically fastened.
- B. Adhesives:
1. Glue all PVC to PVC joints such as window surrounds, long fascia runs, etc. with AZEK® Adhesive, a cellular pvc cement, to prevent joint separation.
 2. The glue joint should be secured with a fastener and/or fastened on each side of the joint to allow adequate bonding time.
 3. AZEK® Adhesive has a working time of 10 minutes and will be fully cured in 24 hours.
 4. If standard pvc cements are used, keep in mind these products typically cure quickly which will result in limited working time and may reduce adhesive strength.
 5. Surfaces to be glued should be smooth, clean and in complete contact with each other.
 6. To bond AZEK® to other substrates, various adhesives may be used. Consult adhesive manufacturer to determine suitability.

PART 3 - EXECUTION

3.01 PREPARATION

- A. General Requirements and Precautions:
 - 1. PVC trim will expand and contract with changes in temperature.
 - 2. Allow 1/8" space for every 18 feet of trim for expansion and contraction.
 - 3. Glue joints between pieces to eliminate joint separation.
 - 4. Properly fasten PVC trim along entire length to minimize expansion and contraction.
 - 5. Sheet Products: 3/8" and 1/2" sheet product is not intended to be ripped into trim pieces. These profiles shall be glued to a substrate and mechanically fastened.
 - 6. When gaps are glued on a long run of the board, allow suitable expansion and contraction space at ends of the run.
 - 7. Scarf joints to minimize seams and allow expansion and contraction.
 - 8. Construction adhesive is recommended to reduce expansion and contraction between trim and substrate.
- B. Spans:
 - 1. 1/2" Beadboard: Supports 12" OC maximum. Mechanically fasten and adhere to joist with high quality construction grade polyurethane adhesive.
 - 2. 1/2" Beadboard spanning greater than 12" OC: Use a minimum 1/2" backer of plywood or OSB with construction grade adhesive and mechanical fastening a minimum of every 8" OC. Fasten to each joist or framing member.
 - 3. Other Locations: PVC trim spans shall not exceed 24 inches.
 - 4. PVC trim shall not to be used in load bearing applications.

3.02 INSTALLATION

- A. Manufacturer instructions:
 - 1. Comply with manufacturer's product catalog installation instructions and product technical bulletin instructions.
- B. Cutting: Products can be cut using the same tools used to cut lumber.
- C. Carbide tipped blades designed to cut wood work well. Avoid fine tooth metal cutting blades.
 - 1. Rough edges from cutting may be caused by excessive friction, poor board support, or worn or improper tooling.
- D. Drill PVC products similar to hardwood. Care should be taken to avoid frictional heat build-up.
 - 1. Use standard woodworking drills. Do not use drills made for normal rigid pvc.
 - 2. Periodic removal of shavings from the drill hole may be necessary.
- E. Milling:
 - 1. PVC products can be milled using standard milling machines used to mill lumber.
 - 2. Relief Angle 20° to 30°
 - 3. Cutting speed to be optimized with the number of knives and feed rate.
- F. Routing:
 - 1. PVC products can be routed using standard router bits and the same tools used to rout lumber.
 - 2. Carbide tipped router bits are recommended.
- G. Edge Finishing:

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PLASTIC SIMULATED WOOD TRIM
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1. Edges can be finished by sanding, grinding or filing with traditional woodworking tools.
- H. Nail Location:
1. Use 2 fasteners per every framing member for trimboard applications.
 2. Trimboards over 12" or wider, as well as sheets, will require additional fasteners.
 3. Fasteners must be installed no more than 2" from the end of each board.
- I. Thermal Expansion and Contraction:
1. PVC products expand and contract with changes in temperature.
 2. Properly fastening PVC material along its entire length will minimize expansion and contraction.
 3. When properly fastened, allow 1/8" per 18 foot of PVC product for expansion and contraction.
 4. Joints between pieces of PVC should be glued to eliminate joint separation. When gaps are glued on a long run of PVC, allow expansion and contraction at ends of the run.

END OF SECTION 06 65 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Exterior rigid board continuous insulation.
 - 2. Exterior mineral-wool insulation.
 - 3. Fiberglass thermal batt insulation in stud cavity at exterior walls.
 - 4. Acoustical insulation at interior partition walls.
- B. Related work in other sections:
 - 1. Section 02 41 00 – Demolition.
 - 2. Section 06 10 00 – Rough Carpentry.
 - 3. Section 07 25 00 – Weather Barriers.
 - 4. Section 07 26 00 – Vapor Retarders
 - 5. Section 07 46 46 - Fiber Cement Siding.

1.02 REFERENCES

- A. Reference Standards: Applicable provisions of the most recent adopted editions of the following standards shall apply to the work of this Section:
- B. ASTM - Standards indicated herein.
- C. UL - Underwriters Laboratories, Inc.
- D. IBC - International Building Code
- E. WSEC - Washington State Energy Code

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's literature including product characteristics, performance criteria, limitations and thermal resistance information.
- C. Manufacturer's installation instructions. Show proposed methods of supporting insulation, and methods for sealing vapor retarders at each type of penetration.
- D. Certificates - Insulation: Indicate conformance with Specifications.

1.04 QUALITY ASSURANCE

- A. Leave product identification visible on insulation exposed at completion.
- B. Obtain insulation materials from a single manufacturer to the greatest extent possible.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in original labeled packages. State manufacturer, material, R-value, thickness, density and other pertinent information.
- B. Store in clean, dry place. Remove protective cover packaging from insulation board to allow ventilation. Cover to protect from as necessary moisture and damage.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 - PRODUCTS

2.01 THERMAL INSULATION - GENERAL

- A. Performance:
 - 1. Comply with requirements of State of Washington Non-Residential Energy Code (WSEC). Meet or exceed R-Values indicated on Drawings.
 - 2. Fire-Resistive Assemblies: Classified by UL or other independent testing agency, approved by Authorities Having Jurisdiction (AHJ).
 - 3. Performance/Design Criteria: Provide thickness and R-Values indicated on Drawings.
- B. General:
 - 1. Provide preformed units, sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
 - 2. Widths and lengths as required for conditions indicated.
 - 3. Rigid insulation shall be HCFC-free.
- C. Product Substitutions: Subject to compliance with requirements, products from manufacturers listed accepted for review. For manufacturers not listed, submit substitution requests in accordance with Division 01.

2.02 EXTERIOR RIGID BOARD INSULATION

- A. Acceptable Manufacturers:
 - 1. Rmax, A Business Unit of Sika Corporation.
 - 2. Johns Manville.
 - 3. Owens Corning.
 - 4. Or approved equal.
- B. Aluminum Faced, Polyisocyanurate Foam Insulating Sheathing: ASTM C1289, Type I, Class 1 and Class 2, rigid, cellular, polyisocyanurate thermal insulation, bonded to reinforced aluminum facers on both sides.
 - 1. Basis of Design: Rmax, Thermasheath.
 - 2. Flame Spread Index and Smoke Contribution Index per ASTM E84:
 - a. Flame: 25 or less at thickness of 1 inch (25 mm) or greater; and 75 or less at thickness of less than 1 inch (25 mm).
 - b. Smoke: 450 or less.
 - 3. Water Vapor Permeability per ASTM E96 desiccant method: 0.1 perm or less.
 - 4. Air Permeability per ASTM E2178: 0.004 cfm per sq ft (1.2192 L per min per sq m) or less.
 - 5. Compressive Strength per ASTM D1621: 20 psi (138 kPa).
 - 6. Compressive Strength per ASTM D1621: 25 psi (172 kPa).
 - 7. Aged R-Value per ASTM C518: R-6.0 minimum at thickness of 1 inch (25 mm).
 - 8. Required Insulation Thickness and R-Value: As indicated on the Drawings.
 - 9. Location: Exterior continuous insulation behind fiber-cement siding assemblies.
 - 10. Exterior Usage in NFPA 285 Wall Assemblies:
 - a. Acceptable for inclusion in NFPA 285 exterior wall assemblies that include exterior gypsum sheathing.

2.03 EXTERIOR MINERAL-WOOL INSULATION

- A. Acceptable Manufacturers:

1. Rockwool (Roxul).
 2. Johns Manville.
 3. Owens Corning.
 4. Or approved equal.
- B. Rigid Mineral Wool Insulation Board: ASTM C612, Type IVB, rock/stone/mineral wool rigid board insulation, non-hygroscopic and non-corrosive to steel; CFC- and HCFC-free, for use as exterior continuous insulation.
1. Thickness: As required to achieve minimum R-Values indicated.
 2. Thermal Resistance: R-Value (per inch) 4.0, tested per ASTM C518 at 75 deg F.
 3. Location: Exterior porch soffit and floor joist cavity above existing crawlspace.
- C. Water Vapor Transmission: 27 perm, tested per ASTM E96 Dessicant Method.
- D. Fire Performance: Non-combustible per ASTM E136; with maximum flame spread 0 and maximum smoke developed 0, tested per ASTM E84/UL 723.

2.04 FIBERGLASS BAT INSULATION

- A. Acceptable Manufacturers:
1. CertainTeed.
 2. Knauf.
 3. Johns Manville.
 4. Owens Corning.
 5. Or approved equal.
- B. Fiberglass Batt Insulation: ASTM C665, Type I, flexible glass-fiber, high-density, unfaced batt insulation.
1. Thickness as indicated on Drawings, but not less than required by State Energy Code. Widths and lengths as required for conditions indicated.
 2. Physical Properties:
 - a. Surface Burning Characteristics: Complying with ASTM E84.
 - b. Flame-Spread: 25 maximum; Smoke-Developed: 50 maximum.
 - c. Combustion Characteristics: Non-combustible tested per ASTM E136.
 3. Location: Stud cavity of exterior walls where existing plaster is removed.
- C. Acoustical Insulation: ASTM C665, Type I (without membrane facing), Commercial, flexible glass-fiber batt insulation, ASTM E136, lightweight. Unfaced.
1. Thickness: Full stud thickness, and as indicated on Drawings.
 2. Widths and Lengths: As required for conditions indicated.
 3. Physical Properties:
 - a. Surface Burning Characteristics: Complying with ASTM E84.
 - b. Flame Spread: 25, maximum; Smoke Developed: 50, maximum.
 - c. Acoustical Coefficients: Tested per ASTM C423, ASTM E795, Type A mounting.
 - d. NRC: Minimum 1.00 tested per ASTM C423 (3.0 pcf at 2 inch thick).
 - e. STC: Minimum 0.65 at 250 Hz; 1.13 at 1000 Hz; and 1.03 at 4000 Hz

2.05 ACCESSORY MATERIALS

- A. Adhesive: As recommended by insulation and adhesive manufacturer suitable to conditions.

- B. Mechanical Anchors (insulation retainers for wall cavities): As recommended by the insulation manufacturer for the type of application and substrate indicated; to be of type, size and design necessary to hold the insulation adequately and to provide a neat appearance.
 - 1. Metallic retaining members shall be non-ferrous or have a non-ferrous coating.
 - 2. At Partition Heights Over 8 Feet: AGM Industries, Inc., "Series TSA TACTOO Self- Adhering Insul-Hangers" impaling pins with self-locking washers, or accepted.
 - 3. Where vent space is required above insulation, provide retainer with sufficient depth to provide required clear space.
 - 4. If required, provide special fasteners so waterproof membrane is not broken.
- C. Head of Wall Insulation: Non-combustible, compression-fitted mineral fiber insulation; ASTM C612, HH-I-558B, Type IA, IB, II, ThermaFiber "TopStop", or accepted.
- D. Provide miscellaneous and accessory materials, methods, tools, and equipment required.
- E. Vapor Retarders: As specified in Section 07 2600, Vapor Retarders

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 PREPARATION

- A. Substrate Preparation - General: Comply with insulation manufacturer's instructions.
 - 1. Remove protrusions flush with adjacent surface.
 - 2. Remove dirt, dust, oil, grease, and other materials that could impair adhesion.

3.03 INSTALLATION

- A. Installation Requirements - General:
 - 1. Comply with insulation manufacturer's written instructions applicable to products indicated.
 - 2. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
 - 3. Install insulation in areas and in thicknesses indicated or required to produce R-values indicated. Butt edges and ends tightly.
 - 4. Secure insulation in place by friction fit, adhesives, mechanical fasteners, or other means suitable to conditions and acceptable to insulation manufacturer.
 - 5. Do not fasten through or penetrate vapor retarder membranes.
 - 6. Extend insulation to continuously envelop entire area to be insulated, and maintain continuity of insulation envelope. Cut and fit tightly around obstructions. Install in miscellaneous voids and cavity spaces to prevent gaps in the thermal envelope.
 - 7. Ceilings: Maintain required clearance, and not less than 3 inches, around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 8. Do not conceal insulation work prior to required inspections.
- B. Stud Cavity Insulation Installation:

1. Provide insulation to provide or maintain continuity of insulation envelope. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required, provide lengths that will produce a snug fit between ends.
 - a. Install insulation in spaces between framing members at walls and as indicated.
 - b. Install carefully and continuously around door frames, other openings and voids.
 - c. Wrap electrical outlets, switches, and the like. Maintain required clearances and protect from contact with insulation.
 - d. Stuff carefully into small spaces, leaving no uninsulated spaces.
 2. Plumbing in Thermally Insulated Walls: Where plumbing occurs within thermally insulated assemblies, locate piping as close as possible to the interior, heated side of the wall cavity, fully insulate space between plumbing and exterior side of the cavity with rigid insulation (as thick as possible but not less than 2 inches). DO NOT insulate between plumbing and interior side of the cavity.
 3. Secure by methods recommended by manufacturers.
 - a. For walls with cavity heights exceeding 96 inches, support unfaced batt insulation mechanically.
 4. Seal joints; seal each continuous area of insulation to ensure airtight installation.
 - a. Where faced insulation occurs, tape joints and tears in insulation facings.
- C. Continuous Insulation (exterior wall assemblies):
1. Coordinate continuous insulation installation with furring and cladding indicated for wall assembly.
 2. Install rigid insulation board in thickness to achieve R-Values indicated on Drawings.
 3. Cut and tightly fit rigid insulation to penetrations, projections, and other construction.
 4. Anchor as recommended by insulation manufacturer; coordinate with wall cladding.
- D. Other Voids and Other Insulation Condition: As detailed. Review conditions with Architect

3.04 ADJUSTING AND CLEANING

- A. Repair and replace installations that do not make continuous thermal enclosure. Tape and seal joints and other locations as required to provide closure and prevent thermal wicking.
- B. Leave installation clean and free from debris and residue from work of this Section.

END OF SECTION 07 21 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Self-adhering weather barrier sheet installed behind fiber-cement siding assemblies.
 - 2. Fluid applied liquid membrane flashing at rough openings and penetrations.
 - 3. Pre-manufactured target flashing panels for electrical and mechanical penetrations.
- B. Related work in other sections:
 - 1. Section 02 41 00 – Demolition.
 - 2. Section 06 10 00 – Rough Carpentry.
 - 3. Section 06 65 00 – Plastic Simulated Wood Trim.
 - 4. Section 07 21 00 – Thermal Insulation.
 - 5. Section 07 46 46 – Fiber Cement Siding.
 - 6. Section 07 62 00 – Sheet Metal Flashing and Trim.
 - 7. Section 07 92 00 – Joint Sealants.
 - 8. Section 08 16 13 – Fiberglass Doors.
 - 9. Section 08 41 13 – Aluminum Framed Entrances.
 - 10. Section 08 52 13 – Aluminum Clad Wood Windows.
 - 11. Section 08 91 00 – Louvers.
 - 12. Section 23 81 26 – Split System Air Conditioners.
 - 13. Section 26 50 00 – Lighting.
 - 14. Section 27 05 00 – Common Work Results for Communications.

1.02 DEFINITIONS

- A. This section includes the following items identified in the drawings as:
 - 1. WRB - Sheet weather resistive barrier used in rainscreen siding assemblies.
 - 2. LAF – Liquid applied STPE flashing membrane.
 - 3. FFSAM - Foil-faced self-adhered membrane.
 - 4. HTSAM - High-temperature, self-adhered membrane flashing.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Manufacturer's installation instructions and substrate preparation.
- D. Shop Drawings: Provide Installation Guideline illustrations applicable to Project.
- E. Certifications:
 - 1. Manufacturer's certification that all components are being supplied and warranted by a single source manufacturer.
 - 2. Letter from manufacturer that Installer is an authorized applicator of the specified product.
- F. Qualifications Data: For manufacturer and installer.
- G. Warranty: Sample copy of warranties

1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Shall have a minimum of 10 years of experience manufacturing fluid-applied AWRB products of type and quality specified, and the following:
 - 1. Manufacturer shall have available an in-house technical staff to assist as necessary, in application of the products.
 - 2. For manufacturer's field service requirements, see Part 3.
- B. Installer Qualifications: Shall be trained or certified by barrier system manufacturer.
- C. Single Source Responsibility: Obtain system components and accessories from a single- source to ensure total system compatibility and integrity.
- D. Pre-Construction Testing: Submit test results before beginning work.
 - 1. Test mock-ups for WRB adhesion to existing substrate.
 - 2. Compatibility of Sealants: Verify compatibility between all sealants and weather barrier components prior to installation.
- E. Mock-Ups/Field Samples: Conduct an in-place mockup for all WRB components to demonstrate a standard of workmanship. Location directed by Architect. See Section 01 4000 for mock-up Requirements.
 - 1. Minimum 20 sf to include WRB treatment at opening, penetrations, and transitions.
 - 2. Perform water spray test of mockup to demonstrate performance.
 - 3. Acceptable mock-ups may remain in place as part of the finished work.
 - 4. Rework all mock-ups until acceptable to the Architect and Owner.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in undamaged and original sealed containers and packaging indicating the name of the manufacturer, product and instructions for use.
- B. Store and handle materials and components as recommended by manufacturer. Store materials in a clean, dry area protected from water and direct sunlight, at temperature between 40 and 80 deg F.
- C. Protect materials from freezing temperatures and heat in excess of 100 deg F.

1.06 SITE CONDITIONS

- A. Environmental Limitations: Apply weather barrier materials within range of ambient and substrate temperatures recommended by weather barrier manufacturer.
- B. Protect substrates from environmental conditions that affect material performance.
- C. Contractor shall provide all necessary means of temporary weather protection during installation of weather barriers.
- D. Do not apply weather barrier materials onto damp or wet substrates, or during snow, rain, fog, or other adverse weather events.
- E. Do not install self-adhered membranes when ambient temperatures are at or below 41° F for 24 hours before application. Minimum temperature for installation of primer is 41° F.
- F. If water penetrates the membrane due to inadequate production, contractor shall cut membranes to inspect damage and replace all damaged material to eliminate all traces of water within the assembly.
- G. Do not allow membranes to remain exposed longer than 3 weeks.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Specified Product Warranty: Manufacturer's 10-year Labor and Material Warranty that installed WRB systems shall perform as air and water-resistive barrier, not disintegrate, retain their integrity, and remain free from defects in materials, and agreeing to replace defective materials and components that fail.
 - 1. Failures include loss of watertight seal, loss of cohesion, and failure to cure properly. Assemblies shall be installed by manufacturer-trained applicators, and the manufacturer's technical field representative shall monitor the application.
- C. Installer Warranty: Original statement on Installer's letterhead in which Installer agrees to repair or replace joint sealants that demonstrate deterioration or failure within warranty period specified.
 - 1. Warranty Period: One (1) year from date of Substantial Completion

PART 2 - PRODUCTS

2.01 PERFORMANCE

- A. Regulatory Requirements:
 - 1. Comply with IBC.
 - 2. Comply with Washington State Commercial Energy Code, including Thermal Certification.
 - 3. Comply with federal, state and local regulations controlling use of VOCs.
- B. Performance - General:
 - 1. Surface Burning Characteristics: Class A, tested per ASTM E84.
 - 2. Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies: PASS, tested per NFPA 285.
- C. Performance Requirements:
 - 1. Provide a continuous air and water-resistive barrier system to control water and air leakage into and out of conditioned space that meets or exceeds ASTM E2357 and ASTM E2178. Ensure air barrier continuity as indicated.
 - a. Make joints, penetrations and paths of water infiltration watertight.
 - 2. System shall be capable of withstanding positive and negative combined wind, stack and HVAC pressures on the envelope without damage or displacement.
 - 3. System shall be installed in an airtight and flexible manner, allowing for the relative movement of systems due to thermal and moisture variations.
 - 4. Verify WRB compatibility with all sealants, flashings, and substrates, prior to installation.

2.02 WEATHER RESISTIVE BARRIER (WRB)

- A. Self-adhered, vapor permeable weather and air-barrier sheet installed at new siding assemblies.
 - 1. Acceptable Manufacturer/Product:
 - a. Henry Company - "Blueskin VP160"
 - b. Grace Construction Products - "Perm-A-Barrier VPS"
 - c. VaproShield - "WrapShield SA Self-Adhered"
 - d. Or approved equal.
- B. Primers: Provide manufacturer's low-VOC primer as necessary for full adhesion.

2.03 FLUID-APPLIED LIQUID MEMBRANE FLASHING

- A. Single-component, Silyl-Terminated-Polymer (STPE) fluid-applied membrane noted in the drawings as Liquid Flashing Membrane, and Liquid Flashing Edge Treatment.
 - 1. Acceptable Manufacturer/Product:
 - 2. Prosoco, Inc. – “FastFlash” Liquid Flashing Membrane.
 - 3. Prosoco, Inc. – “Joint & Seam Filler” Seam Treatment.
 - 4. Vaproshield – “Vapro Liqui-Flash”.
 - 5. Or approved equal.

2.04 ACCESSORIES

- A. Flashing panels used to weatherproof electrical and plumbing panels in exterior walls.
 - 1. Acceptable Manufacturer/Product:
 - a. Quickflash Weatherproofing Products, Inc. – “Quickflash” Flashing Panels
 - b. Provide electrical and plumbing models as needed to suit existing construction. Field verify prior to submittal.
 - 2. Or approved equal.
- B. Interior Sealant (joints at interior side of openings): PROSOCO “R-Guard Air Dam”.
 - 1. Description: Gun-grade, single component, STPE, medium-modulus, high- movement/non-shrink, elastomeric waterproofing sealant, ASTM C920, Type S, Grade NS, Class 50. 98 percent solids.
 - 2. Physical Properties/Performance Characteristics:
 - 3. Elongation at Break: 1000 percent, tested per ASTM D412.
 - 4. Peel Strength: 25 pli, tested per ASTM C794.
- C. Backer Rod: Compressible, closed cell rod stock as recommended by manufacturer for compatibility with sealant. Provide size and shape of rod to control joint depth.
- D. Joint Sealants: Specified in Section 07 92 00.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 PREPARATION

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, dry substrate for self-adhered sheet flashing application.
- B. Ensure substrate is continuous, and provide solid backing as required. Unsupported membrane greater than 1/4 inch is unacceptable.
- C. Round off sharp metal flashing edges to prevent puncture of self-adhered membrane and underlayment.

3.03 INSTALLATION

- A. General: Install self-adhered sheet flashings and accessory materials according to manufacturer's written instructions, recommendations, and technical bulletins.

- B. Apply manufacturer's primer to substrates at required rate, per manufacturer's recommendations. Allow primers to dry or "tack" prior to application of membrane. Limit priming to areas that will be covered by air-barrier sheet on same day. Re-prime areas exposed for more than 4 hours or if contaminated by dust or debris.
- C. Underlayment Installation: Remove and dispose of release paper layer. Roll onto substrate with a mechanical roller to encourage full contact bond. Use heat gun as required to achieve adequate continuous bond.
- D. Lap each sheet or strip in a water-shedding manner with upper sheets overlapping lower sheets in a horizontal fashion. Horizontal laps to be a minimum of 6 inches. Vertical laps to be no less than 3 inches.
- E. All laps to be shingle laps unless explicitly detailed otherwise in the drawings. Seal exposed membrane edges with continuous bead of mastic or silicone sealant.
- F. Inspect finished installation and repair any punctures, voids, and deficient lapped seams in self-adhered membranes. Slit and flatten any "fishmouths" and blisters.

3.04 QUALITY CONTROL

- A. Maintain a quality control program specifically to verify compliance with this specification. Keep a daily log to record actions in the field. Submit logs to Owner and Architect.
 - 1. Provide all equipment and construction as necessary to perform the tests.
- B. Manufacturer's Field Services: A technical field representative of WRB manufacturer shall:
 - 1. Be available for site visits and or consultation during installation, and shall monitor and inspect the assemblies for compliance with warranty requirements;
 - 2. Prepare reports to be submitted to the Owner and Architect documenting any non-compliant issues and how they will be address and resolved, as necessary; and
 - 3. Submit a final closeout report, indicating the WRB system is installed per requirements; and distribute reports to Contractor, Owner and Architect.
- C. Testing: Test air barrier materials and assemblies as required by Authorities Having Jurisdiction, and to verify compliance with performance requirements:
 - 1. Air Leakage Testing: Perform tests as specified in ASTM E1186.
 - 2. Pressurization/depressurization with use of anemometer.
 - 3. Overall Building Envelope Performance Test (WSEC): Perform fan pressurization tests as specified in ASTM E779.
 - a. Test Scope: Volume of the building within the air barrier boundary.
 - 4. Air Barrier Adhesion Test: Minimum of one test for each substrate on each elevation per ASTM D4541.
 - 5. Adhesion and Compatibility Test: Wet sealant manufacturer's field quality control adhesion test.
- D. Distribute inspection reports to building code official, Owner and Architect.
- E. If Overall Building Envelope Performance test results exceed WSEC performance requirements, make corrections and repairs as required by the WSEC.
 - 1. Submit follow-up report to code official noting corrective measures taken.

Division 07 Specifications

Whatcom County Library System
Birch Bay Vogt Library Express

07 25 00

WEATHER BARRIERS
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3.05 CLEANING AND PROTECTION

- A. Remove excess and misplaced materials as work progresses. Clean the adjoining surfaces to remove misplaced materials, without damage to adjacent surfaces or finishes.
 - 1. Separate and recycle waste materials in accordance with Section 01 7419 - Construction Waste Management.
- B. Cover and protect exposed back-up walls against wet weather conditions during and after application of WRB system. Do not expose barrier applications to sunlight longer than as recommended by manufacturer. Protect installed barrier system from the effects of sunlight and weathering in accordance with manufacturer's exposure limitations.
- C. Protect WRB components from damage during subsequent operations.

END OF SECTION 07 25 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Vapor retarder sheeting with taped seams installed over placed fill in concrete.
 - 2. Vapor barrier sheeting at interior side of exterior walls where plaster has been removed.
 - 3. Seam tape, mastic and accessories as required for complete installation.
- B. Related work in other sections:
 - 1. Section 02 41 00 – Demolition.
 - 2. Section 02 41 13 – Site Demolition.
 - 3. Section 06 10 00 – Rough Carpentry.
 - 4. Section 07 21 00 – Thermal Insulation.
 - 5. Section 07 25 00 – Weather Barriers.
 - 6. Section 07 92 00 – Joint Sealants.
 - 7. Section 08 16 13 – Fiberglass Doors.
 - 8. Section 08 41 13 – Aluminum Framed Entrances.
 - 9. Section 08 52 13 – Aluminum Clad Wood Windows.
 - 10. Division 22 – Plumbing.
 - 11. Division 23 – HVAC.
 - 12. Division 26 – Electrical.

1.02 DEFINITIONS

- A. Water Vapor Permeability: Coefficient of permeance to unit film thickness. Do not use except where film thickness is known and material is homogeneous.
- B. Water Vapor Permeance: Ratio of unit water vapor transmission (WVT) to vapor pressure between two parallel surfaces of a flat material of known thickness.
- C. Water Vapor Transmission Rate: Described by ASTM E96 as steady water vapor flow in unit time through unit area between specific parallel surfaces of a material, under specific conditions of temperature and humidity at each surface.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's literature for each material and accessory indicated.
 - 1. Manufacturer's installation instructions including methods for sealing vapor retarders at each type of penetration.
- C. Certified Test Data: Manufacturer's test data illustrating compliance with specifications, certified in writing from independent testing agency.

1.04 SITE CONDITIONS

- A. Do not apply vapor retarder sheeting during inclement weather or when air temperature exceeds manufacturer's recommended limits

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

- B. Specified Product Warranty - Below Grade Vapor Retarder: Basis of Design manufacturer's Limited "Life of the Building" warranty against defects in materials and manufacturing, when vapor barrier is installed per ASTM E1163 and manufacturer's instructions.
 - 1. Manufacturer warrants that material meets requirements of ASTM E1745, and has been tested per ASTM E1745, ASTM F1249, ASTM D1709, ASTM D882, ASTM E154, ASTM D1434, and ASTM D4833.

PART 2 - PRODUCTS

2.01 CRAWLSPACE VAPOR RETARDER SHEETING

- A. Acceptable Manufacturers:
 - 1. Stego.
 - 2. Henry, a Carlisle Company (formerly Fortifiber).
 - 3. ISI Building Products (formerly Insulation Solutions).
 - 4. W.R. Meadows
- B. Below-Grade Vapor Retarder Sheeting: Stego "Stego Wrap Vapor Barrier", 15-mil.
 - 1. Description: Polyolefin film manufactured with virgin resins, meeting or exceeding requirements of ASTM E1745, Class A.
 - 2. Thickness: 10 mil, minimum.
- C. Performance Characteristics:
 - 1. Water Vapor Permeance: Maximum 0.01 perms, tested per ASTM E154 for new and conditioned vapor retarder per Sections 8, 11, 12 and 13; or ASTM F1249.
 - 2. Tensile Strength: Minimum 45 foot-pounds per inch, tested per ASTM E154 Section 9 (ASTM D882).
 - 3. Puncture Resistance: Minimum 2,200 grams, tested per ASTM D1709, Method B.
 - 4. Impedes the transmission of methane gas and radon gas.
- D. Accessory Materials:
 - 1. Seam Tape: High density, polyethylene tape, single- and double-sided with pressure-sensitive adhesive as furnished or recommended by vapor retarder manufacturer.
 - 2. Penetration Fittings: Provide pipe boots and other penetration fittings from vapor retarder material and pressure sensitive tape per manufacturer's instructions.
 - 3. Miscellaneous Accessories: Seam splice tape primer, "Crete Claw", termination bars, adhesives, mastic and other accessories as recommended by vapor retarder manufacturer for a complete installation and to maintain watertightness.

2.02 VAPOR BARRIER SHEETING

- A. Acceptable Manufacturers:
 - 1. CetainTeed.
 - 2. Henry.
 - 3. Stego.
 - 4. Or approved equal.
- B. Vapor barrier sheet at exterior walls behind gypsum board over unfaced insulation:
 - 1. Description: Polyamide film vapor retarder sheeting, changes its permeability based on ambient humidity conditions while providing continuous air seal.
 - 2. Basis of Design: CertainTeed "MemBrain".

3. Physical Properties:
 - a. Water Vapor Permeance: 1 perm or less tested per ASTM E96, dessicant method and increases to greater than 10 perms using the water method.
 - b. Corrosivity: No unusual aspect of corrosion such as pitting, cracking and adhesion cure inhibition, tested per ASTM C665.
 - c. Fungi Resistance: No growth, tested per ASTM C1338.
 - d. Surface Burning Characteristics: Tested per ASTM E84.
 - 1) Flame Spread Index: Maximum 25.
 - 2) Smoke Developed Index: Maximum 450.
- C. Vapor-Retarder Tape (MemBrain): Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- D. Install 6 mil polyethylene film at cementitious backer board walls to receive FRP paneling, tiling, or where waterproof construction is required.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Verify installation conditions as satisfactory to receive work of this Section.
 1. Crawlspace: Verify that subgrade work is complete, and free from conditions that may cause puncture, movement, settlement, and other damage to vapor retarder.
 2. Verify that items which pass through vapor retarder are properly and rigidly installed.
- B. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 CRAWLSPACE VAPOR RETARDER INSTALLATION

- A. Installation – General:
 1. Comply with vapor retarder manufacturer’s installation instructions.
 2. Install vapor retarder in accordance with procedures outlined in ASTM E1643.
- B. Place vapor retarder over prepared granular base course with a minimum number of joints, and laid smooth without folds or bunches of material.
- C. Install continuous below-grade vapor retarder with penetrations, transitions, and perimeters sealed as required to prevent unacceptable moisture vapor migration levels from diffusing through concrete slabs-on-grade into building spaces.
 1. Lap joints minimum 6 inches unless otherwise recommended by vapor retarder manufacturer for conditions of installation. Face laps away from the expected direction of the placement whenever possible.
 2. Seal lapped joints, boots, penetrations, patches and the like, with manufacturer’s recommended tape or mastic to suit conditions.
 3. Roll tape to remove wrinkles and to make continuous contact with vapor retarder, and to achieve water vapor-tight performance.
 4. Turn up edges at vertical surfaces not less than 6 inches.
 5. Lap vapor retarder over footings, turn up to full slab thickness, and seal with pressure sensitive tape to foundation wall.
 6. Seal vapor retarder continuously around the perimeter/edges to vertical sides of footings or foundation walls with double-sided tape or termination bar or both.

7. Penetrations: Seal penetrations as recommended by vapor retarder manufacturer. At pipes and other openings, install factory-fabricated boots or field-fabricated boots and other shapes suitable to conditions, as necessary to seal against vapor penetration.
 8. Vapor retarder, boots and other shapes shall be clean and dry before sealing.
- D. Repair: Patch and repair tears, punctures, and damaged areas in accordance with manufacturer's instructions.
1. Overlap tears and holes 6 inch beyond damaged area with patches.
 2. Seal patch to installed sheeting with pressure sensitive tape, in accordance with manufacturer's instructions, taping all four sides.
 3. Do not patch or seam when vapor retarder is wet.

3.03 VAPOR BARRIER INSTALLATION

- A. Vapor Barrier Installation:
1. Install in accordance with manufacturer's instructions for conditions of installation to create a complete, continuous air tight barrier within the conditioned space.
 2. Install vapor retarder toward heated space at exterior walls.
 3. Extend vapor retarder to extremities of areas to be protected from vapor transmission and to cover miscellaneous voids in insulated substrates. Preinstall vapor retarder ahead of services and equipment wherever necessary to ensure continuity of membrane.
 4. Secure in place with adhesives or other anchorage system as indicated. Locate joints over framing members and other solid substrates and seal joints with vapor retarder tape. Comply with manufacturers written instructions.
 - a. Seal vertical joints over framing by lapping, no fewer than two studs.
 5. 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.
 6. Do not install damaged, wet or soiled insulation, or products that have been exposed to ice, rain or snow at any time.
- B. Repair tears or punctures in vapor retarders immediately before concealment by other work as recommended by manufacturer

3.04 QUALITY CONTROL

- A. Visually inspect vapor retarder sheeting to verify that the installation complies with manufacturer's instructions, has not been penetrated, and is free of tears, voids and holes. Repair damaged areas.

3.05 PROTECTION

- A. Protect from damage after cleaning area of debris.
1. Do not allow traffic on completed Work or, if required, lay insulation, then protection board over the installed vapor retarder at areas to receive temporary foot traffic.
 2. Do not stack or store items or materials directly on vapor retarder.
 3. Protect installed vapor retarder from construction loads and items that may puncture or damage the installation.

END OF SECTION 07 26 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Exterior fiber-cement siding assemblies as indicated in the Drawings:
 - a. Type 1: Fiber-cement lap siding with exposure pattern.
 - b. Type 2: Fiber-cement shingle panels with staggered edge.
 - c. Type 3: Fiber-cement panel siding with fiber-cement battens.
- B. Related work in other sections:
 - 1. Section 06 65 00 – Plastic Simulated Wood Trim.
 - 2. Section 07 21 00 – Thermal Insulation.
 - 3. Section 07 25 00 – Weather Barriers.
 - 4. Section 07 62 00 – Sheet Metal Flashing and Trim.
 - 5. Section 07 92 00 – Joint Sealants.
 - 6. Section 08 91 00 – Louvers.
 - 7. Section 09 91 00 – Painting.

1.02 REFERENCES

- A. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Manufacturer's requirements for related materials to be installed by others.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods, including nail patterns.
- C. Samples: For each siding type including plank, shingles, panels, battens, trim, and accessories.
- D. Installer's Qualification Statement.
- E. Cleaning and Maintenance Instructions: Manufacturer's periodic inspection recommendations and maintenance procedures.
- F. Warranty: Submit copy of manufacturer's warranty, made out in Owner's name, showing that it has been registered with manufacturer

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.
- B. Source Limitations: Obtain fiber-cement materials from one manufacturer.
- C. Mock-Up: Build mock-up for evaluation of surface preparation techniques, installation workmanship, and to verify selections made from sample submittals to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Minimum 48-inches wide x 60-inches high, location as directed by the Architect.
 - 2. Include outside corner on one end of mockup and inside corner on the other end.
 - 3. Finish areas designated by Architect. Coordinate painting under Section 09 91 00.

4. Approval of mock-up does not constitute approval of deviations from the Contract Documents unless approved in writing.
5. Approved mock-up may remain as a part of the completed work.
- D. Rework all mockups until acceptable to the Architect and Owner.
- E. Obtain approval of mock-up from Architect prior to commencement of Work.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.
- C. Store products under waterproof cover and elevated above grade, on a flat surface

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: 30-year, non pro-rated warranty on all fiber-cement materials.
- C. Installer Warranty: Warrant fiber-cement siding assemblies against defective materials and/or workmanship, to remain watertight and weatherproof with normal usage for three (3) years following the Project Substantial Completion date.

PART 2 - PRODUCTS**2.01 FIBER-CEMENT SIDING**

- A. Acceptable Manufacturers:
 1. JamesHardie.
 2. LP Building Solutions.
 3. Allura USA.
 4. Substitutions: Submit in accordance with Section 01 2500 – Substitution Procedures.
- B. Continuous Insulation: Fiber-cement siding assemblies shall be approved by the manufacturer for installation over 1-inch exterior continuous insulation.
- C. Lap Siding (**Type 1**): Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 1. Style: Standard lap style.
 2. Texture: Select Cedarmill.
 3. Length: 12 ft, nominal.
 4. Width (Height): Repeating pattern with varied exposure as indicated on the drawings.
 - a. 5-1/4 inches (4-inch exposure).
 - b. 7-1/4 inches (6-inch exposure).
 5. Thickness: 5/16 inch, nominal.
 6. Finish: Factory applied primer for field painting under Section 09 91 00.
 7. Color: To be determined by Architect.
 8. Warranty: 30 year limited, non pro-rated; transferable.
 9. Basis of Design: JamesHardie, Hardie Plank.
 - a. Climate Zone: HZ-10.

- D. Shingle Siding (**Type 2**): Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.
1. Style: Shingle panel, staggered edge.
 2. Texture: Select Cedarmill.
 3. Dimensions: 48-inches wide by 15-1/4" high.
 4. Exposure: 6-inches.
 5. Thickness: 1/4 inch, nominal.
 6. Finish: Factory applied primer for field painting under Section 09 91 00.
 7. Color: To be determined by Architect.
 8. Warranty: 30 year limited, non pro-rated; transferable.
 9. Basis of Design: JamesHardie, Hardie Shingle; Shingle Panel, Staggered Edge; 6" exposure.
 - a. Climate Zone: HZ-10
- E. Board and Batten Panel Siding (**Type 3**): Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.
1. Style: Fiber-cement panel with battens.
 2. Texture: Select Cedarmill.
 3. Panel Dimensions: 48-inches wide by lengths indicated on the drawings.
 4. Batten Dimensions: 2-1/2 inches wide.
 5. Thickness: 5/16 inch, nominal.
 6. Finish: Factory applied primer for field painting under Section 09 91 00.
 7. Color: To be determined by Architect.
 8. Warranty: 30 year limited, non pro-rated; transferable.
 9. Basis of Design:
 - a. Panel: JamesHardie, Hardie Panel.
 - b. Batten: JamesHardie, Hardie Trim Batten Boards.
 - c. Climate Zone: HZ-10.

2.02 ACCESSORIES

- A. Siding Trim: Plastic simulated wood trim specified in Section 06 65 00.
1. Refer to the drawings for profiles.
 2. Provide rabbeted profile trim to conceal fasteners.
- B. Fasteners: Hot-dipped-galvanized or corrosion resistant, length as required to penetrate existing substate minimum 1-1/4 inch.
1. Fastener length shall account for installation over 1-inch continuous outboard insulation.
 2. Contractor to provide specialty fasteners and/or nailing tools and equipment as required for proper installation at no additional cost to the Owner.
- C. Flashing: Refer to Section 07 62 00 - Sheet Metal Flashing and Trim
- D. Sealants: As recommended and approved by the manufacturer.
1. Refer to Section 07 90 00 - Joint Sealants
- E. Finish: Factory primed for field painting.
1. Refer to Section 09 91 00 – Painting.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Verify that weather barrier has been installed over substrate completely and correctly.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Proceed with installation only after Architect approval of all mockups.
- B. Protect surrounding areas and adjacent surfaces during execution of this work.
- C. Ensure all weather barriers, rigid insulation, and metal flashings have been installed and accepted by the Architect.
- D. Coordinate penetrations with other trades.
 - 1. Verify penetrations and rough-in locations for Owner provided equipment.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations.
 - 1. Read warranty and comply with terms necessary to maintain warranty coverage.
 - 2. Use trim details indicated on drawings.
 - 3. Touch up field cut edges before installing.
- B. Pre-drill nail holes if necessary to prevent breakage.
- C. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.
- D. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.
- E. Joints in Horizontal Siding: Avoid joints in lap siding except at corners. Where joints are inevitable stagger joints between successive courses.
- F. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses.
- G. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.
- H. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.
- I. Finish Painting: Refer to Section 09 91 00 – Painting.

3.04 CLEANING AND PROTECTION

- A. Clean faced panels in accordance with manufacturer's maintenance instructions, using cleaning materials and methods acceptable to manufacturer.
- B. Protect installed products until Date of Substantial Completion.
- C. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 07 46 46

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Brake-formed, prefinished flashing and trim profiles as indicated in the drawings.
 - 2. Custom fabricated, prefinished endcaps to fit existing rafter tails.
 - 3. New roll-formed gutters and downspouts.
 - 4. Accessories and attachments as needed for a complete, weather-tight installation.
- B. Related work in other sections:
 - 1. Section 06 65 00 – Plastic Simulated Wood Trim.
 - 2. Section 07 21 00 – Thermal Insulation.
 - 3. Section 07 25 00 – Weather Barriers.
 - 4. Section 07 46 46 – Fiber Cement Siding.
 - 5. Section 07 92 00 – Joint Sealants.
 - 6. Section 08 91 00 – Louvers.
 - 7. Section 09 91 00 – Painting

1.02 PERFORMANCE REQUIREMENTS

- A. Conform to recommendations of “Architectural Sheet Metal Manual”, latest edition issued by Sheet Metal and Air conditioning Contractor’s National Association (SMACNA) insofar as applicable for all metals.
- B. General: Sheet metal flashing and trim assemblies to withstand wind loads as noted in Structural Drawings, 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 remain watertight.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 Degrees F, ambient; 180 Degrees F, material surfaces.
- D. Fabricate and install flashing at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:
 - 1. Wind Zone 1: Wind Pressure of 21 to 30 psf.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: Show layout of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identify material, thickness, weight, and finish for each item and profile.
 - 2. Details for forming sheet metal flashing including profiles, shapes, seams, and dimensions.

3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
- D. Color Samples: Illustrating base material and factory finish.
- E. Copy of Special Warranties specified in this section

1.04 QUALITY ASSURANCE

- A. Fabricator and Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.
- B. Source Limitations: Obtain flashing and sheet metal materials from one manufacturer.

1.05 ELECTROLYTIC AND CORROSIVE ACTION

- A. Protect adjacent dissimilar metals from electrolytic action by adequate coating. Coat exterior masonry, plates, and concrete surfaces against which sheet metal work is applied with suitable paint, red rosin paper, or polyethylene underlayment.
- B. Marine Environments: Where any stainless-steel products are specified in marine environments, 316 SS is required. 410 SS is not allowed.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Substrate Warranty: Manufacturer's standard galvalume base metal material warranty in which manufacturer agrees to repair or replace panels that show evidence of deterioration within specified warranty period.
 1. Warranty Period: 45 years for bare material and metal substrate.
- C. Finish Warranty: Manufacturer's standard form PVDF Fluorocarbon System Warranty for film integrity, chalk rating and fade rating in which manufacturer agrees to repair or replace panels that show evidence of deterioration within specified warranty period.
 1. Deterioration shall include but is not limited to:
 - a. Color fading of more than 5 Hunter in accordance with ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating in accordance with ASTM D 4214.
 - c. Cracking, checking, peeling or failure of paint to adhere to bare metal.
 - d. Warranty Period: Film integrity for 45 years and chalk and fade rating for 35 years from date of Substantial Completion.
- D. Installer Warranty: Warrant panels, flashings, sealants, fasteners, and accessories against defective materials and/or workmanship, to remain watertight and weatherproof with normal usage for two (2) years following Project Substantial Completion date.
- E. All warranty terms and language shall match the sample documents previously reviewed during the submittal phase.

PART 2 - PRODUCTS**2.01 PREFINISHED SHEET METAL**

- A. General: Assure protection from damage to exposed surfaces of mechanical and other finishes by requiring application of strippable, temporary protective film before shipping.
- B. Base Metal: Aluminum-zinc coated (Galvalume) steel sheet conforming to the requirements of ASTM A792 (or A792M) with a minimum coating of AZ50(AZM150).

1. Thickness: Minimum 24-gauge thickness, unless noted otherwise in the drawings.
- C. Coil-Coated Finish: Two-coat PVDF coil coated finish in standard or premium color finish.
 1. Fluoropolymer Coating: "Kynar 500" 70% resin finish coat baked-on for 15 minutes at 450 degrees F (232 degrees C), over 0.2 mil baked-on epoxy primer for a total film thickness of 1.0 mils, 30% reflective gloss (ASTM D 523).
 2. Durability: Provide coating which has been field tested under normal range of weathering conditions for minimum of 20 years without significant peel, blister, flake, chip, crack or check in finish, and without chalking in excess of 8 (ASTM D 659), and without fading in excess of 5 NBS units.
 3. Exposed Finish: To be selected from manufacturer's full offering of standard and premium color finishes.
 4. 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
- D. Acceptable Manufacturers:
 1. AEP Span.
 2. Metal Sales Manufacturing Corporation.
 3. Cascadia Metals.
 4. Or approved equal.

2.02 OTHER METALS

- A. Pre-Primed Zinc-Coated Steel: Same as zinc-coated steel except for primer coating suitable for field painting under Section 09 91 00 - Painting.
 1. Provide a baked-on epoxy-based primer of .2 mils on each side of metal.
 2. Thickness: Minimum 26-gauge, unless noted otherwise.
 3. Location: Provide where indicated in the drawings.
- B. Galvanized Steel: Commercial quality with 0.20 percent copper, ASTM A 526 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 24 gauge except as otherwise indicated.
 1. Finish requirements for shop-fabricated, soldered assemblies:
 - a. Clean galvanized surfaces with non-petroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- C. Stainless Steel: Type 304, complying with ASTM A 167, 2D annealed finish, soft, except where harder temper required for forming or performance; 0.0187-inch thick (26 gauge) except as otherwise indicated.

2.03 GUTTERS AND DOWNSPOUTS

- A. Acceptable Manufacturers:
 1. Custom-Bilt Metals.
 2. Or approved equal.
- B. Base Metal: Prefinished aluminum made up of Alloy 3105/5005, Hardness (H14).
 1. Thickness: 0.032 Aluminum.
 2. Gutter Profile: 5" O.G. (K-Style).
 3. Downspout Profile: 2-inch by 3-inch.

- C. Finish: Standard color finish to be selected from standard offering of no less than 22 colors.
- D. Accessories: Provide all endcaps, elbows, straps, and other accessories provided by the gutter and downspout manufacturer.
- E. Fabrication:
 - 1. Fabricate gutters, flashings and accessories in longest practical lengths.
 - 2. Gutters and downspouts shall be factory or field formed as required

2.04 ACCESSORIES

- A. Isolation Coating: Alkali resistant bituminous paint.
- B. Washers: Provide washers of same material as sheet metal. 1 mm thick with rubber packings.
- C. Touch-up Paint: As recommended by prefinished material manufacturer.
- D. Cleats, Clips and Splice Plates: Provide items of same material, coating and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.
- E. Primer: Zinc chromate type.
- F. Sealant: As specified in Section 07 92 00 – Joint Sealants.
- G. Plastic Cement: ASTM D4586/D4586M, Type I.
- H. Solder: Per ASTM B32 Standard Specifications For Metal Solder.
- I. Screw and Nail Type Fasteners – General: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
- J. Fasteners for Concrete & Masonry: "Zamac Nailin" by Rawl with stainless steel nail and separate neoprene gasketed stainless steel washer or Rawl Hex Head Rawl stainless steel "Tapper" with separate neoprene gasketed stainless steel washer.
- K. Gasketed Fasteners: #10 x 1-1/2" painted head hex head screws with separate neoprene gasketed stainless steel washers.
- L. Rivets: Stainless steel closed end pop-rivets, length as required.
- M. Bituminous Coating: FS TT-C-494 or SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- N. Sealant Tape: Tremco MBT-35 Metal Building Tape or butyl tape to meet TT-C-1796-A or approved equivalent.
- O. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- P. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- Q. Non-Curing Butyl Sealant: Non-skinning, non-drying synthetic butyl elastomer sealant suitable for use and adhesion to Kynar/PVDF coated metals
- R. Separation Tape: 1/16" x 1/2" neoprene tape.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Proceed with the installation of metal flashing and trim following Architect's review and approval of all required mockups.

3.02 FABRICATION - GENERAL

- A. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
- B. Wind Zone 2: For velocity pressures of 31 to 45 lbf/sq. ft: 90-lbf/sq. ft. perimeter uplift force, 120-lbf/sq. ft. corner uplift force, and 45-lbf/sq. ft. outward force.
- C. General Metal Fabrication: Shop-fabricated work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices.
- D. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Fabricate sheet metal to fit substrates.
- E. Comply with material manufacturer instructions and recommendations for shop fabrication and brake-forming of material.
- 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. Form exposed sheet metal work in 10' lengths without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- H. Expansion Provisions: Provide for thermal expansion of exposed sheet metal work. Space movement joints at maximum 10 feet intervals with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion joints as detailed cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic (concealed within joints).
- I. 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 where pre-tinned surfaces would show in finished work.
- J. Sealant Joints: Where moveable non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of urethane sealant in compliance with SMACNA standards.
- K. Separate metal from non-compatible material or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.
- L. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

3.03 INSTALLATION

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual". Anchor units of

work securely in place by methods indicated, providing for thermal expansion of metal units, conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams, laid away from southerly prevailing weather, which will be permanently watertight and weatherproof.

- B. Shop fabricate all flashing profiles to the greatest extent possible.
- C. Install exposed sheet metal work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashings and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- D. 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, 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, levels, and slopes. 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. Attach each cleat with at least two fasteners. Bend tabs over fasteners. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 4. Install sealant tape where indicated.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
 - 6. Do not use graphite pencils to mark material surfaces.
- E. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
- F. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- G. Use lapped expansion joints only where indicated on Drawings.
- H. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- I. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- J. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 - Joint Sealants.
 - 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 of 07 92 00.

- K. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
 - 1. Do not solder prefinished metallic-coated sheet.
 - 2. Do not use torches for soldering.
 - 3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 - 4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization
- L. Counterflashing: Coordinate installation of counterflashing with installation of assemblies to be protected by counterflashing. Install counterflashing in reglets or receivers. Secure in a watertight manner by means of snap-in installation and sealant, blind rivets and sealant, reglets with sealant and face pins.
- M. Wall counter flashings, fascia flashings and other straight run sheet metal work where indicated: Fabricate from factory-primed galvanized steel.
- N. Coping and Counterflashing: Form to details as indicated. Flat locked seams: lap ends 4-inch minimum with bayonet joints per details, seal with urethane sealant, hem, and crimp bottom edge. Install upper edges of flashing in existing reglet as indicated by details or as surface-applied installation per details

3.04 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes, and promptly apply match touch-up paint to surface scratches and cut "raw" edges prior to exposure to weather. Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.
- B. Do not apply touch-up paint to damaged paint areas that involve minor scratches. Flashings that have paint and/or substrate damage shall be replaced as directed by the Architect.

END OF SECTION 07 62 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Exterior and interior sealant joints.
 - 2. Acoustical sealant.
 - 3. Backer-rod and accessories.
- B. Related work in other sections:
 - 1. Section 07 25 00 – Weather Barriers.
 - 2. Section 07 46 46 – Fiber Cement Siding.
 - 3. Section 07 62 00 – Sheet Metal Flashing and Trim.
 - 4. Section 07 92 00 – Joint Sealants.
 - 5. Section 08 16 13 – Fiberglass Doors.
 - 6. Section 08 41 13 – Aluminum Framed Entrances.
 - 7. Section 08 52 13 – Aluminum Clad Wood Windows.
 - 8. Section 08 91 00 – Louvers.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: For each joint-sealant product indicated.
- C. Schedule of Sealant Joints: Identify locations and type of joints, and list proposed sealant for each joint type, including manufacturer, product, and color.
- D. Samples:
 - 1. Initial Selection: Manufacturer's color charts with strips of cured sealants showing the full range of colors available for each product exposed to view.
 - 2. Verification: Each type and color of sealant required for mock-ups.
- E. Product Certificates: Manufacturer's certification for each type of joint sealant and accessory.
- F. Test Reports:
 - 1. Product Test Reports: Based on comprehensive testing of product formulations performed by qualified testing agency, indicating compliance with requirements.
 - 2. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 3. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 4. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
 - 5. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
- G. Field Test Report Log: For each elastomeric sealant application.
- H. Sample Warranties: For each type of sealant used.
- I. Closeout: Submit in accordance with Section 01 7800.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Shall have a minimum of 3 years of experience installing materials of types specified, and the following:
 - 1. Shall be a manufacturer's authorized installer who is approved or licensed for installation of elastomeric sealants required for this Project.
 - 2. If requested, provide three projects of similar scope and complexity, including location and current phone contacts for owner and architect.
 - 3. Use adequate numbers of skilled workers thoroughly trained and experienced in the installation methods needed for proper performance of the work of this Section.
- B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealants from a single manufacturer for each different product required to ensure compatibility. Manufacturer shall instruct applicator in procedures for intersecting sealants.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the Notice to Proceed with or commencement of the Work, whatever occurs latest.
 - 1. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
 - 2. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
 - 3. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- D. 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 ASTM C1087 or 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 quantity of each type of material, including joint substrates, shims, backings, secondary seals and miscellaneous materials, as required by sealant manufacturer.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying Work.
 - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
- E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
 - 1. Locate test joints where indicated; if not indicated, as directed by Architect.
 - 2. Conduct field tests for each type of sealant and joint substrate indicated.
 - 3. Notify Architect 7 days in advance of dates and times when test joints will be erected.
 - 4. Arrange for joint-sealant manufacturer's technical representative to be present at test.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193.
 - b. For joints with dissimilar substrates, verify adhesion to each substrate separately
 - 5. Evaluate and report results of field adhesion testing.
 - 6. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.

7. Do not use joint preparation methods or sealants that produce less than satisfactory adhesion to joint substrates during testing.
- F. Mock-Ups: Build mock-ups incorporating sealant joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants. Mock-ups shall demonstrate aesthetic effects and set quality standards for materials and execution.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original unopened containers labeled with manufacturer's data.
- B. Store materials in clean, dry area at temperatures above 40 and below 86 deg F.
- C. Do not use sealants and primers after manufacturer's stated shelf life.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide written warranties against adhesive and cohesive failure of the sealant and against infiltration of water and air through the sealed joints:
- C. Specified Product Warranty: Manufacturer's warranty to furnish joint sealants to repair or replace non-complying work with performance and other specified requirements.
 1. Warranty Periods:
 - a. Silicones: 20-years from date of Substantial Completion.
 - b. Urethanes: 5-years from date of Substantial Completion.
- D. Special Project Warranty: Installer's 2-year Labor and Materials warranty to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section, including against adhesive and cohesive failure of the sealant and infiltration of water and air through the sealed joints

PART 2 - PRODUCTS

2.01 PERFORMANCE

- A. Performance Requirements:
 1. Joint sealants shall establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
 2. Interior joint sealants shall establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.
 3. Compatibility: Select joint sealants, backings, and related materials for compatibility with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

2.02 MATERIALS – GENERAL

- A. General:
 1. Provide joint sealants for applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.
 2. Compatibility: Provide sealants, backings, and 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. Elastomeric Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- C. Non-Elastomeric Sealants: Comply with ASTM C834 for type, grade, class, and uses.
- D. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.
- E. 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.
- F. Colors of Exposed Joint Sealants: Matching color of adjacent surfaces, as selected by Architect from manufacturer's full range.

2.03 ELASTOMERIC JOINT SEALANTS – SILICONE AND HYBRID

- A. Acceptable Manufacturers:
 - 1. DOW.
 - 2. Momentive (GE-Silicones).
 - 3. Pecora Corporation.
 - 4. SIKA (formerly BASF).
 - 5. Tremco
- B. Products: Basis of Design:
 - 1. Exterior Sealant Joints (paintable): SIKA “Sikaflex HY 100 Hybrid Sealant” (formerly Masterseal NP100).
 - 2. Exterior Non-Painted Surfaces: DOW “Dowsil 796 Silicone Sealant”.
 - 3. Exterior Air Barrier Sealant (non-exposed): DOW “Dowsil 758 Weather Barrier Sealant”.
 - 4. Exterior CMU and Masonry Joints: DOW “Dowsil 790 Silicone Sealant”.
- C. Silicone Joint Sealants:
 - 1. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50 or Class 50 as applicable, for Use NT.
 - 2. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.
 - 3. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use T.
 - 4. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade P, Class 100/50, for Use T.
 - 5. Single-Component, Mildew-Resistant, Acid-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.
 - a. Use: Interior joints in wet areas.
- D. Hybrid Joint Sealants:
 - 1. Non-sag, low-modulus, high-movement (+100% / -50), silyl-terminated polyurethane joint sealant, ASTM C920, Type S, Grade NS, Use T, NT, M, A, O, excluding glass.

2.04 ELASTOMERIC JOINT SEALANTS – URETHANE

- A. Acceptable Manufacturers:
 - 1. Bostik, Inc.

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Whatcom County Library System
Birch Bay Vogt Library Express

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2. Momentive.
 3. Pecora Corporation.
 4. SIKA (formerly BASF).
 5. Tremco.
- B. Products: As accepted, suitable to conditions.
- C. Urethane Joint Sealants:
1. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.
 2. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT and T.
 3. Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C920, Type S, Grade P, Class 25, for Use T.
 4. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 50, for Use NT.
 5. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Use NT.
 6. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 50, for Use T.
 7. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Use T.
 8. Multi-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C920, Type M, Grade P, Class 25, for Use T.

2.05 NON-ELASTOMERIC BUTYL SEALANT

- A. Acceptable Manufacturers/Products:
1. SIKA "SikaLastomer-511".
 2. Tremco "Butyl Sealant".
 3. Pecora "BC-150".
 4. Or approved equal.
- B. Butyl Non-Elastomeric Joint Sealants: ASTM C1311, non-skinning butyl sealant, movement capability +/- 12 1/2 percent, contains additive to inhibit microbial activity.
1. Use: At exterior concealed (no UV exposure) joints requiring non-drying sealant like lap joints at sheet metal flashing and trim.

2.06 NON-ELASTOMERIC LATEX JOINT SEALANT

- A. Acceptable Manufacturers:
1. BASF Corporation
 2. Bostik, Inc.
 3. Momentive (GE)
 4. Pecora Corporation
 5. Schnee-Morehead Inc.
 6. SIKA (formerly BASF).
 7. Tremco.
 8. Or approved equal.

- B. Latex Joint Sealants: Acrylic latex or siliconized acrylic latex, non-hardening, non-corrosive, non-staining, non-bleeding, ASTM C834, Type OP, Grade NF.
 - 1. Use: General interior applications.

2.07 ACOUSTICAL SEALANT

- A. Acceptable Manufacturers/Products:
 - 1. Tremco "Acoustical Sealant".
 - 2. US Gypsum "Sheetrock Acoustical Sealant".
 - 3. Or approved equal.
- B. Acoustical Joint Sealants (at sound-rated assemblies): Non-skinning, non-hardening, flexible sealant designed for sealing gypsum wall board, capable of spanning 1/2 inch wide by 3/8 inch deep gaps. ASTM C834, or ASTM D217, tested for acoustic properties.
 - 1. Products shall effectively reduce airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
 - 2. Provide acoustical sealants with flamespread and smoke-developed indexes of less than 25 per ASTM E84 where required by AHJ.
- C. Sheet Caulking for Junction Boxes:
 - 1. Non-Rated Assemblies: Tremco "Sheet Caulking", or approved equal.

2.08 JOINT SEALANT BACKING

- A. Backer Rod:
 - 1. Provide sealant backings of material and type that are nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 - 2. Cylindrical Sealant Backings: ASTM C1330, closed-cell polyethylene foam rod or other flexible, permanent, durable non-absorbent material of size to control sealant depth. Oversize backer rod minimum 25 percent to 50 percent of opening.
- B. 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. Provide self-adhesive tape where applicable.

2.09 MISCELLANEOUS MATERIALS

- A. Sanded Sealant Joints: Sand aggregate to match texture, color and appearance of adjacent substrates.
- B. Primer/Sealer: Non-staining types 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.
- C. 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.
- D. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.
- E. Expanding Foam Sealant: UL Class 1 fire-retardant, polycell expanding foam.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 PREPARATION

- A. Preconstruction Adhesion Testing: Apply sealant to small area and perform adhesion test in accordance with ASTM C1193, Method A, to determine if primer is required to achieve adequate adhesion.
- B. 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 foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), oil, grease, waterproofing, water repellents, water, surface dirt and asphalt-based materials.
 - 2. Clean porous joint substrate surfaces such as concrete by brushing, grinding, blast cleaning, mechanical abrading, or a combination, to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
 - a. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
 - b. Remove laitance and form-release agents from concrete.
 - 3. 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. Glazed surfaces of ceramic tile.
 - 4. Verify that new sealant joints will not be in contact with any asphalt-based products, including edges of self-adhering membrane, and the air barrier membrane.
- C. Joint Priming: Prime or seal joint substrates, where recommended by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. 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.
- D. Masking: Apply masking tape as required to protect adjacent surfaces and to ensure straight bead line and facilitate cleaning. Remove immediately without disturbing joint seal.

3.03 INSTALLATION

- A. Installation – General: Comply with ASTM C1193, and sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Apply sealants before other coatings are applied to adjacent surfaces, or are applied to substrate, to ensure sealant adhesion.

- C. Install sealants using proven techniques that comply with the following and at the same time backings are installed.
 - 1. Install sealant backings of type indicated to support sealants during application and at proper depth of position required to achieve required joint width/depth ratio that allow optimum sealant movement capability, and to align to adjacent work.
 - a. Provide backing materials in as long lengths as practicable. Do not leave gaps between ends of sealant backings.
 - b. Do not stretch, twist, puncture, or tear sealant backings.
 - c. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
 - 2. Install bond-breaker tape as required to avoid 3-sided bond of sealant to substrate, and where required by manufacturer's recommendations to ensure proper joint sealant performance.
 - 3. Place sealants so they directly contact and fully wet joint substrates.
 - 4. Apply in continuous operation. Ensure sealant firmly contacts all surfaces and completely fill recesses in each joint configuration.
 - 5. Produce uniform, cross-sectional shapes and depths relative to joint widths recommended by sealant manufacturer allowing optimum sealant movement capability. General measurements at center of bead:
 - a. Horizontal Joints: 75 percent width, with minimum depth of 3/8 inch.
 - b. Elastomeric Joints: 50 percent width, with minimum depth of 3/8 inch.
 - c. Non-Elastomeric Joints: 75 percent to 125 percent of joint width.
 - 6. Complete horizontal joints prior to vertical joints, without trapping moisture or dirt.
 - 7. Tooling of Nonsag 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.
 - a. Remove excess sealant from surfaces adjacent to joints.
 - b. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - c. Provide concave joint tooled slightly below adjacent surfaces, per configuration per Figure 8A in ASTM C1193, unless otherwise indicated.
 - d. Provide flush joint configuration where indicated per Figure 8B in ASTM C1193.
 - e. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C1193.
- D. Thresholds (at exterior doors): Set thresholds for exterior doors in full bed of silicone sealant compatible with substrate, prior to setting in place.
- E. Acoustical Sealant Application Standard: Comply with ASTM C919 and manufacturer's written recommendations.
 - 1. Acoustical Sealant Installation: Use acoustical sealants to form an airtight seal at penetrations and perimeters of sound-rated partitions, floors and ceilings.
 - a. Apply acoustical sealant as continuous bead along gypsum board face layer at head and sill conditions of sound-rated partitions, around perimeter of resilient openings, behind control joints, and at penetrations.

- b. Apply acoustical sealant at both faces of partitions at perimeters and through penetrations.
 - c. Apply expanding foam sealant where detailed and where multiple pipes or conduits penetrate sound-rated construction and assemblies.
 - d. Apply sheet caulking to seal the back and sides of junction boxes 4-gang and smaller, recessed into sound-rated partitions.
2. Provide fire-rated acoustical sealant at fire-resistance rated conditions.
3. See Drawings and Section 09 2900, Gypsum Board, for application of acoustical sealants in gypsum board installations.

3.04 CURING

- A. Curing: Prior to painting or coating, allow sealant joints to cure as directed by sealant manufacturer, minimum 7 days for a single component, and 3 days for a multi-component.
- B. Allow sealant to fully cure before adhesive is stressed. Use test specimens formed at time of sealant application to verify curing time.
 1. Environmental Conditions: Ambient temperatures and humidity affect the cure rate and time required for joint to be "tack-free".

3.05 QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 1. Extent of Testing: Test completed and cured joints as follows:
 - a. Perform 10 tests for the first 1,000 ft. of joint length for each type of elastomeric sealant and joint substrate.
 - b. Perform 1 test for each 1,000 ft. 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 C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 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 filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. 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.
 5. Record test results in a field-adhesion-test log. Include installation dates, installer, 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.

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JOINT SEALANTS

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- B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory.
 - 1. 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.

3.06 CLEANING AND PROTECTION

- A. Clean off excess sealant 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. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations.
 - 1. If damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Interior non-rated, solid core, flush wood doors with transparent factory finish.
 - 2. Glazed vision panels.
 - 3. Factory fitting for door hardware.
- B. Related work in other sections:
 - 1. Section 06 10 00 – Rough Carpentry.
 - 2. Section 06 20 00 – Finish Carpentry.
 - 3. Section 08 71 00 – Door Hardware.
 - 4. Section 08 81 00 - Glazing

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: For each type of door, including face and core materials, type, construction, openings, and factory finishing.
- C. Door Schedule: Match numbering on Drawings; coordinate with Shop Drawings.
- D. Shop Drawings: Include:
 - 1. Door materials, and finishes.
 - 2. Door elevations, dimensions, openings, and construction.
 - 3. Internal blocking for hardware attachment, and details for cutouts and hardware.
 - 4. Condition at floor and at door bottom to clear flooring material on both sides.
- E. Samples: 8 inch square sample representing the construction, glazing bead, face material and each shop-applied finish.
- F. Certifications:
 - 1. Letter from manufacturer certifying that construction of doors meets referenced NAAWS and WDMA Quality Standards; note which Standards were met.
- G. Qualifications Data: For manufacturer.
- H. Warranty: Sample copy of warranties

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Shall have a minimum 5 years of experience producing of type and quality of doors specified, capable of performing to WDMA and NAAWS standards.
- B. Source Limitations: Obtain wood doors through one source from a single manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and requirements of WDMA IS 1-A.
- B. Mark each door with opening number used on Shop Drawings.
- C. Deliver in manufacturer's original unopened protective material. Inspect for damage before accepting. Break package on site to permit ventilation.

- D. Store on flat, level surface, off the floor, with cross supports and protective plywood under bottom door and over top of stack. Store in area with no great variation of heat, dryness, or humidity. Protect from damage. Do not drag doors across one another.

1.05 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 remainder of construction period, but no less than the following:
 - 1. 25 to 55 percent relative humidity, and 50 to 90 deg F temperature range conditions.
 - 2. Condition doors to average prevailing humidity in installation area prior to hanging.
- B. Field verify actual measurements/openings by field measurements before fabrication.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide warranty where manufacturer agrees to repair or replace doors that fail in materials or workmanship within 5 years. Failures include:
 - 1. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - 2. Telegraphing of core construction in face veneers over 0.01 inch in 3 inch span

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Lynden Door.
 - 2. Oregon Door.
 - 3. Vancouver Door.
 - 4. VT Industries.
 - 5. Or approved equal.

2.02 WOOD DOORS - GENERAL

- A. Wood Doors:
 - 1. Quality Standards: Comply with NAAWS Section 9, WDMA IS 1-A standards.
 - 2. Conform to "Premium" Grade standards for clear/transparent-finished doors.
 - 3. Performance Grade: "Heavy-Duty" per WDMA IS 1-A.
 - 4. Specifications contain selections chosen from options in quality standards and additional requirements beyond those of quality standards.
- B. Adhesives and composite wood and agrifiber materials used on the inside of the vapor barrier of the building shall not contain added urea-formaldehyde (NAUF).

2.03 WOOD DOORS - INTERIOR

- A. Interior Flush Wood Doors - Non-Rated:
 - 1. Cores: Solid core. Structural Composite Lumber Core (SCLC), or Stave Lumber Core (SLC) as allowed by reference standard and grade specified.
 - 2. Construction: 5-ply. Stiles and rails are bonded to the core, then entire unit is abrasive planed before veneering. Hot press.
 - 3. Face Veneer: HPVA HP-1.

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WOOD DOORS
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- a. Grade AA (Premium Grade).
 - b. Species: Birch.
 - c. Cut/Match: Plain sliced, Book Matched.
 - d. Veneer Thickness: Minimum 1/50 inch (before sanding).
4. Door Thickness: 1 3/4 inch thick.
5. Exposed Edges (vertical and top): Solid stock matching species of face veneer.
6. Factory Finish: Clear/transparent finish.
 - a. Color: Golden, matching sample approved by Architect.
- B. Interior Partially Glazed Flush Wood Doors - Non-Rated:
 1. Cores/Construction: Solid core, 5-ply Structural Composite Lumber Core (SCLC), or as required by manufacture to support fully glazed doors and door sizes indicated.
 2. Rails: Manufacturer's standard side and top rail width as required to support fully glazed doors/sizes; provide minimum 12 inch bottom rail.
 3. Face Veneer: HPVA HP-1.
 - a. Grade AA (Premium Grade).
 - b. Species: Birch.
 - c. Cut/Match: Plain sliced, Book Matched.
 - d. Veneer Thickness: Minimum 1/50 inch (before sanding).
 4. Door Thickness: 1 3/4 inch thick.
 5. Exposed Edges (vertical and top): Match face veneer.
 6. Glazing: As indicated on Drawings; factory-glazed.
 7. Factory Finish: Clear/transparent finish.
 - a. Color: Golden, matching sample approved by Architect.

2.04 ACCESSORIES

- A. Glass and Glazing: Factory-glazed, including safety glazing as indicated on Drawings and Schedules. Refer to Section 08 80 00 - Glazing.
- B. Frames: Custom wood as specified in Section 06 20 00 – Finish Carpentry.
- C. Door Hardware: As specified in Section 08 71 00 - Door Hardware.

2.05 FABRICATION

- A. General: Fabricate in accordance with referenced WDMA and NAAWS Quality Standards, and in compliance with NFPA for fire-rated doors.
 1. Doors shall meet specified WDMA performance duty level, including face screw holding requirement. Surface applied hardware shall be installed with screws; through-bolts are not acceptable.
 2. Factory-machine doors carefully for door hardware that is not surface-applied. Accurately drill, mortise, bevel or otherwise work doors to template for specified hardware.
 3. Openings: Cut and trim openings through doors to comply with requirements of referenced standards. Factory glaze doors. Provide non-removable stops on secure side of interior doors for glass.
- B. As applicable, mill doors to accommodate frames indicated.

1. Factory-fabricate doors to fit properly and to suit frame-opening sizes indicated, with uniform clearance at each edge, in accordance to WDMA IS 1-A. Unless more stringent requirements are indicated, conform to WDMA IS 1-A.
- C. Fabrication Tolerances:
 1. Height and Thicknesses (as scheduled): $\pm 1/16$ inch;
 2. Squareness: All four corners shall be square, and diagonal measurement of the face shall vary a maximum $1/8$ inch;
 3. Flatness, Warp, Bow, Cup or Twist: Maximum $1/4$ inch in plane of door.

2.06 FINISHES

- A. Shop-Applied Finishes - General:
 1. Comply with the referenced NAAWS Quality standard for factory (shop) finishing. Complete fabrication, including openings, and machining for hardware that is not surface applied, before finishing.
 - a. Finish faces, all four edges, edges of cutouts, and mortises.
 - b. Include fillers on bottom edges, edges of cutouts and mortises.
- B. Shop-Applied Finishes:
 1. Clear/Transparent Finish: Factory finish doors in accordance with Grade indicated, WDMA "TR-6", UV-cured catalyzed polyurethane".
 - a. Color: "Golden", matching sample approved by Architect.
 - b. Apply finishes to match samples accepted in the submittal process.
 - c. Completely sand face of doors before final finish.
 - d. Sand; apply two coats sealer; sand; apply one coat sealer; and apply top coat.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section.
 1. Ensure that conditions relating to wall structural framing, fire rated construction, door hardware, thresholds and finished flooring have been coordinated and meet requirements.
- B. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and provisions of the Contract Documents.
- B. Installation – General:
 1. Installed doors shall be plumb, square, and level.
 2. Align in frames for uniform clearance at each edge.
 3. Do not impair the utility of structural strength of doors when fitting and trimming, applying hardware, or other detailing.
 4. Do not trim top of bottom edge by more than $3/4$ inch without additional blocking. Trim door height to maximum $1/4$ inch clearance between door and threshold or door and finished floor surface.

- 5. Visual Inspection Standards: Comply with WDMA IS 1-A F-6.
- C. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.
- D. Installation Tolerances: Conform to WDMA IS 1-A requirements for fit and clearance tolerances including but not limited to the following:
 - 1. Clearance between the top, hinge edge, and lock edge to the frame and meeting edge of pair of doors shall be maximum 1/8 inch.
 - 2. At Thresholds: Provide 1/4 inch from bottom of door to top of threshold.

3.03 ADJUSTING, CLEANING, AND REPLACEMENT

- A. Make adjustments required. Perform adjusting in accordance with following:
 - 1. Adjust door for smooth and balanced door movement.
 - 2. Adjust closer for full closure, with closing force complying with ADA.
- B. Restore damaged finishes, site cuts, and machined surfaces and edges prior to installation. Return to shop, doors that cannot be acceptably refinished on site.
 - 1. Remedial work such as filling and sanding to correct excessive damage is not acceptable in lieu of replacement.
 - 2. Replace site-refinished or repaired work not acceptable to Architect.
- C. Remove and replace warped doors, doors that show telegraphing of cores in face veneers, do not operate or swing freely, and doors or frames that do not conform to tolerances of reference standards, or otherwise do not comply with specifications, with new undamaged work meeting specifications.

3.04 PROTECTION

- A. Protect installed work as required to ensure that the work is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08 14 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. In-swing, exterior fiberglass entry doors.
- B. Related work in other sections:
 - 1. Section 06 10 00 – Rough Carpentry.
 - 2. Section 06 20 00 – Finish Carpentry.
 - 3. Section 06 65 00 – Plastic Simulated Wood Trim.
 - 4. Section 07 25 00 – Weather Barriers.
 - 5. Section 07 92 00 – Joint Sealants.
 - 6. Section 08 71 00 – Door Hardware.

1.02 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 502 – Voluntary Specification for Field Testing of Windows and Doors.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections and locations, anchorage methods and locations, hardware locations, and installation details.
- D. Samples: Submit full-size or partial full-size sample of door illustrating glazing system, quality of construction, and color of finish.
- E. Warranty: Submit manufacturer's standard warranty.

1.04 PERFORMANCE REQUIREMENTS

- A. All fiberglass doors shall meet or exceed the Commercial provisions of the 2021 Washington State Energy Code (WSEC-C).
 - 1. Exterior swinging doors shall have a maximum U-factor of U-0.37.
 - 2. Swinging door U-factor shall be rated in accordance with NFRC-100.

1.05 COORDINATION

- A. Access Control: Coordinate rough-in and pathways for electrified door hardware and access control. Refer to Section 08 71 00 – Door Hardware for additional details and requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site undamaged in manufacturer's or sales branch's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name. Include installation instructions.
- B. Storage: Store materials in an upright position, off ground, under cover, and protected from weather, direct sunlight, and construction activities.
- C. Handling: Protect materials and finish during handling and installation to prevent damage.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Special Manufacturer Warranty: Manufacturer's transferrable, non-prorated limited warranty.
 - 1. Warranty Period, Glass: 20 years, non-impact.
 - 2. Warranty Period, Non-Glass Parts: 10 years.
 - 3. Warranty Period, Exterior Coating, Fading and Hardware Corrosion:
 - a. Exterior Coating: Limited lifetime of the original structure
 - b. Fading: 20 years
 - c. Hardware Corrosion: 10 years
- C. Special Installer Warranty: Installer's standard form in which installer agrees to repair or replace patio doors that fail due to poor workmanship or faulty installation within the specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS**2.01 MANUFACTURER**

- A. Acceptable Manufacturers: Subject to compliance with the specifications listed below.
 - 1. Pella Corporation.
 - 2. Trustile, A Marvin Brand.
 - 3. Andersen Windows and Doors.
 - 4. Or approved equal.

2.02 FIBERGLASS ENTRY DOORS

- A. Fiberglass Doors: Factory-assembled doors with inward-swing door panels installed in frames.
 - 1. Basis of Design: Pella Fiberglass Entry Door, In-Swing Composite Frame.
- B. Frames:
 - 1. Exterior surfaces are a multi-part composite material at the head and jambs.
 - 2. Interior surfaces are composite painted finish to match interior finish.
 - 3. Sills: Extruded thermally broken aluminum with PVC threshold.
 - a. Finish: Mill finish aluminum.
 - b. Door thresholds shall be ADA compliant.
- C. Fiberglass Door Panels:
 - 1. Fiberglass Door Panels:
 - a. 0.075-inch minimum fiberglass skin on exterior and interior surfaces with CFC-free injected foam insulating core.
 - b. Rails and Stiles: Wood top rails and stiles and wood plastic composite bottom rails secured with structural adhesive between skins at perimeter.
 - c. Fiberglass Grain: Smooth.
 - d. Lock Block: 12-inches or greater, solid wood.
 - e. Panel Thickness: 1-3/4 inches.
 - f. Panel Style: Glazed, Craftsman Light.
 - g. Finish: Factory applied, premium paint finish. Colors to be confirmed by Architect.
 - 1) Exterior Color: Brick Red.
 - 2) Interior Color: White.

- h. Decorative Accents:
 - 1) Provide factory applied Dentil Shelf.
- D. Hardware Preparation:
 - 1. Coordinate preparation of frames and panels to accept electrified hardware and access control components specified in Section 08 71 00 - Door Hardware, including:
 - a. Electric strike.
 - b. Door position sensor.
 - 2. Provide custom machining and hardware preparation for commercial grade hardware.
 - a. Manufacturer's standard hardware prep is not acceptable.
- E. Door Closer Reinforcement:
 - 1. Provide solid reinforcement positioned to support surface-mounted door closer.
 - 2. Door closer specified in Section 08 71 00 – Door Hardware.
- F. Weatherstripping:
 - 1. Dual-durometer extruded polymer along perimeter of door frames and along the bottom of door panels.
 - 2. Compression type foam filled weatherstrip at head and jambs.
 - 3. Sill: Dual durometer extruded polymer with bulb at bottom rail of door panel will contact threshold and include drip.

2.03 GLAZING

- A. Glazing:
 - 1. Float Glass: ASTM C 1036, Quality 1.
 - a. Tempered Glass: ASTM C 1036.
 - b. ASTM E1300 compliant.
 - 2. Type:
 - a. Tempered Insulating Glass: [Clear] [multi-layer Low-E coated with argon], dual-seal insulating glass, installed into high-performance glazing frames.
 - b. Craftsman Panel with tempered glass inserts, multi-layer Low-E coated with argon, dual-seal insulating glass.
 - c. Dual seal insulating glass shall be traditional rim glazed into panel.

2.04 HARDWARE

- A. Hinges: In-swing, 3 hinges per panel.
 - 1. Type: Self-closing, steel spring type.
 - 2. Finish: Stainless Steel.
- B. Locking Hardware: Specified in Section 08 71 00 – Door Hardware.
 - 1. Coordinate factory hardware prep for commercial door hardware and access controls.

2.05 TOLERANCES

- A. Doors shall accommodate the following opening tolerances:
 - 1. Vertical Dimensions Between High and Low Points: Plus 1/4 inch, minus 0 inch.
 - 2. Width Dimensions: Plus 1/4 inch, minus 0 inch.
 - 3. Building Columns or Masonry Openings: Plus or minus 1/4 inch from plumb.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and approved shop drawings.
- B. Install doors to be weather-tight and freely operating.
- C. Maintain alignment with adjacent work.
- D. Secure assembly to framed openings, plumb and square, without distortion.
- E. Integrate door system installation with exterior weather-resistant barrier using flashing/sealant tape. Apply and integrate flashing/sealant tape with weather-resistant barrier using watershed principles in accordance with door manufacturer's instructions.
- F. Place interior seal around door perimeter to maintain continuity of building thermal and air barrier using backer rod and sealant or insulating-foam sealant.
- G. Seal door to exterior wall cladding with sealant and related backing materials at perimeter of assembly.
- H. Leave doors locked and closed to prevent damage following installation.

3.03 QUALITY CONTROL

- A. Field Testing: Field-test doors in accordance with AAMA 502, Test Method A. Manufacturer's representative shall be present.

3.04 CLEANING AND PROTECTION

- A. Clean door frames and glass in accordance with Division 1 requirements.
 - 1. Do not use harsh cleaning materials or methods that would damage finish.
 - 2. Remove manufacturer's proprietary labels and visible markings.
- B. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 08 14 13

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Aluminum framed entrance doors.
- B. Related work in other sections:
 - 1. Section 06 10 00 – Rough Carpentry.
 - 2. Section 06 20 00 – Finish Carpentry.
 - 3. Section 06 65 00 – Plastic Simulated Wood Trim.
 - 4. Section 07 25 00 – Weather Barriers.
 - 5. Section 07 92 00 – Joint Sealants.
 - 6. Section 08 71 00 – Door Hardware.
 - 7. Section 08 81 00 – Glazing.
 - 8. Division 27 – Communications and Access Control.

1.02 PERFORMANCE REQUIREMENTS

- A. General Performance:
 - 1. Aluminum-framed entrance system shall withstand the effects of the following performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Air Leakage:
 - 1. For single-acting offset pivot or butt-hung entrances in the closed and locked position, the test specimen shall be tested in accordance with ASTM E 283 at a pressure differential of 1.57 psf (75 Pa) for single doors and pairs of doors.
 - 2. A single 3'0" x 7'0" entrance door and frame shall not exceed 1.0 cfm/ft².
- C. Structural-Test Performance:
 - 1. Corner strength shall be tested per the Kawneer dual moment load test procedure and certified by an independent testing laboratory to ensure weld compliance and corner integrity. (Testing procedure and certified test results are available upon request.)
- D. Thermal Performance: Computer simulation testing shall be in accordance with NFRC 100/200/500 and AAMA 507-03.
- E. All aluminum framed doors shall meet or exceed the Commercial provisions of the 2021 Washington State Energy Code (WSEC-C).
 - 1. Exterior swinging doors shall have a maximum U-factor of U-0.37.
 - 2. Swinging door U-factor shall be rated in accordance with NFRC-100.

1.03 COORDINATION

- A. Access Control: Coordinate rough-in and pathways for electrified door hardware and access control. Refer to Section 08 71 00 – Door Hardware for additional details and requirements.
- B. Pre-Installation Meeting: Review conditions and installation requirements, including Owner's security vendor review of security device and cabling locations, prior to installation.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections and locations, anchorage methods and locations, hardware locations, and installation details.
- D. Samples: Submit full-size or partial full-size sample of door illustrating glazing system, quality of construction, and color of finish.
- E. Warranty: Submit manufacturer's standard warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least ten (10) years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience and approved by manufacturer.
- C. Source Limitations:
 - 1. Obtain aluminum-framed entrance doors through one source from a single manufacturer.

1.06 PROJECT SITE CONDITIONS

- A. Field Measurements: Verify locations of structural supports and adjacent conditions by field measurements before fabrication and indicate measurements on Shop Drawings.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Special Manufacturer Warranty:
 - 1. 10-years covering failure of exterior finishes and of glass seal on insulating glass unit.
 - 2. Finish (Class I Clear Anodized): Manufacturer's 5-year Finish Warranty against failure.
- C. Special Installer Warranty: Installer's standard form in which installer agrees to repair or replace doors that fail due to poor workmanship or faulty installation within the specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion

PART 2 - PRODUCTS**2.01 PERFORMANCE**

- A. Regulatory Requirements:
 - 1. Comply with IBC including seismic requirements determined according to ASCE 7.
 - 2. Safety Glazing: Conform to IBC Chapter 24.
 - 3. Comply with ADA.
 - 4. Energy Performance (exterior systems): Comply with Washington State Non- Residential Energy Code.
 - 5. Provide NFRC certified and labeled system.
 - 6. Shading Coefficient and U-factor Requirements: See Drawings.
- B. Design/Performance Requirements:

- C. General Performance: Provide systems that withstand the effects of the indicated performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction.
- D. Design Wind Loads (exterior systems): As indicated on Structural General Notes.
- E. Movement of Structure: Provide aluminum-framed entrances and frames capable of withstanding movements of supporting structure.
- F. Tested Performance:
 - 1. Exterior Doors: Provide systems which have been manufactured, fabricated and installed to support the following requirements:
 - a. Uniform Load: Tested per ASTM E330.
 - 1) Deflection under design load shall not exceed $L/175$ of the clear span.
 - 2) Exterior Swing Doors: Apply 60 psf (single door) and 50 psf (pair of doors) static air design load in positive and negative direction. At 1.5 x design load, assemblies do not evidence deflection exceeding limits; and no glass breakage or permanent set in framing over 0.2 percent of clear span.
 - 2. Air Infiltration: Tested per ASTM E283, air infiltration rate for doors (single or pair) shall not exceed 1.0 cfm/sq. ft. at air pressure differential of 1.57 psf.
 - 3. Thermal Transmittance: System U-Factor maximum 0.34 BTU/Hr/Ft²/°F in accordance with NFRC 100.
- G. Thermal Movement: Design capable of withstanding thermal movements resulting from temperature change (range) of 180 degrees F. Operating doors shall function normally over this temperature range

2.02 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Kawneer.
 - 2. EFCO.
 - 3. Arcadia.
 - 4. Or approved equal.

2.03 ALUMINUM FRAMED ENTRANCE DOORS

- A. Exterior Aluminum-Framed Entrance Doors: Commercial, thermally broken, aluminum-framed, glazed, swing doors with dual moment corner construction.
 - 1. Basis of Design: Kawneer Insulclad Thermal Entrance, 560 Wide Stile.
 - a. Vertical face dimension: 5-9/16" (141.3 mm)
 - b. Top Rail: 5-9/16" (141.3 mm)
 - c. Bottom Rail: 7-1/16" (179.4 mm)
 - d. Optional Bottom Rail: 10" (254.0 mm)
 - 2. Major portions of the door members shall be 0.125" (3.2 mm) nominal thickness.
 - 3. Glazing molding shall be 0.05" (1.3 mm) thick.
 - 4. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer. Provide adjustable glass jacks to help center the glass in the door opening.
 - 5. Hardware and Accessories: Continuous geared hinges, offset hinges (where indicated), EPDM blade gasket sweep strip on door bottom (concealed fasteners), and polymeric bulb weatherstripping.

B. Components:

1. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
2. Reinforcements: High-strength aluminum or steel coated with rust-inhibitive primer for concealed locations, as required to meet performance requirements including concealed steel to reinforce mullions:
3. Aluminum Plate Closures, Covers, Sills, Brake Shapes, and Other Components: Aluminum sheet matching entrances color and finish. Thickness as indicated, and as recommended by manufacturer for conditions of installation.

C. Accessories:

1. Anchors, Clips and Accessories: Aluminum, non-magnetic stainless steel, or recommended by entrance manufacturer, of sufficient strength to withstand design pressure indicated.
2. Fasteners: 300 or 400 Series stainless steel, non-corrosive and compatible with door materials, and as recommended by manufacturer for conditions of installation. Concealed fasteners except where unavoidable for installation of hardware.
3. Thermal separators: Silicon compatible, continuous extruded EPDM 70 spacer at frame and pressure plates; sponge neoprene zone dams at framing intersection.
4. Weather Seals: "Sealair", thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
5. Shims: Nonstaining, nonferrous shims for aligning system components.

2.04 MATERIALS**A. Aluminum Extrusions:**

1. Alloy and temper recommended by aluminum-framed entrance door manufacturer for strength, corrosion resistance, and application of required finish.
2. Not less than 0.090" (2.3 mm) wall thickness at any location for the main frame and door leaf members.

B. Glazing: See Glazing Schedule on Drawings. Refer to requirements in Section 08 80 00 - Glazing suitable for installation, including GANA Glazing Manual.

1. Safety glass where indicated and as required by code.
2. Setting Blocks: Manufacturer's standard elastomeric type, and as recommended by GANA Glazing Manual.
 - a. Setting blocks used in conjunction with soft-coat low-e glass shall be silicone.
3. Warm Edge Spacers (IGUs): As specified in Section 08 80 00.
4. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
5. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber, color black.

2.05 HARDWARE**A. General Hardware Requirements:** Provide manufacturer's standard hardware

1. Hardware shall be fabricated from aluminum, stainless steel, or other corrosion-resistant material that is compatible with aluminum.
2. Hardware shall be designed to smoothly operate, tightly close, and securely lock aluminum- framed entrance doors.
3. Coordinate electrified hardware specified in Section 08 71 00 – Door Hardware.

- B. Standard Hardware:
 - 1. Weather-Stripping:
 - a. The door weathering on a single-acting offset pivot or butt hung door and frame (single or pairs) shall be comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
 - 2. Sill Sweep Strips:
 - a. EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners (necessary to meet specified performance tests)
 - 3. Threshold:
 - a. Extruded aluminum.
 - b. One piece per door opening
 - c. Ribbed surface, ADA compliant.
- C. Refer to Section 08 71 00 – Door Hardware for additional hardware requirements.

2.06 FABRICATION

- A. General: Fabricate components that, when assembled, will have the following:
 - 1. Profiles shall be sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Conceal fastenings, anchors and connection devices to greatest extent possible.
 - 4. Fastenings shall not impair independent frame movement, or bridge thermal barrier, unless such bridging was also present in thermal test units and thermal models.
 - 5. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter from exposed surfaces by grinding.
 - 6. Prepare components to receive door hardware, concealed fasteners and anchor and connection devices.
 - 7. Provisions for field replacement of glazing.
- B. Thermal Movement: Accommodate thermal and mechanical movements to maintain required glazing edge clearances, and performance criteria specified, without damage.
- C. Thermal Barriers (exterior doors): Install to provide physical and thermal isolation of glazing from framing members. Mechanical fasteners, welded components and hardware items shall not bridge thermal barriers. Thermal barriers shall align at all frame and sash corners.
- D. Welding: Weld components before finishing components, in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- E. Glazing Pockets: Provide minimum clearances for thickness and type of glass per GANA.

2.07 ALUMINUM FACTORY FINISH

- A. Finish designations that are prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Factory Finish - Aluminum:
 - 1. Clear Anodized Aluminum Finish: AA-M12C22A41, Architectural Class I, meeting AAMA 611, Kawneer #14 Clear anodized aluminum.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section.
 - 1. Verify that aluminum storefront framing to receive entrance doors is within allowable tolerances, plumb, level, and ready to receive entrances including installation of hardware.
- B. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 PREPARATION

- A. Remove dust, dirt and loose debris and the like, that may interfere with installation.
- B. Apply protective coating, isolation tape, or other barrier to protect aluminum from cementitious materials and dissimilar metals subject to galvanic action.
- C. Coordinate installation of hardware specified in Section 08 71 00 - Door Hardware.

3.03 INSTALLATION

- A. Installation - General: Install entrances in accordance with manufacturer's instructions.
 - 1. Fit to produce hairline joints free of burrs and distortion.
 - 2. Erect components and systems to building benchmarks; in alignment with established lines and grades as indicated; rigid, level, square and true.
 - 3. Plumb and align door faces in single plane for each wall plane.
 - 4. Installations shall be free of warp or twist and aligned with adjacent work as indicated.
- B. Exterior Systems: Install components to drain water passing joints, condensation occurring within framing members, and moisture migration.
 - 1. Anchor frames solidly to surrounding building structure to prevent distortion or misalignment using concealed fasteners, and to maintain positions permanently when subjected to normal thermal and building movement and specified wind loads. Rigidly secure nonmovement joints.
- C. Field Glazing: Install glazing according to requirements of Section 08 80 00 - Glazing. Install glazing gaskets and sealants in accordance with manufacturer's instructions.
- D. Galvanic Action: Separate dissimilar metals and prevent galvanic corrosion, and provide protection as approved by manufacturers of materials in contact.
 - 1. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 2. Protect aluminum in contact dissimilar materials, by coating contact surfaces, or installing nonconductive spacers or other suitable insulating material, as recommended by manufacturers for conditions of installation.
- E. Apply sealants, for weathertight installation, at joints, intersections and perimeters to surrounding construction as specified in Section 07 92 00 - Joint Sealants. Wipe off excess material and leave exposed surfaces and joints clean and smooth as work proceeds.

3.04 QUALITY CONTROL

- A. Manufacturer's Field Services: As required by warranties, and upon request by Owner, provide field services including periodic site observation/reports for conformance with manufacturer's recommendations.

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- B. Field Testing: Coordinate spray testing after entrances are installed.
- C. Corrective Work: Repair or remove and replace Work that does not meet specifications.

3.05 ADJUSTING AND CLEANING

- A. Inspect and adjust after installation. Remove and replace defective installations.
- B. Touch-Up and Repair: Immediately after installation, touch-up scratched, nicked, abraded, chipped, or otherwise damaged areas of the finish in accordance with manufacturer's instructions, and to the satisfaction of the Owner. Replace damage not satisfactory.
- C. Leave exposed surfaces and joints clean and smooth, free of labels and dirt.
- D. Remove excess sealants using materials and methods acceptable to manufacturers.
- E. Wash down surfaces with solution of mild detergent in warm water, applied with soft, clean wiping cloths or as recommended by manufacturer. Wipe surfaces clean.

END OF SECTION 08 41 13

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Aluminum clad fixed and hung window units.
- B. Related work in other sections:
 - 1. Section 06 10 00 – Rough Carpentry.
 - 2. Section 06 20 00 – Finish Carpentry.
 - 3. Section 07 25 00 – Weather Barriers.
 - 4. Section 07 62 00 – Sheet Metal Flashing and Trim.
 - 5. Section 07 92 00 – Joint Sealants.
 - 6. Section 08 81 00 – Glazing.

1.02 REFERENCES

- A. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- B. ASTM E 547 - Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential.
- C. Window and Door Manufacturers Association (WDMA):
 - 1. AAMA/WDMA/CSA 101/I.S.2/A440 – North American Fenestration Standard/Specification for windows, doors and skylights.
 - 2. WDMA I.S.4 - Industry Specification for Preservative Treatment for Millwork.

1.03 PERFORMANCE REQUIREMENTS

- A. Window Air Leakage, ASTM E 283, 1.57 psf (25 mph): 0.05 cfm per square foot of frame or less.
- B. Window Unit Water Penetration: No water penetration through window unit when tested in accordance with ASTM E 547, under static pressure of 7.5 psf (52 mph) after 4 cycles of 5 minutes each, with water being applied at a rate of 5 gallons per hour per square foot.
- C. All new windows shall meet or exceed the Commercial provisions of the 2021 Washington State Energy Code (WSEC-C).
 - 1. Refer to the Window Schedule on sheet A9.01 for maximum SHGC and U-Factors.
 - 2. U-Factor and SHGC shall be rated in accordance with NFRC 100.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections and locations, anchorage methods and locations, hardware locations, and installation details.
- D. Samples: Submit full-size or partial full-size sample of window illustrating glazing system, quality of construction, and color of finish.
- E. Sample Warranties.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope, and location.
- B. Installer Qualifications: Certified in writing by the manufacturer and having a minimum of five years experience on projects of similar size and scope
- C. Mockup:
 - 1. Provide sample installation for field testing window performance requirements and to determine acceptability of window installation methods..
 - 2. Approved mockup shall represent minimum quality required for the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site undamaged in manufacturer's or sales branch's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name. Include installation instructions.
- B. Storage: Store materials in an upright position, off ground, under cover, and protected from weather, direct sunlight, and construction activities.
- C. Handling: Protect materials and finish during handling and installation to prevent damage.
 - 1. Jig, brace, or box window assemblies to prevent flexing and damage during transport.
 - 2. Protect all finished surfaces with non-adhesive or bonding wrapping.
- D. Windows damaged during shipping or storage shall be replaced with new units.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Special Manufacturer Warranty:
 - 1. Clear Insulated Glass Units: 20 years from date of purchase.
 - 2. Exterior Aluminum Cladding Finish: 20 years from date of purchase.
 - 3. Factory Applied Interior Finish: 5 years from date of purchase.
 - 4. Hardware and Non-Glass Components: 10 years from date of purchase
- C. Special Installer Warranty: Installer's standard form in which installer agrees to repair or replace windows that fail due to poor workmanship or faulty installation within the specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Acceptable Manufacturers:
 - 1. Pella.
 - 2. Marvin.
 - 3. Andersen Windows and Doors.
 - 4. Or approved equal.
- B. Substitutions: Submit in accordance with Section 01 2500 – Substitution Procedures.

2.02 ALUMINUM-CLAD WOOD WINDOWS

- A. Aluminum-Clad Wood Windows: Factory-assembled aluminum-clad wood windows.
 - 1. Basis of Design: Pella Lifestyle Series, Double-Hung Frames.
 - a. Includes both fixed and factory mulled hung units, refer to the window schedule.
- B. Frame:
 - 1. Select woods, water-repellent, preservative-treated with EnduraGuard® in accordance with WDMA I.S.-4. EnduraGuard includes water-repellency, three active fungicides and an insecticide applied to the frame.
 - 2. Interior Exposed Surfaces: Pine.
 - 3. Exterior Surfaces: Clad with aluminum.
 - 4. Overall Frame Depth: 5 inches.
- C. Sash:
 - 1. Select woods, water water-repellent, preservative-treated with EnduraGuard in accordance with WDMA I.S.-4. EnduraGuard includes water-repellency, three active fungicides and an insecticide applied to the sash.
 - 2. Interior Exposed Surfaces: Pine.
 - 3. Exterior Surfaces: Clad with aluminum, lap-jointed at corners.
 - 4. Corners: Mortised and tenoned, glued and secured with metal fasteners.
 - 5. Operable sash tilt to interior for cleaning or removal.
 - 6. Sash Thickness: 1-13/16 inches.
- D. Weather Stripping:
 - 1. Foam with 3-mil vinyl skin at frame head and at lower sash bottom rail.
 - 2. Thermal-plastic elastomer with slip-coating set into upper sash for contact at checkrail.
 - 3. Secondary polyvinyl chloride (PVC) leaf-type weather strip on bottom sash at sill.
 - 4. Water-stop santoprene wrapped foam at head and sill.
 - 5. Vinyl-wrapped foam inserted into jambliner components to seal to sides of sash.

2.03 GLAZING

- A. Glazing:
 - 1. Float Glass: ASTM C 1036, Quality 1.
 - a. Tempered Glass: ASTM C 1048.
- B. Type: Multi-layer, Low-E coated with argon, dual-seal insulating glass, silicone-glazed.

2.04 OPTIONS

- A. Insect Screens: Double-hung Hidden Screen.
 - 1. Compliance: ASTM D 3656 and SMA 1201.
 - 2. Screen Cloth: Black vinyl-coated Fiberglass, 18/18 mesh.
 - 3. Set in exterior mounted aluminum channels with retractable screen cloth.
 - 4. Frame color: Standard color to be selected by Architect.

2.05 HARDWARE

- A. Balances: Comply with AAMA 902 specification
 - 1. Block-and-tackle balances connected to self-locking shoes with zinc die cast terminals concealed within the frame.
 - 2. Balances are attached to frame and connected to sash with polyester cord.

3. Class 5 hybrid balance attached to locking balance shoes connected to the sashes using zinc die cast terminals and concealed within the frame.
 4. Galvanized block-and-tackle balances combined with a Class 5 hybrid balance attached to non-locking balance shoes connected to the sashes using zinc die cast terminals and concealed within the frame.
- B. Locking System:
1. Two-piece locking system with lock and keeper, standard cam-action.
 - a. One installed on units with frame width less than 37 inches, 2 locks installed on units with frame width of 37 inches or greater.
- C. Sash Lifts:
1. Sash lift furnished for field installation.
 2. One sash lift on units with frame width less than 37 inches, 2 sash lifts on units with frame width of 37 inches or greater.
- D. Hardware Finish: Stain Brass; Architect to confirm during the submittal phase.

2.06 TOLERANCES

- A. Windows shall accommodate the following opening tolerances:
1. Vertical Dimensions Between High and Low Points: Plus 1/4 inch, minus 0 inch.
 2. Width Dimensions: Plus 1/4 inch, minus 0 inch.
 3. Building Columns or Masonry Openings: Plus or minus 1/4 inch from plumb.

2.07 FINISH

- A. Exterior Finish System: High-performance, specialty finish with enhanced fade resistance.
1. Basis of Design: Pella EnduraClad Plus.
 2. Exterior aluminum surfaces shall be finished with the following multi-stage system:
 - a. Clean and etch aluminum surface of oxides.
 - b. Pre-treat with chrome phosphate conversion coating.
 - c. Pre-treat with chromic acid sealer/rinse.
 - d. Top coat with baked-on 70% fluoropolymer-based enamel.
 3. Color: Standard color to be selected by Architect.
 4. Performance Requirements: Exterior aluminum finishes shall meet or exceed all performance requirements of AAMA 2605.
- B. Interior Finish: Factory finished stain. Color: Natural Stain.

2.08 SOURCE QUALITY CONTROL

- A. Factory Testing: Factory test individual standard operable windows for air infiltration in accordance with ASTM E 283, to ensure compliance with this specification.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Examine areas to receive windows. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Ensure all rough opening flashings are in place and approved for cover prior to installation.

3.03 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions and approved shop drawings.
- B. Install windows to be weather-tight and freely operating.
- C. Maintain alignment with adjacent work.
- D. Secure assembly to framed openings, plumb and square, without distortion.
- E. Integrate window system installation with exterior water-resistant barrier using flashing/sealant tape. Apply and integrate flashing/sealant tape with water-resistant barrier using watershed principles in accordance with window manufacturer's instructions.
- F. Place interior seal around window perimeter to maintain continuity of building thermal and air barrier using backer rod and sealant and insulating-foam sealant.
- G. Seal window to exterior wall cladding with sealant and related backing materials at perimeter of assembly.
- H. Leave windows closed and locked.

3.04 QUALITY CONTROL

- A. Field Testing: Field water testing shall be conducted in accordance with ASTM E1105 Test Procedure B. The test pressure shall be based on the maximum positive components and cladding design pressure. Utilizing the AAMA 502 field test reduction, the water test pressure is 10% of the maximum positive design pressure.

3.05 CLEANING

- A. Clean window frames and glass in accordance with Division 1 requirements.
- B. Do not use harsh cleaning materials or methods that would damage finish.
- C. Remove labels and visible markings.
- D. Protect installed windows to ensure that, except for normal weathering, windows will be without damage or deterioration at time of substantial completion.

END OF SECTION 08 52 13

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Hardware for wood, fiberglass, and aluminum doors.
 - 2. Thresholds.
 - 3. Weatherstripping and gasketing.
- B. Related work in other sections:
 - 1. Section 08 14 00 – Wood Doors.
 - 2. Section 08 16 13 – Fiberglass Doors.
 - 3. Section 08 41 13 – Aluminum Framed Entrances.
 - 4. Section 27 05 00 - Common Work Results for Communications.
 - 5. Section 28 31 00 - Fire Detection & Alarm.

1.02 REFERENCES

- A. Reference Standards: Applicable provisions of the most recent adopted editions of the following standards shall apply to the work of this Section:
 - 1. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
 - 2. ASTM E283/E283M - Standard Test Method for Determining Rate of Air
 - 3. Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2019.
 - 4. DHI Sequence and Format for the Hardware Schedule 2019.
 - 5. DHI Keying Systems and Nomenclature 2019.
 - 6. DHI Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames 2004.
 - 7. DHI WDHS.3 Recommended Locations for Architectural Hardware for Flush Wood Doors 1993, also in WDHS-1/WDHS-5 Series, 1996.
 - 8. IBC International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - 9. ICC A117.1 Accessible and Usable Buildings and Facilities 2017.
 - 10. NFPA 70 National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - 11. NFPA 80 Standard for Fire Doors and Other Opening Protectives 2022.
 - 12. NFPA 101 Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - 13. NFPA 105 Standard for Smoke Door Assemblies and Other Opening Protectives 2022.
 - 14. NFPA 252 Standard Methods of Fire Tests of Door Assemblies 2022.
 - 15. UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

- B. Sequencing and Scheduling: Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.
- C. Pre-Installation Meetings: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
 - 1. Architect.
 - 2. Hardware Supplier's Architectural Hardware Consultant (AHC).
 - 3. Hardware Installer.
 - 4. Owner's Security Consultant.
- D. Furnishing: Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- E. Keying Requirements Meeting:
 - 1. Schedule meeting at project site prior to Contractor occupancy.
 - 2. Attendance Required:
 - a. Contractor.
 - b. Owner.
 - c. Hardware Supplier's Architectural Hardware Consultant (AHC).
 - d. Door Hardware Installer.
 - e. Owner's Security Consultant.
 - f. Manufacturer's Representative (if required)
 - 3. Agenda:
 - a. Establish keying requirements.
 - b. Verify locksets and locking hardware are functionally correct for project requirements.
 - c. Verify that keying and programming complies with project requirements.
 - d. Establish keying submittal schedule and update requirements.
 - 4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
 - a. Access control requirements.
 - b. Key control system requirements.
 - 5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
 - 6. Deliver established keying requirements to manufacturers.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings – Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 - 2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
 - a. Submit in vertical format.

3. List groups and suffixes in proper sequence.
 4. Include complete description for each door listed.
 5. Include manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
 6. Include account of abbreviations and symbols used in schedule.
- D. Shop Drawings – Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
 2. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
 3. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.
 4. Provide electrical operation technical sheets including product schematics, point to point diagrams, and electrical requirements of all electrified hardware. Completely coordinate with the general contractor, electrical engineer, electrician, security access subcontractor and the installer. Operational descriptions are for demonstration only – verify operational intent with the owner, architect and electrical engineer.
- E. Samples for Verification:
1. Submit samples if requested.
 2. Architect will return full-size samples to Contractor.
 3. Include product description with samples.
- F. Closeout: Submit in accordance with provisions of Division 01:
1. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
 2. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
 - a. Bitting List: List of combinations as furnished.
 3. Keying Schedule:
 - a. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
 4. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 5. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
 - a. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.05 QUALITY ASSURANCE

- A. Qualifications:

1. Manufacturer (Supplier) Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.
 2. Installer (Applicator) (Erector) Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.
- B. Regulatory and Operational Requirements:
1. Provide hardware for all openings, whether specified or not, in compliance with NFPA Standard No. 80, proper operation and local building code requirements. Where required, provide only hardware which has been tested and listed by UL or FM for types and sizes of doors required and complies with requirements of door and door frame labels. Label hardware, as required, for compliance with pressure testing criteria as dictated in IBC.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
1. Closers: Twenty Five years, minimum.
 2. Exit Devices: Ten years, minimum.
 3. Locksets and Cylinders: Ten years, minimum.
 4. Electrical Hardware: One year, minimum.
 5. Other Hardware: Two years, minimum.
 6. Provide a manufacturer's variance on the manufacturer's letterhead that indicates that they will comply with these requirements (if not compliant).

PART 2 - PRODUCTS**2.01 PERFORMANCE**

- A. General Requirements:
1. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
 2. Door Pulls and Push Plates:
 - a. Provide door pulls and push plates on doors without a lockset, latchset, exit device, or auxiliary lock unless otherwise indicated.
 3. Closers:
 - a. Provide door closer on each exterior door, unless otherwise indicated.
 - b. Provide door closer on each fire-rated and smoke-rated door.
 4. Thresholds:
 - a. Exterior Applications: Provide at each exterior door, unless otherwise indicated.
 5. Smoke and Draft Control Seals:
 - a. Provide gasketing for smoke and draft control doors (Indicated as "S" on Drawings) that complies with local codes, requirements of assemblies tested in accordance with UL 1784.
 6. Weatherstripping and Gasketing:

- a. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
 - b. Provide door bottom sweep on each exterior door, unless otherwise indicated.
 - c. Fabricate as continuous gasketing, do not cut or notch gasketing material.
- 7. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
- 8. Fasteners:
 - a. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - b. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
 - c. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
 - d. Provide wall grip inserts for hollow wall construction.
 - e. Fire-Resistance-Rated Applications: Comply with NFPA 80.
 - f. Concealed Fasteners: Do not use through or sex bolt type fasteners on door panel sides indicated as concealed fastener locations, unless otherwise indicated or required per manufacturer's testing requirements.
- B. Performance/Design Criteria:
 - 1. Provide door hardware products that comply with the following requirements:
 - a. Applicable provisions of federal, state, and local codes.
 - 1) IBC.
 - 2) NFPA 101.
 - b. Accessibility: ADA Standards and ICC A117.1.
 - c. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 - d. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
 - e. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
 - f. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified.

2.02 HINGES

- A. Manufacturers: Conventional hinges.
 - 1. Listed in Door Hardware Schedule: Best
 - 2. Approved Substitutions: Hager, McKinney
 - 3. Continuous hinges are as manufactured by Best. Equal products by ABH or Select are acceptable.
- B. Properties:
 - 1. Butt Hinges: As applicable to each item specified.
 - a. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.

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- b. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
 - c. Template screw hole locations.
 - d. Pins:
 - 1) Easily seated, non-rising pins
 - 2) Non removable pins (NRP) as needed.
 - e. UL 10C listed for fire-resistance-rated doors.
- 2. Continuous Hinges: As applicable to each item specified.
 - a. Geared Continuous Hinges: As applicable to each item specified.
 - 1) Non-handed.
 - 2) UL 10C listed for fire-resistance-rated doors.
 - 3) Sufficient size to permit door to swing 180 degrees
 - 4) Best, equals by Select and ABH are acceptable.
- C. Finishes: See Door Hardware Schedule.
- D. Grades:
 - 1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 - 2. Continuous Hinges: Comply with BHMA A156.26, Grade 1.
- E. Types:
 - 1. Butt Hinges: Include full mortise hinges.
 - 2. Continuous Hinges: Include geared hinges.
- F. Options: As applicable to each item specified.
- G. Quantities:
 - 1. Butt Hinges: Three (3) hinges per leaves up to 90 inches in height. Add one (1) for each additional 30 inches in height or fraction thereof.
 - a. Hinge weight and size unless otherwise indicated in hardware sets:
 - 1) For doors up to 36 inches wide and up to 1-3/4 inches thick provide hinges with a minimum thickness of 0.134 inch and a minimum of 4-1/2 inches in height.
 - 2) For doors from 36 inches wide up to 42 inches wide and up to 1-3/4 inches thick provide hinges with a minimum thickness of 0.145 inch and a minimum of 4-1/2 inches in height.
 - 3) For doors from 42 inches wide up to 48 inches wide and up to 1-3/4 inches thick provide hinges with a minimum thickness of 0.180 inch and a minimum of 5 inches in height.
 - 4) For doors greater than 1-3/4 inches thick provide hinges with a minimum thickness of 0.180 inch and a minimum of 5 inches in height.
 - 2. Continuous Hinges: One per door leaf.
- H. Applications: At swinging doors.
 - 1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.
- I. Products:
 - 1. Butt Hinges:
 - a. Concealed or exposed bearing, five (5) knuckle.
 - b. Plain Bearing, Five (5) Knuckle.

2. Continuous Hinges:
 - a. Aluminum geared hinges.

2.03 LOCK CYLINDERS

- A. Manufacturers:
 1. Listed in Door Hardware Schedule: Schlage.
 2. Approved Substitutions: None – facility standard
- B. Properties:
 1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
 - a. Provide cams and/or tailpieces as required for locking devices.
 - b. Provide cylinders with appropriate format interchangeable cores where indicated.
- C. Material:
 1. Manufacturer's standard corrosion-resistant brass alloy.
- D. Products:
 1. Rim/mortise/removable cores.

2.04 MORTISE LOCKS

- A. Manufacturers:
 1. Listed in Door Hardware Schedule: Schlage.
 2. Substitutions: Dorma M1000, Schlage L9000, Sargent 8200
- B. Properties:
 1. Mechanical Locks: Manufacturer's standard.
 - a. Fitting modified ANSI A115.1 door preparation.
 - b. Door Thickness Coordination Fitting 1-3/4 inch (44 mm) to 2-1/4 inch (57 mm) thick doors.
 - c. Latch: Solid, one-piece, anti-friction, self-lubricating stainless steel.
 - 1) Latchbolt Throw: 3/4 inch (19 mm), minimum.
 - d. Auxiliary Deadlatch: One piece stainless steel, permanently lubricated.
 - e. Backset: 2-3/4 inch (70 mm).
 - f. Lever Trim:
 - 1) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
 - 2) Strength: Locksets outside locked lever designed to withstand minimum 1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
 - 3) Spindle: Designed to prevent forced entry from attacking of lever.
 - 4) Independent spring mechanism for each lever.
 - (a) Trim to be self-aligning and thru bolted.
 - 5) Handles: Made of forged or cast brass, bronze, or stainless steel construction. Levers that contain a hollow cavity are not acceptable.
 - 6) Levers to operate a roller bearing spindle hub mechanism.
 2. Electrified Locks: Same properties as standard locks, and as follows:
 - a. Voltage: 24 VDC.

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- b. Function: Electrically locked (Fail Safe) or unlocked (Fail Secure), as indicated for each lock in Door Hardware Schedule.
- C. Finishes: See Door Hardware Schedule.
 - 1. Core Faces: Match finish of lockset.
- D. Options:
 - 1. Provide locksets made in a manufacturing facility to compliant with ISO 9001-Quality Management and ISO 14001-Environmental Management.

2.05 EXIT DEVICES

- A. Manufacturers:
 - 1. Listed in Door Hardware Schedule: Precision 2000.
 - 2. Substitutions: Dorma 9000, Sargent 8800, Von Duprin 98/35
- B. Properties:
 - 1. Touchpads: "T" style metal touchpads and rail assemblies with matching chassis covers end caps.
 - 2. Latch Bolts: Stainless steel deadlocking with 3/4 inch projection using latch bolt.
 - 3. Cylinder: Include where cylinder dogging or locking trim is indicated.
 - 4. Strike as recommended by manufacturer for application indicated.
 - 5. Sound dampening on touch bar.
 - 6. Dogging:
 - a. Non-Fire-Resistance-Rated Devices: Manual dogging feature UNO
 - 7. Handing: Field-reversible.
- C. Grades: Complying with BHMA A156.3, Grade 1.
- D. Standards Compliance:
 - 1. Provide UL (DIR) listed exit device assemblies for fire-resistance-rated doors.
 - 2. Comply with UL 10C.
- E. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.

2.06 BOLTS

- A. Manufacturers:
 - 1. Listed in Door Hardware Schedule: Trimco
 - 2. Substitutions: DCI, ABH, Ives
- B. Properties:
 - 1. Flush Bolts:
 - a. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
 - b. Manual Flush Bolts: Manually latching upon closing of door leaf.
 - 1) Bolt Throw: 3/4 inch, minimum.
 - 2) Provide manual flush bolts where allowed by code.

2.07 CLOSERS

- A. Manufacturers:
 - 1. Listed in Door Hardware Schedule: Best EHD9016

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2. Approved Substitutions: LCN 4040XP, Sargent 271
- B. Properties:
 1. Surface Mounted Closers: Manufacturer's standard.
 - a. Construction: Cast Iron
 - b. Covers:
 - 1) Type: Standard for product selected.
 - (a) Full.
 - 2) Material: Plastic.
 - 3) Finish: Painted.
- C. Grades:
 1. Closers: Comply with BHMA A156.4, Grade 1.
 - a. Underwriters Laboratories Compliance:
 - b. Testing Standards Compliance: Meeting requirements of UL 10C for positive pressure.
- D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
- E. Types:
 1. Rack-and-pinion, surface-mounted. 1-1/2 inches minimum bore.
- F. Installation:
 1. Mounting: Includes surface mounted installations.
 2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.
 3. At outswinging exterior doors, mount closer on interior side of door.
 4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
 5. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.

2.08 STOPS AND HOLDERS

- A. Manufacturers:
 1. Listed in Door Hardware Schedule: Trimco
 2. Approved Substitutions: Rockwood, Don Jo
- B. General: Provide overhead stop/holder when wall or floor stop is not feasible. Do not install floor stops unless specifically approved by Architect.
- C. Grades:
 1. Door Holders, Wall Bumpers, and Floor Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.
- D. Material: Base metal as indicated for each item by BHMA material and finish designation.
- E. Types:
 1. Wall Bumpers: Bumper, concave, wall stop.
 2. Floor Stops: Provide with bumper floor stop.
- F. Installation:

1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.

2.09 WEATHERSTRIPPING AND GASKETING

- A. Manufacturers:
 1. Listed in Door Hardware Schedule: Pemko
 2. Approved Substitutions: Pemko, Zero
- B. Grades: Comply with BHMA A156.22.
- C. Products:
 1. Weatherstripping: See Door Hardware Schedule.
 2. Door Bottom Seals: See Door Hardware Schedule.
 3. Door Sweeps: See Door Hardware Schedule.
 4. Door Shoes: See Door Hardware Schedule.

2.10 KEYS AND CORES

- A. Manufacturers:
 1. Listed in Door Hardware Schedule: Schlage.
 2. Approved Substitutions: None – facility standard.
- B. Properties: Complying with guidelines of BHMA A156.28.
 1. Provide small format interchangeable core.
 2. Provide keying information in compliance with DHI standards.
 3. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
 4. Keying: Master keyed.
 5. Include construction keying and control keying with removable core cylinders.
 6. Brass construction cores. Plastic is not acceptable.
 7. Do not make brass construction cores and construction control and operating keys a part of Owner's permanent keying system, nor furnish in the same keyway (or key section) as Owner, permanent keying system.
 8. Supply keys in following quantities:
 - a. Grand Master Keys: 2 each.
 - b. Master Keys: 4 each.
 - c. Construction Master Keys: 6 each.
 - d. Construction Keys: 10 each.
 - e. Construction Control Keys: 1 each.
 - f. Permanent Control Keys: 1 each.
 - g. Change Keys: 3 each for each keyed core.
 - h. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
 9. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
 10. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

2.11 FINISHES

- A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
 - 1. Finish: 630; satin stainless steel. 652; satin chromium plated with steel base material, 626, satin chromium plated with brass/bronze base material and 689; aluminum painted, with any base material.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.
- B. Correct all defects prior to proceeding with installation.
- C. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

- A. Install (Apply) (Erect) in accordance with manufacturer's instructions for conditions of installation.
- B. Install hardware in accordance with manufacturer's instructions and applicable codes.
- C. Install hardware using the manufacturer's fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.
- D. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- E. Install hardware for smoke and draft control doors in accordance with NFPA 105.
- F. Use templates provided by hardware item manufacturer.
- G. Do not install surface mounted items until application of finishes to substrate are fully completed.
- H. Wash down masonry walls and complete painting or staining of doors and frames.
- I. Complete finish flooring prior to installation of thresholds.
- J. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
 - 1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
 - 2. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
 - 3. Mount hardware at locations and heights recommended by manufacturer, requirements of ANSI A117.1, ADA and State Building Code, as applicable.
- K. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.03 QUALITY CONTROL

- A. Field (Site) Tests and Inspections:
 - 1. Perform field inspection and testing under provisions of Division 1 – Quality Control.

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2. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.04 HARDWARE SCHEDULE

- A. TO BE ISSUED VIA ADDENDUM #1.

END OF SECTION 08 71 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Interior sidelight glazing.
 - 2. Insulated glass units in exterior doors and windows.
 - 3. Tempered/laminated glazing in exterior railings.
 - 4. Glazing sealants and accessories.
- B. Related work in other sections:
 - 1. Section 05 52 00 – Aluminum Railings.
 - 2. Section 06 20 00 – Finish Carpentry.
 - 3. Section 08 10 00 – Wood Doors.
 - 4. Section 08 14 13 – Fiberglass Doors.
 - 5. Section 08 41 13 – Aluminum Framed Entrances.
 - 6. Section 08 52 13 – Aluminum Clad Wood Windows.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and sealant thicknesses, with reasonable tolerances.
 - 2. Coordinate systems requiring glazing specified in other sections, including submittals.
- B. Pre-Installation Meetings: Convene to review field glazing requirements including temporary protection.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Shop Drawings indicating required glazing data incorporated with framing members.
 - 1. Show sizes and thicknesses of glass. Show proposed bites in frames.
 - 2. Show sizes and locations of blocks, beads, stops, edge treatments and the like.
 - 3. Note quality, type, color, and strength of each light.
- D. Samples:
 - 1. Fully Captured Units: Provide 12 inch square sample of each type of glass proposed for the project showing coloration, sealant (application and types), spacer, and insulating glass unit design.
- E. Glazing Schedule: List glass types and thicknesses for each size opening and location, using the same designations indicated in the Contract Documents.
- F. Product Test Reports: Tests performed by qualified testing agency, for coated glass.
- G. Preconstruction Adhesion and Compatibility Test Results.
- H. Certificates: Manufacturer's Product Certificates of Conformance for glass.
- I. Qualifications Data: For glazier.
- J. Warranties: Sample copy of warranties.

1.04 QUALITY ASSURANCE

- A. Installer/Glazier's Qualifications: Shall have a minimum of 5 years of documented experience in cutting and installing glass of types specified, in conditions specified.
- B. Insulating Glass Fabricator Qualifications: Fabricators of IGU with Low-E Coatings shall be approved and certified by coated-glass manufacturer.
- C. Source Limitations:
 - 1. Glass: Obtain from single source from single manufacturer for each glass type.
 - 2. Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- D. Preconstruction Adhesion and Compatibility Testing: Testing by independent testing agency. Test each glass product, tape, sealant, gasket, glazing accessory, and glass framing member for adhesion to and compatibility with glazing sealants, including weather seals, and insulated glazing units.
 - 1. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primer.
- E. Insulating units shall be tested and certified to ASTM E2190.
- F. Low-E Coatings: Supply by single manufacturer for each performance value required. Color rendition between glass units shall have no apparent difference in reflectivity, hue, and shade when viewed from outside building and through adjacent window in same room.
- G. Mock-Up: See Division 01, and individual technical sections for mock-up requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Maintain original labels with manufacturer's name, brand, strength, and glass quality on each piece of glazing, except where cutting makes requirement impossible.
- B. Storage: Protect against abrasion, pressure and impact; weather, temperature changes, direct exposure to sun, condensation, or other damage. Store sheets of glass vertically - do not lean.
- C. Protect edges of glass at all times to preserve edge strength. No striking, stoning, nipping, seaming or grinding will be allowed.
- D. Insulating Units: Comply with manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Specified Product Warranties:
 - 1. Coated Glass: Manufacturer's 10-year warranty to replace coated-glass units that peel, crack, or exhibit other indications of deterioration in coating.
 - 2. Laminated Glass: Manufacturer's 5-year warranty to replace laminated glass units that exhibit edge separation, delamination materially obstructing vision through glass, or blemishes exceeding those allowed by referenced standard.
 - 3. Insulating Glass: Fabricator's 10-year warranty that insulating glass units will not develop material obstruction to vision as a result of dust, moisture or film on the inner glass surfaces caused by failure of the hermetic seal other than through glass breakage, and agreeing to replace units failing to comply.

PART 2 - PRODUCTS

2.01 PERFORMANCE

- A. Performance/Design Criteria:
 - 1. Glazing Performance: Ensure capability to withstand normal thermal movement and wind and impact loads without failure, including loss due to defective manufacturer, fabrication and installation, deterioration of glazing materials, and or other defects.
 - a. Installations shall be designed for wind speed and exposure indicated on Structural General Notes, and in accordance with IBC and ASTM E1300.
 - b. Limit deflection to prevent disengagement from the frame.
 - 2. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - a. For laminated-glass lites, properties are based on products of construction indicated.
 - b. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 7 computer program, expressed as Btu/sq. ft. x h x deg F.
 - c. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 7 computer program.
 - d. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
 - e. Safety Glazing: Provide safety glazing where indicated on Drawings, and in addition, where required by applicable codes.
 - 3. All glazing shall meet or exceed the Commercial provisions of the 2021 Washington State Energy Code (WSEC-C).

2.02 GLASS PRODUCTS – GENERAL

- A. Verify and coordinate glass and related glazing materials with performance requirements of the assembly and installation and as recommended, in writing, by the applicable glass and gasket manufacturers.
 - 1. See Drawings for glass assemblies and locations.
- B. Verify and document the type, size, thickness, and design of glass units, including dimensions, tolerances, glazing pockets, jamb and seismic blocking, glass edge clearance, and frame lap.
- C. Glazing Publications: Comply with published recommendations of GANA and IGMA unless more stringent requirements are indicated.
- D. Safety Glazing: Where scheduled and where required by Code, provide safety glazing that complies with 16 CFR 1201, Category II.
 - 1. Provide fully tempered light where wind conditions and governing authorities require.
 - 2. Permanently mark glazing with certification label of SGCC or other certification agency acceptable to Authorities Having Jurisdiction (AHJ). Such labels shall be visible, consistently placed and unobtrusively located, and indicate manufacturer's name, type of glass, thickness, and safety glazing standard applicable to glass.
- E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- F. Thickness: Thicknesses indicated are minimums. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- G. Strength: Provide glass with sufficient strength to meet specified performance requirements.

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1. Where annealed float glass is indicated, provide any of annealed, heat-strengthened float glass, or fully tempered float glass as needed.
 2. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed.
 3. Where fully tempered float glass is indicated, provide fully tempered float glass.
- H. Allowable Tolerances: Thicknesses of glass specified are nominal. Provide glass manufactured to tolerances listed in GANA Manual.

2.03 GLASS PRODUCTS

- A. Manufacturers:
1. Glass (non-rated):
 - a. Cardinal.
 - b. Guardian Industries Corp. (Guardian Glass).
 - c. Pilkington NA (Nippon Sheet Glass).
 - d. Vitro Architectural Glass.
 - e. Or approved equal.
 2. Products: Basis of Design: As indicated.
- B. Clear Annealed Float Glass: ASTM C1036, Type I, Class I, Quality-Q3.
1. Minimum 1/4 inch thicknesses except as otherwise indicated or required by Code.
- C. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear), Quality-Q3.
- D. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear), Quality-Q3.
- E. Laminated Glass: ASTM C1172, two lites of clear glass laminated with interlayer.
1. Provide tempered inboard lite and heat strengthened outboard lites where indicated and where required by IBC; and provide tempered lites where required for strength.
 2. Interlayers: Apply in accordance with interlayer manufacturer's written instructions.
 - a. Polyvinyl Butyral (PVB) Interlayer: Shall not bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1) Manufacturers/Products:
 - (a) Eastman "Saflex/Vanceva".
 - (b) Kuraray "Trolisol".
 - (c) Sekisui "S-LEC Film".
 - (d) Or approved equal.
 - 2) Thicknesses: Minimum thickness not less than that indicated and as needed to comply with requirements.
 - b. Color: Clear typical.

2.04 INSULATED GLASS UNITS (IGU)

- A. Fabricators:
1. Garibaldi Glass.
 2. Hartung Glass Industries.
 3. Northwestern Industries, Inc.
 4. Oldcastle Glass/Oldcastle Building Envelope.

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5. Vitrum Industries/Vitrum Glass Group.
 6. Or approved equal.
 7. Insulating glass fabricator shall be certified at the fabrication location by the manufacturer of the coating.
- B. Insulating Glass Units (IGUs): Factory-assembled, double-glazed, 1 inch thick, unless other thickness indicated or required for performance, consisting of sealed lites of glass separated by argon-filled interspace, complying with ASTM E2190, and certified by IGCC.
1. Glazing shall meet or exceed U-Value specified in Division 08 glazing system Sections. Performance characteristics are based on testing by glazing system manufacturers in their frames and sizes.
 2. IGU Glazing Products: Basis of Design: Vitro "Solarban 60" (on Surface #2); Guardian SunGuard IS20" (on Surface #4) also accepted.
 3. Sealing System: Dual sealed (polyisobutylate primary seal and silicone secondary seal), double glazed units with air space, filled with argon gas and moisture absorbing desiccant, between two panes of clear float glass or safety glass as required.
 4. Insulating glass units shall be free of skips or voids in the primary or secondary seals.
 5. Warm Edge Spacers: Thermally broken aluminum spacer bars with polymer or polyamide barrier; thickness suitable to IGU.
 - a. Manufacturers/Products:
 - 1) DGS Group "Chromatech Ultra" spacer.
 - 2) Technoform "TGI Warm Edge IG Spacer".
 - 3) Or approved equal.
 - b. Finish/Color: Black.
 6. Edge Deletion: Delete low-E coating prior to fabrication of insulating units according to coated glass manufacturer's instructions.

2.05 SETTING MATERIALS AND ACCESSORIES

- A. Setting Materials and Accessories: Provide products for setting glass, including following:
1. Setting Accessories - General: Manufacturer's standard permanent, nonmigrating types compatible with sealants and suitable for system performance requirements; of material, size, and shape complying with referenced glazing standards, with a proven record of compatibility with surfaces contacted.
 2. Setting Blocks and Edge Blocks: Type and durometer hardness as recommended by sealant or glass manufacturer.
 3. Spacers: Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place. Type as recommended by manufacturer.
 4. Gaskets: See Division 08 storefront, curtain wall and window sections as applicable.
- B. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based 100 percent solids elastomeric tape; nonstaining and nonmigrating 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; complying with ASTM C1281 and AAMA 807.3 (tape not subject to continuous pressure).
- C. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; 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.

2.06 SEALANTS

A. General:

1. Sealants used on the interior of the building shall comply VOC limits indicated.
2. 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.
3. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications and conditions indicated.
4. Perform Preconstruction Adhesion and Compatibility Testing indicated.
5. Exposed Glazing Sealants: Color as selected by Architect from full range of options.
6. See also, Section 07 92 00 - Joint Sealants.

B. Glazing Sealants (for use with exterior exposed glazing as applicable):

1. Silicone Sealant: ASTM C920, one-part, moisture-cure silicone: Dow "Dowsil 795", Tremco, "Spectrem 2", or approved equal.
2. Silicone Sealant (for use where only nonporous surfaces are contacted/referenced): ASTM C920, one-part low modulus silicone, Type S, Grade NS, Class 25: Dow "Dowsil 732", Tremco "Proglaze" or "Spectrem 2", or approved equal.

2.07 FABRICATION

A. Fabrication:

1. Fabricate glazing units in sizes required to fit 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.
2. Allow for thermal movements from ambient and surface temperature changes, based on temperature change 120 deg F ambient; 180 deg F.
3. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 PREPARATION

- A. Field Measurements: Measure carefully prior to any cutting and fabricating.
- B. Protect glass edges from damage during handling and installation. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

- D. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.03 INSTALLATION - GENERAL

- A. Install in accordance with provisions of the Contract Documents including, referenced glazing publications, and combined written instructions of manufacturers of glass, sealants, gaskets, and other materials. Where in conflict, the more stringent requirements govern.
 - 1. 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.
 - 2. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
 - 3. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 4. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel.
- B. Glass Cutting:
 - 1. Cut to accurate sizes and shapes as required; allow edge clearances and tolerances in accordance with GANA recommendations, unless otherwise indicated.
 - 2. Edges: Float, and Safety Glass: Take care when cutting and forming edges of glass to furnish clean accurate edges. Grind and polish any mitered edges.
- C. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics; with proper orientation so that coatings face exterior or interior as specified.

3.04 GLAZING

- A. Perform glazing indicated.
 - 1. Sizes and thicknesses indicated are nominal only.
 - a. Obtain exact sizes at building or from manufacturer or doors, frames, and sash.
 - b. Specified thicknesses are subject to normal commercial tolerances.
 - 2. Glass Positioning: Center glass in rabbets. Position so as to maintain clearances on all sides, indoors and out, in accordance with GANA recommendations. Shim as required to position against fixed stops and frame bars.
- B. Where single glass is indicated but thickness is not noted, glass is required to be 1/4-inch or more in thickness, as recommended by manufacturer.
- C. Except as indicated, use the following glazing methods to suit conditions of installation:
 - 1. Exterior dry method (tape and gasket spline glazing).
 - 2. Exterior wet/dry method (performed tape and sealant).
 - 3. Exterior wet method (sealant and sealant).
 - 4. Interior dry method (tape and tape).
 - 5. Interior wet/dry method (tape and sealant).
 - 6. Interior wet method (compound and compound).
- D. Other Glass: Glaze in accordance with referenced Standards, AHJ, Details, and the like.
- E. Refer to Division 08 Sections for manufacturer's glazing requirements.

3.05 CLEANING AND REPLACEMENT

- A. Immediately after installation remove nonpermanent labels and clean surfaces.

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- B. Replace, as scheduled, damaged glass at no additional cost to the Owner. Remove damaged glass from Project site and legally dispose of off Project site.

END OF SECTION 08 81 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Exterior wall louvers
 - 2. Flood vents.
- B. Related work in other sections:
 - 1. Section 04 20 00 – Unit Masonry.
 - 2. Section 06 10 00 – Rough Carpentry.
 - 3. Section 07 25 00 – Weather Barriers.
 - 4. Section 07 62 00 – Sheet Metal Flashing and Trim.
 - 5. Section 07 92 00 – Joint Sealants.
 - 6. Division 23 – HVAC.

1.02 REFERENCES

- A. Refer to sheet A1.00 for flood vent requirements.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Shop Drawings: Submit project specific shop drawings for the following items. Drawings shall include field verified dimensions and other relevant information needed to match existing construction where indicated.
 - 1. Exterior wall louvers. Indicate field verified dimensions, depth, and open area.
- D. Color Samples: For factory applied color finishes.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A company designing, manufacturing, and installing products of this section which have performed in a satisfactory manner under comparable conditions for a period of 5 years.

1.05 DELIVERY, STORAGE, AND HANDLING

- A.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Submit a written warranty signed by the manufacturer guaranteeing fluoropolymer finish for 10 years after substantial completion, without reducing or otherwise limiting any other rights to correction which the owner may have under the contract documents. Failure is defined to include cracking, peeling, blistering, chalking, and fading in excess of 3 NBS points.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:

1. Greenheck.
2. Ruskin.
3. Airolite Company.
4. Construction Specialties, Inc.
5. Or approved equal.

2.02 LOUVERS AND FLOOD VENTS

- A. Wall Louvers: Size and type as specified in the mechanical drawings.
 1. Provide screening and backdraft dampers as required by code.
- B. Flood Vents: Size as noted in the drawings, refer to sheet A1.00 for details.
 1. Provide minimum open area noted in flood vent calculations.
 2. Type "R" vents to be operable to allow for crawlspace access.
- C. Finish: Fluoropolymer Coating: "Kynar 500" 70% resin finish coat baked-on for 15 minutes at 450 degrees F (232 degrees C), over 0.2 mil baked-on epoxy primer for a total film thickness of 1.0 mils, 30% reflective gloss (ASTM D 523).
 1. Durability: Provide coating which has been field tested under normal range of weathering conditions for minimum of 20 years without significant peel, blister, flake, chip, crack or check in finish, and without chalking in excess of 8 (ASTM D 659), and without fading in excess of 5 NBS units.
 2. Color: To be selected by architect from manufacturer's full range.

2.03 FABRICATION

- A. Provide complete, shop-fabricated units, unless unit size dictates shipment in pieces; mark each component as required for proper field assembly.
- B. Minimize the necessity for field assembly and field modifications. Coordinate shop drawings, field measurements, and shop fabrication.
- C. Fabricate frames to indicated profiles with features and clearances to suit installation conditions.
 1. Include integral sills of finish and construction to match louver.
 2. Provide clearance or recesses as required to accommodate sealant between louver and adjacent construction.
- D. Provide shop-welded joints between framing components, and between framing components and fixed louver blades, unless otherwise indicated or where field assembly is unavoidable.
- E. Provide uniform spacing between blades, including gap between blades and exposed face of head and sill members
- F. Continuous Horizontal Blades: Do not expose support framing to view on exterior louver surfaces. Install mullions, brackets, braces, etc., on inside surfaces. At field joint between adjacent units, provide close-fitted, spliced joint capable of sustaining thermal movement without damaging frame or blades.
- G. Provide shop-fabricated corner assemblies complete with concealed bracing members and properly aligned, mitered, and welded blades.
- H. Operable Flood Vents: Louvers designated as a flood vent shall be operable to allow access into the crawlspace area.
 1. Provide minimum clear access opening as required by code, but not less than 24" high.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that substrates and openings to receive louvers are rigidly set, at proper lines and elevation, properly sized, and ready to receive louvers.
- B. Do not proceed with installation until conditions detrimental to proper installation have been corrected.

3.02 PREPARATION

- A. Coat contact surfaces of dissimilar metals with one or more coats of bituminous paint.
 - 1. The following metals are not considered dissimilar: Aluminum, stainless steel, and zinc.
- B. Apply one 15-mil dry film thickness coat of bituminous isolation coating to metal surfaces, other than galvanized steel, which will be in contact with cementitious materials.

3.03 INSTALLATION

- A. Install louvers in accordance with manufacturer's instructions and shop drawings.
- B. Coordinate louver installation with adjacent elements of building envelope to ensure watertight construction.
- C. Set units and flashings in proper location, plumb and true, free of warp or twist.
- D. Fit joints tightly, where joint sealers are to be installed, make joints of sizes required.

3.04 CLEANING

- A. Remove protective material from prefinished surfaces immediately after installation.
- B. Wash exposed surfaces using mild detergent, thoroughly clean inside corners.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent recommended by sealant manufacturer.
- D. Touch up marred or abraded areas of finished elements. If satisfactory touch-up cannot be accomplished, remove and replace element.

END OF SECTION 08 91 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Repair and maintenance of existing lathe and plaster finishes.
 - a. Inspection, assessment, and documentation of existing plaster systems.
 - b. Cleaning of existing plaster surfaces.
 - c. Crack repair and stabilization.
 - d. Delamination and debonded plaster repair.
 - e. Patching and resurfacing of plaster.
 - f. Moisture mitigation related to plaster deterioration.
 - g. Reapplication of finish coats to match existing textures.
 - h. Protection and curing of repaired areas.
- B. Related work in other sections:
 - 1. Section 02 41 00 – Demolition.
 - 2. Section 06 10 00 – Rough Carpentry.
 - 3. Section 09 21 16 – Gypsum Board Assemblies.
 - 4. Section 09 91 00 – Painting.

1.02 REFERENCES

- A. ASTM International:
 - 1. ASTM C11 – Terminology Relating to Gypsum and Related Building Materials
 - 2. ASTM C28/C28M – Gypsum Plasters
 - 3. ASTM C35 – Inorganic Aggregates for Use in Gypsum Plaster
 - 4. ASTM C587 – Gypsum Veneer Plaster
 - 5. ASTM C842 – Application of Interior Gypsum Plaster
 - 6. ASTM C926 – Application of Portland Cement-Based Plaster
 - 7. ASTM C1063 – Installation of Lathing and Furring
 - 8. ASTM C1328 – Plastic (Stucco) Cement
- B. Plastering Contractors Association Technical Bulletins.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: For repair mortars, bonding agents, consolidants, and coatings.
- C. Mock-Ups:
 - 1. Minimum 4 SF repair area demonstrating full process.
 - 2. Approved mock-up shall serve as quality standard.

1.04 QUALITY ASSURANCE

- A. Contractor Qualifications:
 - 1. Minimum 5 years experience in plaster restoration.
 - 2. Demonstrated experience with historic or coastal conditions (if applicable).
- B. Field Supervisor: On-site at all times during plaster work.
- C. Pre-Installation Meeting: Review substrate conditions, sequencing, and moisture control.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original, unopened packaging.
- B. Store in dry, protected conditions above ground.
- C. Protect lime-based materials from moisture and freezing.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Contractor Warranty: Provide 1-year warranty for all repairs.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Materials shall be compatible with existing plaster system.
- B. Match existing composition (lime, gypsum, or cement-based).

2.02 PLASTER MATERIALS

- A. Gypsum Plaster:
 - 1. ASTM C28 compliant.
- B. Portland Cement Plaster:
 - 1. ASTM C926 compliant.
- C. Lime Plaster:
 - 1. High-calcium hydrated lime.
- D. Aggregates:
 - 1. ASTM C35 compliant sand.

2.03 REPAIR MATERIALS

- A. Bonding Agents:
 - 1. Acrylic or latex-based bonding agents.
- B. Crack Fillers:
 - 1. Elastomeric fillers for non-structural cracks.
 - 2. Cementitious repair mortars for structural cracks.
- C. Consolidants:
 - 1. Acrylic or silicate-based consolidants for friable plaster.
- D. Patch Compounds:
 - 1. Pre-blended plaster repair materials.
 - 2. Custom field-mixed plaster matching existing.

2.04 LATH AND ACCESSORIES

- A. Metal Lath:
 - 1. Galvanized expanded metal lath per ASTM C847.
- B. Fasteners:
 - 1. Corrosion-resistant.
- C. Corner Beads:
 - 1. Galvanized steel or PVC.

2.05 FINISH MATERIALS

- A. Texture Finishes:
 - 1. Smooth trowel finish.
 - 2. Sand float finish.
 - 3. Dash or skip trowel finish.
- B. Coatings:
 - 1. Breathable mineral or acrylic coatings compatible with plaster.

2.06 CLEANING MATERIALS

- A. Mild Detergents:
 - 1. Non-ionic, pH-neutral cleaners.
- B. Chemical Cleaners:
 - 1. Specifically formulated for plaster.
- C. Prohibited:
 - 1. Acidic or abrasive cleaners unless approved by the Architect during mockup.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify substrate conditions:
 - 1. Structural stability.
 - 2. Moisture presence.
 - 3. Delamination or hollow areas.
- B. Sounding:
 - 1. Tap surfaces to identify voids.
- C. Do not proceed until deficiencies are corrected.

3.02 PREPARATION

- A. Protect adjacent materials.
- B. Remove loose, cracked, or delaminated plaster.
- C. Clean substrate of dust, salts, and contaminants.
- D. Pre-wet substrate where required.

3.03 CRACK REPAIR

- A. Remove unsound plaster to solid substrate.
- B. Re-secure lath if present.
- C. Apply bonding agent.
- D. Rebuild plaster in coats:
 - 1. Scratch coat
 - 2. Brown coat
 - 3. Finish coat.

3.04 PATCHING AND RESURFACING

- A. Match existing plaster characteristics, including:

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1. Thickness.
 2. Texture.
 3. Color.
- B. Feather edges into existing work.
- C. Apply skim coat where required.
- D. Ensure uniform appearance across surfaces.

3.05 QUALITY CONTROL

- A. Inspect repairs for:
1. Bond integrity.
 2. Cracking.
 3. Visual consistency.
 4. Other defects that may affect application of new finishes.

3.06 CLEANING

- A. Remove debris and excess materials.
- B. Leave surfaces clean and ready for finishing.

END OF SECTION 09 01 20

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. New gypsum wall board and accessories.
- B. Related work in other sections:
 - 1. Section 02 41 00 – Demolition.
 - 2. Section 06 10 00 – Rough Carpentry.
 - 3. Section 07 26 00 – Vapor Retarders.
 - 4. Section 07 92 00 – Joint Sealants.
 - 5. Section 09 91 00 – Painting.
 - 6. Divisions 22, 23, 26, and 27.

1.02 REFERENCES

- A. ASTM C36 - Gypsum Wallboard and ASTM C-588 – Gypsum Veneer Base (“Blue Board”)
- B. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction
- C. ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board
- D. ASTM E90 - Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions
- E. ASTM C-840 Applications & Finishing of Gypsum Board
- F. ASTM E119 - Fire Tests of Building Construction and Materials
- G. GA-201 - Gypsum Board for Walls and Ceilings
- H. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board
- I. Gypsum Construction Handbook, current edition.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Submit product data under provisions of Section 01 3000 – Administrative Requirements.
- C. Include manufacturer’s published descriptive literature for gypsum board types, trims, accessories, and control joints.
- D. Product information: Include manufacturer’s published descriptive literature for gypsum board types, trims, accessories, and control joints.

1.04 PERFORMANCE REQUIREMENTS

- A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by a qualified independent testing agency.
 - 1. STC-Rated Assemblies: Indicated by design designations from GA-600, “Fire Resistance Design Manual.”

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Temperature and Ventilation: Provide adequate, properly regulated heating and ventilation in accordance with NWCB and manufacturer's instructions
- B. Lighting: Provide sufficient temporary lighting to properly perform the work and to achieve specified finishes.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for warranty requirements.

PART 2 - PRODUCTS

2.01 GYPSUM BOARD MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide gypsum board products by one of the following:
 - 1. US Gypsum (USG).
 - 2. National Gypsum Co.
 - 3. Substitutions: Under provisions of Section 01 2500 – Substitution Procedures.

2.02 INTERIOR GYPSUM WALLBOARD

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Fire-Rated Gypsum Board: ANSI/ASTM C36; fire-resistive; UL rated; 5/8-inch thick, maximum permissible length; ends square cut, tapered edges. Type X.

2.03 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Aluminum-coated steel or aluminum-coated steel sheet or rolled sheet.
 - 2. Shapes:
 - a. Corner bead: Use at outside corners.
 - b. LC-Bead (J-Bead): Use at exposed panel edges.
 - c. Expansion (Control) Joint: Use where indicated.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following: Schluter, Tamlyn, Stockton Products
 - 2. Aluminum: Alloy and temper with not less than the strength; and durability properties of ASTM B 221 (ASTM B221M), alloy 6063-T5.
 - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.04 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C457.
- B. Joint Tape: Paper.
- 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, beveled panel edges, 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 4 finish, use setting-type sandable topping compound.

2.05 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Elastomeric Sealant: Medium-modulus, neutral-curing silicone sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturers for application indicated, and complying with requirements for elastomeric sealants specified in Section 07 92 00 - Joint Sealants.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Field verify and match existing construction of adjacent surfaces.
- C. Beginning of installation means acceptance of existing surfaces.

3.02 GYPSUM BOARD INSTALLATION

- A. Install gypsum board in accordance with GA 201 and GA 216 and NWCB specifications and recommendations, and manufacturer's instructions. Where in conflict follow more stringent requirements.
- B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- C. Do not install GWB directly to the slip track at the top of partition walls.
- D. Corner Trim: Reinforce external corners with specified corner beads
- E. Edge Trim: Install square edged metal trim bead at exposed edges and boundaries of areas and where abutting dissimilar materials.
- F. Control Joints: Comply with NWCB GWB-5, except as otherwise indicated. Verify that required double framing is in place before installing control joints.
- G. Door and window openings: Minimum one control joint at each wall opening. Locate at strike side of door openings.
 1. Continuous Wall Planes: Not to exceed 30 linear feet.
 2. Ceilings: Not to exceed 50 linear feet. Area not to exceed 2,500 square feet.
 3. Other trim: Install as indicated or required for complete and finished installation.
- H. Panel Joints:

1. Layout: Design to reduce joints to minimum.
 2. Install board in maximum lengths to minimize horizontal and vertical joints.
 3. Start installation of panels at exterior wall to position butt joints as far away from exterior wall as possible.
 4. Place edges in contact and fit neatly, without forcing into place.
 5. Stagger joints on opposite sides of partitions and on same side of wall surface at adjacent joints.
- I. Single Layer Systems: Install in accordance with ASTM C840. Where modified, amended, or otherwise, or required by fire resistive or sound isolation system, conform to the requirements of the manufacturer's tests, as approved.
1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) and horizontally (perpendicular 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 board.
 - 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.
- J. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- K. Mechanical and Electrical: Coordinate with Division 23 and 26. Provide for installations and penetrations of ductwork, equipment, receptacles, and other work.
- L. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch setback where non-load-bearing construction abuts structural elements.

3.03 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 C840 and in specific locations approved by Architect for visual effect.

3.04 JOINT TREATMENT

- A. Joints and Interior Angles; Tape embedded in joint compound and three separate coats of joint compound applied over joints, angles, fastener heads, and accessories. Tool joint compound smooth and free of tool marks and rides.
1. Center reinforcing tape over joint and coat into compound leaving approximately 164 inch to 1/32 inch under tape to provide proper bond.
 2. Follow skin coat to embed tape, but not to function as second coat.
 3. Allow embedding coat to thoroughly dry prior to application of second coat.
 4. Allow embedding coat to thoroughly dry.

5. Apply third coat evenly over and extending beyond second coat on joints, feathering to smooth uniform finish.
- B. Beads, Trim, Fastener and Joint Depressions:
 1. Cover with three coats of taping and joint compound, each applied in different directions to make true and level with adjacent surfaces.
 2. Allow sufficient drying time between coats.
 3. Leave depressions flush with surface plane.

3.05 FINISHING GYPSUM BOARD ASSEMBLIES

- 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, 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, according to ASTM C 840, for locations indicated:
 1. Level 4, or as required to match adjacent surfaces and construction

3.06 LEVEL 4 FINISH

- A. Apply Level 4 Finish in accordance with NWCB for all finish areas. Match adjacent surfaces.
- B. Where necessary sand between coats and after final coat, do not scuff paper, repair blemishes and joint ridges.
- C. After final sanding wipe all drywall surfaces with a damp sponge to remove dust and particles.
- D. Leave areas finished uniformly smooth for subsequent smooth finish (paint, wallcovering, or as indicated). No wall texturing is applied.
- E. Apply a thin skim coat of joint compound, or material manufactured for this purpose, over entire surface. Finished surface to be free of tool marks and ridges.
- F. Beads, Trim, Fastener and Joint Depressions:
 1. Cover with three coats of taping and joint compound, each applied in different directions to make true and level with adjacent surfaces.
 2. Allow sufficient drying time between coats.
 3. Leave depressions flush with surface plane.

3.07 ALLOWABLE TOLERANCES

- A. Shim panels as necessary to comply with tolerances.
 1. Between Board Faces: 1/16-inch offset.
 2. Plane, Level, Warp, and Bow: 1/8 inch in 8 feet.

3.08 CLEANING

- A. Clean beads, screeds, metal base, metal trim, mechanical and electrical items, and other work.
- B. Wipe clean, leaving work ready for finish specified under other Sections.
- C. Clean and thoroughly vacuum work areas at the end of each day.

END OF SECTION 09 21 16

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Ceramic Wall Tile.
 - 2. Cementitious Backer Units.
 - 3. Waterproof Membrane and Crack Suppression Membranes.
 - 4. Metal Edge Trim.
 - 5. Metal Wall Base.
- B. Related work in other sections:
 - 1. Section 07 92 00 – Joint Sealants.
 - 2. Section 09 21 16 – Gypsum Board Assemblies.
 - 3. Section 09 65 00 – Resilient Flooring.

1.02 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Samples for Verification: Of each item listed below, prepared on Samples of size and construction indicated. Where products involve standard color and texture variations, include Sample sets showing the full range of variations expected.
 - 1. Each type and composition of tile and for each color and texture required, at least 12 inches square, mounted on braced cementitious backer units, and with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by Architect.
 - 2. Full-size units of each type of trim and accessory for each color required.
 - 3. Stone thresholds in 6-inch (150 mm) lengths.
- E. Installer's Qualification Statement:
- F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

- C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings".

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A 137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.
- C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

1.06 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
- B. Tile and Trim Units: Furnish quantity of full-size units equal to 5 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.01 PRODUCTS – GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A 137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
 - 2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
 - 1. Match colors, textures, and patterns indicated by referencing manufacturer's standard designations for these characteristics.
 - 2. Provide tile trim and accessories that match color and finish of adjoining flat tile.
- D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

- E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.
- F. Products: Subject to compliance with requirements, provide products indicated in the ceramic tile installation schedules at the end of this Section.

2.02 WALL TILE

- A. General: All new ceramic and/or porcelain tile
- B. Rectilinear wall tile type 1: "T-1"
 - 1. Manufacturer: Daltile.
 - 2. Style/Series: Rekindle, Light Grey.
 - 3. Nominal Size: 12" x 24".
 - 4. Thickness: 5/16".
 - 5. Orientation: Horizontal, per drawings.
 - 6. Finish: Matte.
 - 7. Color Code: RK12, Architect to confirm during the submittal phase.

2.03 SETTING MATERIALS

- A. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:
 - 1. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.
 - 2. Ceramic Tile Walls: Custom Building Products "ProLite Premium Large Format Tile Mortar.

2.04 GROUTING MATERIALS

- A. Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy: ANSI A118.3.
- B. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140°F and 212°F, respectively, and certified by manufacturer for intended use.
- C. Epoxy Grout: All tile locations.
 - 1. Custom "CEG-Lite", or approved equal meeting ANSI A118.3.
 - 2. Color: 165 Delorean Gray, Architect to confirm during submittal phase.
 - 3. For bidding purposes assume up to 3 grout colors.

2.05 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.
- C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.
- D. Products: Subject to compliance with requirements, provide one of the following:
 - 1. One-Part, Mildew-Resistant Silicone Sealants:

- a. Dow Corning 786; Dow Corning Corporation.
- b. Sanitary 1700; GE Silicones.
- c. Or approved equal.

2.06 METAL EDGE STRIPS

- A. General: Provide tile trim units to comply with the following requirements:
 - 1. Basis of Design: Schluter Systems: "Jolly"
 - a. Material: Anodized aluminum with brushed stainless steel appearance.
 - b. Substitutions under 01 2500 – Substitution Procedures.
- B. Metal edge strips to be provided at locations as indicated on the drawings and:
 - 1. Transition between tile and gypsum wall board.
 - 2. Transition between tile and PVC Wall Panels.
 - 3. Transition from first course of wall tile (which is the same material as the floor tile) to second course of wall tile.

2.07 CONCEALED ACCESS PANELS

- A. Basis of Design: Schluter Systems: "REMA"
 - 1. Material: anodized aluminum with brushed stainless-steel appearance

2.08 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.09 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

2.10 WATERPROOF AND CRACK SUPPRESSION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10, for use beneath all tile floors.
- B. Chlorinated-Polyethylene-Sheet Product: Nonplasticized, chlorinated polyethylene face on both sides with high-strength, nonwoven, polyester fabric, for adhering to latex-portland cement mortar: 60 inches wide by 0.030-inch nominal thickness.
- C. Available Manufacturers: Subject to compliance with requirements, provide one of the following products at all tile flooring:
 - 1. Dalseal TS by Dal-Tile Corporation.
 - 2. Nobleseal TS by The Noble Company.

3. LevelQuik Trowel and Seal Waterproofing and Anti-Fracture Membrane by Custom Building Products.
4. Chloraloy (CPE) by the Noble Company.
5. Kerdi by Schluter.
6. DITRA by Schluter.

2.11 CEMENTITIOUS BACKER UNITS

- A. Provide cementitious backer units complying with ANSI A 118.9, of thickness and width indicated below, and in maximum lengths available to minimize end-to-end butt joints.
 1. Thickness: Manufacturer's standard thickness, but not less than ½ inch, unless otherwise indicated.
 2. Width: Manufacturer's standard width, but not less than 32 inches (813 mm).
- B. Products: Subject to compliance with requirements, provide one of the following products:
 1. Wonderboard Multi+Board; Custom Building Products.
 2. DomCrete Cementitious Tile-Backer Board; Domtar Gypsum.
 3. Util-A-Crete Concrete Backer Board; FinPan, Inc.
 4. DUROCK Cement Board; United States Gypsum Co.

2.12 SELF-LEVELING CEMENTITIOUS UNDERLAYMENT

- A. Provide non-gypsum underlayment at all locations as required to ensure a level base for new finishes.
 1. Basis of design: Custom Levelquik RS self-leveling underlayment

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A 108 series of tile installation standards for installations indicated.
 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.

1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.03 INSTALLATION - GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A 108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TC installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
 1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.
- F. Grout tile to comply with the requirements of the following tile installation standards:
 1. For ceramic tile grouts (sand-portland cement, dry-set, commercial Portland cement, and latex-portland cement grouts), comply with ANSI A108.10.
- G. Install cementitious backer units at all locations to receive wall tile and treat joints to comply with ANSI A108.11, UL U442 fire resistance rating at rated construction and manufacturer's written instructions for type of application indicated.

3.04 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

3.05 WALL TILE INSTALLATION

- A. Install types of tile designated for wall installations to comply with requirements in the Ceramic Tile Wall Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
- B. Joint Widths: To match floor joints.

3.06 CLEANING AND PROTECTION

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove latex-portland cement grout residue from tile as soon as possible.
 - 2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure tile is without damage or deterioration at the time of Substantial Completion.
 - 1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
 - 2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from the tile surface.

END OF SECTION 09 30 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Heterogeneous Sheet Flooring (HS).
 - 2. Luxury Vinyl Tile (LVT).
 - 3. Resilient Base (RB).
 - 4. Related accessories including adhesives, transition strips,
- B. Related work in other sections:
 - 1. Section 06 10 00 – Rough Carpentry.
 - 2. Section 07 92 00 – Joint Sealants.
 - 3. Section 09 30 00 – Tiling.

1.02 REFERENCES

- A. ----

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's printed descriptions of materials, components and systems, performance criteria, use limitations, recommendations, installation information, and the following:
 - 1. Typical section details indicating each specified system on proposed substrates and transitions to other flooring systems.
 - 2. Sections indicating flooring system abutting walls.
- C. Shop Drawings: Submit keyed location plans, plans indicating resilient sheet flooring type, layout, pattern direction, edge transitions, columns, doorways, enclosing partitions, built-in furniture, cabinets, cutouts, expansion and control joints, and attachment requirements.
 - 1. Provide typical plan views of various layout patterns.
- D. Samples: For each type, including accessories.
 - 1. Initial for Selection: Submit printed color charts, sample chains or Architectural Binder indicating manufacturer's complete range to determine color, texture, shape, and/or composition for each type of material finish.
 - 2. Final Selection: Submit two (2) cut 9 x 12-inch samples of each different type, color and pattern selected for acceptance.
- E. Indoor Environmental Air Quality and VOC Content:
 - 1. Submit manufacturers' product data for construction adhesives and sealants, including printed statement of VOC content and MSDS Sheets.
 - 2. Submit manufacturer's product data for systems that includes printed statement of VOC content.
- F. Sample Warranties: For each type specified.
- G. Maintenance Materials: Submit no less than five (5) percent additional full and unopened rolls of each type and pattern of sheet good used.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.
- B. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 W/sq.cm. or greater when tested per ASTM E 648.
 - 2. Smoke Density: Maximum optical density of 450 or less when tested per ASTM E 662.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery, Storage and Handling per industry and manufacturer guidelines and as follows:
 - 1. Delivery and Acceptance Requirements:
 - a. Deliver materials to Project site in an undamaged condition, in original unopened rolls or other packaging bearing manufacturer's intact label, names, brand names, types and sizes of contents, and proper handling, storing, unpacking, protecting, and installation instructions, as warranted.
 - b. Inspect shipped materials on delivery to ensure compliance with requirements of Contract Documents and to ensure that products are undamaged and properly protected.
 - c. Document and report damaged goods at time of delivery. Accept properly ordered, protected and undamaged goods.
- B. Storage and Handling Requirements:
 - 1. Store materials in a dry, temperature-controlled interior area at 65-80 deg F (18-27 deg C). Avoid exposure to temperature extremes. Protect materials from damage from improper handling, and the action of other trades.
 - 2. Store rolls of sheet goods standing up, with capped end down. Do not lay flat.
- C. Packaging Waste Management:
 - 1. Request that manufacturers, suppliers and shippers provide least amount of packaging that adequately and properly protects, supports and contains the items shipped, and is reusable, returnable or recyclable

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty. Provide manufacturer's limited warranty to be free from defects in material and workmanship, under normal use and service, to repair or replace all defective sheet flooring.
 - 1. Warranty Period: Fifteen (15) years.

PART 2 - PRODUCTS

2.01 RESILIENT FLOORING – GENERAL

- A. Acceptable Manufacturers: Subject to compliance with the specifications, acceptable manufacturers include.
 - 1. Mannington Commercial.
 - 2. Armstrong Flooring.
 - 3. Toli North America.
 - 4. Karndean Flooring.
 - 5. Roppe.
 - 6. Or approved equal.

2.02 HETEROGENOUS SHEET FLOORING (HS)

- A. Description: Heterogenous sheet flooring, ASTM F1303 Type I, Grade 1, Class B.
 - 1. Basis of Design: Mannington Commercial, Realities III Collection.
 - 2. Total Thickness: 0.080".
 - 3. Wear Layer Thickness: 0.020".
 - 4. Wear Layer: Quantum Guard Elite.
 - 5. Sheet Width: 9'-0" or 12'-0".
 - a. Provide full width sheet in toilet rooms, extending up wall base per details.
 - b. Seaming and welding is not permitted, no exceptions.
 - 6. Color/Pattern:
 - a. **HS-1:** Boardwalk Birke (5668R).
 - b. Colors to be confirmed by Architect during submittal phase.

2.03 LUXURY VINYL TILE (LVT)

- A. Description: Luxury Vinyl Tile with micro-bevel edge, ASTM F1700 Class III, Type B.
 - 1. Basis of Design: Mannington Commercial.
 - 2. Series/Collection: Natural Optimist Collection.
 - 3. Total Thickness: 0.1575" (4.0mm).
 - 4. Wear Layer Thickness: 20 mil.
 - 5. Wear Layer: Quantum Guard Elite
 - 6. Size: 7.25" x 48"
- B. Color/Pattern: All colors/patterns to be confirmed by Architect during submittal phase.
 - a. **LVT-1:** Sylvan Ash (NAT101)
 - b. **LVT-2:** Springhouse Teak (NAT108)
 - c. **LVT-3:** Brandywine Ash (NAT105)

2.04 RESILIENT BASE (RB)

- A. Description: PVC base with premium, non-standard profile and accessories.
 - 1. Basis of Design: Roppe, Pinnacle Plus Wall Base.
 - 2. Dimensions: 5-1/2" height.
 - 3. Profile: Nobility (#55)
 - 4. Color: To be selected from manufacturer's standard color offering.
 - 5. Accessories:
 - a. Provide manufacturer's rubber Corner Block at inside and outside corners.

2.05 ACCESSORIES

- A. Leveling and Patching Compound: Trowelable, latex-modified Portland cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Self-Leveling Underlayment: Pourable latex-modified Portland cement-based formulation provided or approved by manufacturer for applications indicated.
- C. Adhesive - Acrylic: Solvent-free, low odor, acrylic based, high tack type adhesive acceptable to resilient sheet flooring manufacturer to suit flooring product and substrate conditions indicated.
 - 1. Manufacturer / Product: CBC 5001 High Performance Resilient Floor Adhesive.
- D. Adhesive – Heavy Duty: CBC 951 solvent-free, hard-setting, reactive, epoxy-type adhesive acceptable to sheet vinyl manufacturer to suit substrate and in-use requirements.
- E. Adhesive Equipment: Professional adhesive application trowel for interior applications.
 - 1. V-notch 1/16 x 1/16 x 1/16 inch for porous substrates.
 - 2. U-notch 1/32 x 1/16 x 1/32 inch for non-porous substrates or use with CBC 951 2-Part Epoxy
- F. Seam Sealing:
 - 1. Heat Welding
 - a. Welding Rod: 3.5mm diameter weld rod as recommended by the manufacturer.
 - 2. Color: As selected by Architect from manufacturer's full range.
- G. Floor Maintenance Systems: Provide maintenance process system as recommended by flooring manufacturer.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Acceptance of Conditions: Carefully examine installation areas with Installer/Applicator present, for compliance with requirements affecting Work performance.
 - 1. Verify that field measurements, surfaces, substrates, structural support, tolerances, levelness, plumbness, temperature, humidity, moisture content level, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
 - a. Verify that substrate meets ASTM F710 requirements and is flat to within 3/16 inch in 10 ft (4.8mm per 3m) or the equivalent of 1/32 inch in 12 inches (0.8mm in 300mm).
 - 2. Test substrates as required by manufacturer to verify proper conditions.
- B. Plywood: Shall be dry, clean, structurally sound, and flat to within 1/8 inch in 10 ft (3mm per 3m) and comply with ASTM F1482. Plywood to be well nailed and/or glued, free of voids and with joints that do not exceed 1/16 inch (1.6mm) per underlayment manufacturer's most recent published installation instructions. Underlayment manufacturer shall warrant underlayment compatibility with resilient flooring.
 - 1. Perform pin meter reading to verify maximum 14 percent moisture with all readings to be within 2 percent of each other.
- C. Proceed with installation only after unsatisfactory conditions have been corrected

3.02 PREPARATION

- A. General: Prepare substrates to ensure proper adhesion of flooring system per adhesive manufacturer's most recent published written instructions.
- B. Wood Substrates or Panel Type Underlayment:
 - 1. Prepare and install per PS1, PS2, APA Form L335, and manufacturer's installation instructions as follows:
 - a. Wood substrate shall be double layer construction of a minimum 1 inch (25.4mm) total thickness with a minimum 18 inches (457mm) of well-ventilated airspace beneath.
 - b. Crawl spaces shall be insulated and protected by a vapor barrier.
 - 2. The top layer of a wood substrate shall be completely free of knots or surface voids and specified as underlayment grade for resilient flooring.
 - a. Refer to Section 06 10 00 for new subflooring.
 - 3. Underlayment shall be smooth, dry and clean, being free of paint, varnish, wax, oils, solvents or other foreign matter, structurally sound, and meets flatness requirements, well nailed or screwed per manufacturer's installation instructions.
 - a. Ensure that each nail or screw head is set flush with or below surface.
- C. Existing Substrates:
 - 1. Properly prepare manufacturer acceptable substrates to accept flooring.
 - a. Cover manufacturer unacceptable substrates with a minimum 1/4-inch (6.4mm) panel underlayment, such as Tecply, designed for use intended.
 - 2. Substrate shall be smooth, dry, clean, and flat to within 1/8 inch in 10 ft. (3mm per 3m), well nailed and/or glued, free of voids and with joints that do not exceed 1/16 inch (1.6mm).
 - 3. Underlayment shall be sanded smooth to remove varnish, high edges, chips, or other contaminants.
 - 4. Ensure that each nail head is set flush with or below surface.
 - 5. Allow 1/32 to 1/16-inch (0.8mm to 1.6mm) expansion space between sheets with staggered joints. Leave 3/4 inch (19mm) minimum expansion space at all vertical obstructions.
 - 6. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps, ridges, and other irregularities to produce a uniform and smooth substrate.
 - a. Verify that substrate is flat to within 3/16 inch in 10 ft (4.8mm per 3m).
 - b. Comply with manufacturer's recommendations for compatible products.
 - 7. Sweep and vacuum clean flooring substrates immediately prior to installation of sheet flooring.

3.03 INSTALLATION

- A. Installation: Install per manufacturer's current written instructions.
- B. Storage on site:
 - 1. Store sheet rolls standing up, capped end down.
 - 2. Do not lay rolls on side or flat.
 - 3. Protect flooring and adhesives from temperature extremes.

- C. Acclimation:
 - 1. Deliver all materials to the job site at least 48 hours before installation.
 - 2. Acclimate materials and job site to stable environmental conditions between 65-80 degrees Fahrenheit.
- D. Seaming considerations:
 - 1. Seaming is not permitted in toilet rooms.
 - 2. Establish layout to use as few seams as possible.
 - 3. Place seams in low traffic areas when possible.
 - 4. Avoid cross seams and utilize only length seams as they blend better with sheet flooring material.
- E. Layout: Coordinate pattern and layout with Architect prior to installation.
 - 1. Trial Laying: Dry Lay flooring without adhesive.
 - 2. Make cuts from rolls in sequential order and do not reverse sheets.
 - 3. Cuts can be rolled face-in if the material will be installed the next day.
 - 4. Lay sheets flat on subfloor overnight to relax material.
 - 5. Trim materials longer than needed to allow for shifting sheets to adjust pattern if needed.
- F. Cutting and Trimming: With the first cut dry laid, trim resilient sheet flooring starting along starting wall.
 - 1. Cut the first sheet closely to the wall using a utility knife.
 - 2. Trim all factory edges at least 1/4 inch to remove shipping damage or deformities.
 - 3. For wood pattern products, trim to edge of outermost full plank for better visual.
 - 4. Cut all seams net. Do not leave a gap and do not cut seams tight so that material peaks. Preferred seam trimming methods are to 'double cut' or 'recess scribe'.
- G. Adhesive Application and Rolling: Evenly comb adhesive perpendicular to length of sheet using proper trowel for conditions.
 - 1. Allow for proper "flash-off" time before placing the flooring into adhesive.
 - 2. Only spread as much adhesive as can be reasonably covered with current environmental conditions and adhesive working and open time.
 - 3. Remove uncured residual adhesive per recommendations.
 - 4. Carefully roll flooring into adhesive and avoid trapping air or allowing wrinkles or stresses in material.
- H. Acrylic Adhesives: Immediately roll flooring into adhesive with a 3-section 100 lb. roller.
 - a. Roll across the width to remove air bubbles and then roll in the length.
 - b. Ensure adhesive transfer to the back of the flooring.
 - c. Use a high wattage light to highlight remaining bubbles. (Do not allow the light to rest on the material).
- I. Flash Cove: Apply cove stick where wall meets the floor and install cap molding on the wall where the flooring ends. Adhere sheet flooring flash cove to wall and hand roll.
 - 1. Weld inside and outside cove corners.

3.04 FIELD QUALITY CONTROL

- A. Inspect floor installation for non-conforming work including, but not limited to, the following:
 - 1. Lack of adequate adhesion.
 - 2. Air blisters, buckles, and dirt or debris under the tile flooring.

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09 65 00**RESILIENT FLOORING**

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3. Loose edges or seams.
 4. Adhesive on top of the flooring.
 5. Improper substrate preparation as indicated by buckling or telegraphing.
 6. Damaged flooring as indicated by dents, splits, cuts, cracks, punctures, melting, burn marks.
 7. Seam integrity and gapping.
- B. Non-Conforming Work per General Conditions and as follows:
1. Remove, Repair and Reinstall or Restore in Place damaged items.
 2. Finish touch-up damaged surface finishes.
- C. Replace damaged materials or items with new if repair not acceptable to Architect.

3.05 CLEANING AND PROTECTION

- A. Work Areas: Continuously clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Clean and maintain completed construction until Substantial Completion.
- B. Protect materials from construction operations until date of Final Completion or Owner occupancy, whichever occurs first.
1. Protect finished floor from abuse and damage by using heavy non-staining kraft paper, drop cloths or equivalent. Use additional non-damaging protective materials as needed.
 2. Traffic can be permitted after:
 - a. 48 hours if installed with CBC 5001 acrylic adhesive.
 - b. 72 hours if installed with CBC 951 epoxy adhesive.
 3. Provide surface protection for installed product and use plywood or rigid panels to roll or move all heavy objects across the flooring before and after owner's acceptance.

END OF SECTION 09 65 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Modular carpet tile, direct glued.
 - 2. Entrance carpet (walk-off mats).
- B. Related work in other sections:
 - 1. Section 06 10 00 – Rough Carpentry.
 - 2. Section 06 20 00 – Finish Carpentry.
 - 3. Section 09 65 00 – Resilient Flooring.
 - 4.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Product Data: For each type of carpet tile and accessory item indicated.
 - 1. Include manufacturer's written data on fiber, physical characteristics, durability, fade resistance, and other tested performance properties of carpet tiles.
 - a. Manufacturer's installation instructions for each type of carpet and type of substrate.
- D. Shop Drawings:
- E. Carpet tile layout, pattern, repeat size, location, direction, and starting point.
 - 1. Columns, doorways, enclosing walls, built-ins, and cutouts in tile carpeting.
 - 2. Carpet layout pattern and color locations.
 - 3. Carpet type, color, and dye lot.
 - 4. Type of subfloor and type of installation, including underlayment and grounding.
 - 5. Transition details to other flooring materials including edge accessories.
- F. Samples: For each carpet product specified. Label each sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings.
 - 1. 3 carpet tiles of each type and color, with manufacturer's permanent labels.
 - 2. Each type of exposed transition strip.
- G. Product Schedule: Use same room and product designations indicated on Drawings.
- H. Method of floor preparation. Include list of products to be used, and include testing.
- I. Certifications and Test Reports:
- J. Manufacturer shall submit copies of independent laboratory reports showing compliance with the following:
 - 1. ASTM E648 - Flooring Radiant Panel
 - 2. ASTM E662 - Smoke Density
 - 3. AATCC 134 - Electrostatic Propensity
 - 4. ASTM D3936 - Delamination
 - 5. AATCC 20 - Fiber Analysis
 - 6. Fiber certification.

- K. Indoor Air Quality Test Reports: Submit for specified products, indicating that the test results do not exceed the stated emission criteria of the CRI Indoor Air Quality Testing Program.
- L. Qualifications Data: For manufacturer and installer.
- M. Warranties: Sample copies of warranties

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is approved by carpet manufacturer.
- B. Source Limitations: Obtain each carpet tile from one source and a single manufacturer.
- C. Carpet Tile shall meet the testing and product requirements of the Carpet and Rug Institute's (CRI) IAQ Green Label Plus program.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Division 01 and following:
 - 1. General: Comply with CRI 104, Section 5.
 - 2. Waste Reduction: Collect polyethylene roll wrap at site and recycle into more roll wrap. Redirect small pieces of waste carpet tile to be appropriately recycled.

1.05 PROJECT SITE CONDITIONS

- A. General: Comply with CRI 104, Section 6.1.
- B. Moisture and Alkalinity Testing (concrete substrate): Test slabs before commencing carpet installation.
- C. Environmental Requirements:
 - 1. Temperature: Maintain products at stable room temperatures between 60 deg F and 80 deg F for 48 to 72 hours before, during and after installation.
 - 2. Humidity: As recommended by flooring manufacturer.
 - 3. Concrete floors shall have cured for not less than 90 days prior to flooring installation.
 - 4. Acclimation: Allow carpet tiles to reach room temperature or minimum temperature recommended by manufacturer before beginning installation.
 - a. Condition carpet at temperature between 60 and 90 deg F; minimum 60 deg F for proper adhesive curing and performance.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Specified Product Warranty: Manufacturer's Limited Lifetime Modular Carpet Warranty to replace carpet that fail under normal use, including following carpet performance:
 - 1. Surface Wear: No more than 10 percent by weight throughout life of product.
 - 2. Color Pattern Permanency: Will exhibit no pattern loss throughout life of product.
 - 3. Static: Maintain maximum static discharges of 3.5KV throughout life of product.
 - 4. No loss of dimensional stability throughout life of product.
 - 5. No delamination throughout life of product.
 - 6. No edge ravel throughout life of product.
 - 7. Carpet will retain its tuft bind integrity throughout life of product.
 - 8. Cushion Resiliency: WellBAC will retain 90 percent throughout life of product.
- C. Special Project Warranty: Installer's 2-year Labor and Materials Warranty against defects in installation.

PART 2 - PRODUCTS

2.01 CARPETING - GENERAL

- A. Acceptable Manufacturers: Subject to compliance with the specifications, acceptable manufacturers include:
 - 1. Milliken.
 - 2. Interface.
 - 3. J+J Flooring.
 - 4. Or Approved Equal.
- B. All patterns and colors to be confirmed by the Architect during the submittal phase.
- C. Carpet tile and specified has been selected for type, quality and performance. Understanding the importance of pattern and color for aesthetics, as well as appearance retention and maintainability, Owner reserves the right to reject any product or manufacturer based solely on pattern and color considerations.
- D. Submit products substitutions in strict conformance with Division 01, and include with substitution request a minimum of 2 sets of 4 carpet tiles large enough to fully represent color and pattern.
- E. Include with substitution request certification that proposed substitution is manufactured with those colors specified herein as standard colors.

2.02 CARPET TILE

- A. CPT-1: Modular Carpet Tile.
 - 1. Manufacturer: J+J Flooring.
 - a. Style: Artistry Modular (Style 7803).
 - b. Color: 3673 Sandblast.
 - c. Size: 18" x 36".
 - d. Install: Herringbone.
- B. CPT-3: Modular Carpet Tile.
 - 1. Manufacturer: Mannington Commercial.
 - a. Style: Water Too.
 - b. Collection: Natural Elements Too.
 - c. Color: Sand Dunes 12244.
 - d. Size: 12" x 36".
 - e. Install: Herringbone.

2.03 ENTRANCE MAT

- A. CPT-2: Entrance Carpet.
 - 1. Manufacturer: Mannington Commercial.
 - a. Style: Force
 - b. Collection: Frixtion.
 - c. Color: Kinetic 11360.
 - d. Size: 18" x 36".
 - e. Install: Ashlar.

2.04 MISCELLANEOUS CCESSORIES

- A. Sealers, Fillers, Primers: Water-resistant type, low VOC, recommended by manufacturer.
- B. Adhesive: Waterproof, low-VOC, non-staining, non-flammable, release-type. Milliken Non-Reactive Standard Adhesive or as recommended by carpet manufacturer for conditions of installation.
- C. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the carpet manufacturer.
- D. Accessories:
 - 1. Transition Strips: Separator of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints, metal or rubber as indicated.
 - a. Metal: Schluter Reno-U, 1/8 inch, satin anodized aluminum, or accepted.
 - b. Refer to Drawings for locations.
- E. Protection Paper: Fortifiber Corporation, "Seekure 892," or approved heavy, reinforced, non-staining kraft laminated paper.
- F. Miscellaneous Materials: As recommended by carpet manufacturers

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 PREPARATION

- A. General: Comply with CRI 104 and carpet tile manufacturer's installation instructions for testing and preparing substrates to receive carpet tile installation, and as required by carpet tile manufacturers to receive specified warranty. Submit test results to Owner and Architect. Method of preparation shall also be approved by Owner and Architect.

3.03 INSTALLATION

- A. Carpet Tile Installation: Comply with CRI 104 Carpet Installation Standard, carpet manufacturer's installation instructions, and provisions of the Contract Documents.
- B. Installation - General:
 - 1. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and the like.
 - 2. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
 - 3. At doorways, center joints under the door in closed position.
 - 4. Do not bridge building expansion joints with carpet.
 - 5. Bind or seal cut edges as recommended by carpet manufacturer.
- C. Transitions and Edges: See Details on Drawings for installation of transition edging between carpet tile and adjacent flooring materials and vertical obstructions.
- D. Install wall base as indicated on Drawings.

3.04 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove yarns that protrude from carpet tile surface.
 - 2. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 15.
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Vinyl sheet wall protection.
 - 2. Accessories and trim.
- B. Related work in other sections:
 - 1. Section 09 65 00 – Resilient Flooring.
 - 2. Section 09 21 16 – Gypsum Board Assemblies.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- C. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement, seams and termination points.
- D. Samples for Verification: 6" x 6" sample.
- E. Qualification Data: qualified testing agency.
- F. Product Test Reports: evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.
- G. Maintenance Data: For wall coverings to include in maintenance manuals

1.03 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flammability Testing: As follows, per ASTM E 84:
 - a. Class A.

1.04 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction project.
- B. Lighting: Do not install wall coverings until a permanent level of lighting is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B.

PART 2 - PRODUCTS

2.01 VINYL WALL PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. WallGuard (www.wallguard.com/vinyl-sheet/)
 - 2. Extrutech Plastics, Inc. (www.epioplastics.com)
 - 3. Duramax PVC Wall Panels (duramaxpvcpanels.com)
 - 4. Or approved equal.
- B. Product/Model: WallGuard Vinyl Sheet 2400.1.
 - 1. Description: Textured vinyl sheet wall covering.
 - 2. Outside Surface: Textured
 - 3. Dimensions: 48 inches by 96 inches.
 - 4. Thickness: 0.60".
 - 5. Weight: 15 pounds per sheet.
 - 6. Surface Burning Characteristics, ASTM E 84
 - a. Flame Spread Index: Class A
 - 7. Color: White, to be confirmed by Architect during submittal phase.
 - 8. Nonporous, waterproof, and corrosion proof.
 - 9. Substitutions under provisions of Section 01 63 00
- C. Accessories: Provide manufacturer's standard PVC trim profiles

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electric moisture meter.
 - 2. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semi gloss, and eggshell finish with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.03 INSTALLATION

- A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated except where most stringent requirements apply.
- B. Install trim in accordance with manufacturer's instructions.
- C. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.
- D. Wall panels: Anchor wall panels with construction adhesive and fasteners in accordance with manufacturer's instructions.
- E. Fasteners:
 - 1. Install fasteners 16 inches to 24 inches on center into nailing fins.
 - 2. Keep top screw head 1/16 inch above top of nailing fins, allowing panels to move slightly.
 - 3. Do not recess screw heads into nailing fins.
- F. Cutting wall panels:
 - 1. Field-cut panels as necessary in accordance with manufacturer's instructions.
 - 2. Ensure cuts are straight, square, and do not damage panels.

3.04 CLEANING

- A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 09 72 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes preparation and field painting of the following:
 - 1. Exposed items and surfaces, including:
 - a. New gypsum board wall and ceiling surfaces.
 - b. All existing plaster wall and ceiling surfaces.
 - c. All exterior surfaces currently painted, including soffits and roof framing members.
 - d. Other items indicated to be painted in the finish schedule or drawings.
 - 2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
 - 3. Refer to paint schedule in this Section under Paragraph 3.06.
- B. Scope of work: Paint all exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color of finish, the Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed pipes and ducts, hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment in finished area of building.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels (unless specifically noted otherwise).
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork and casework.
 - b. Finished mechanical and electrical equipment.
 - c. Light fixtures.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas.
 - b. Ceiling plenums
 - c. Pipe spaces.
 - d. Duct shafts.
 - 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Bronze and brass.
 - 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 - 5. Labels: Do not paint over Underwriters laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

- D. Related work in other sections:
1. Section 06 65 00 – Plastic Simulated Wood Trim.
 2. Section 07 46 46 – Fiber Cement Siding.
 3. Section 07 62 00 – Sheet Metal Flashing and Trim.
 4. Section 09 01 20 – Maintenance of Plaster Finishes.
 5. Section 09 21 16 – Gypsum Board Assemblies.
 6. Section 09 96 00 – High Performance Coatings.

1.02 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
 3. Satin refers to a low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
 4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: For each paint system specified. Include block fillers and primers.
1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
- C. Samples for Initial Selection (for colors not presently scheduled): Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
1. After color selection, the Architect will furnish color chips for surfaces to be coated.
- D. Samples for Verification (for colors scheduled): Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
- E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45°F (7°C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.06 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90°F (10 and 32°C).
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95°F (7.2 and 35°C).
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5°F (3°C) above the dewpoint; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.07 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
 - 1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gallon or 1 case, as appropriate, of each material and color applied.

1.08 PERFORMANCE REQUIREMENTS FOR INTERIOR WALL AND CEILING COATINGS

- A. Performance:
 - 1. Abrasion Resistance: 50 mg loss/1000 cycles/1000 gram weight, ASTM D 4060.

2. Accelerated Weathering: 2000 hours, no chalking or change in film integrity, very good color retention, excellent water resistance, ASTM G 53.
3. Adhesion Over Primed Surfaces: Good adhesion, ASTM D 3359.
4. Bacterial Resistance: No growth, ASTM D 3456.
5. Continuous Color: Complete integration of color particles within and throughout finish.
6. Coverage: Up to 170 square feet per gallon depending upon pattern size, surface porosity, surface texture and method of application.
7. Fire Rating: Coating shall be Class A fire-rated, ASTM E 84.
8. Flashpoint: D.O.T., not regulated; OSHA, not regulated; ASTM D 56.
9. Flexibility Test: No cracking of film when bent around a 1/8 inch mandrel, ASTM D 522.
10. Hardness, Pencil: 2B, ASTM D 3363.
11. Hiding Power of Paints by Reflectometry: Not less than 0.96 contrast ratio, passes LEED requirement of minimum 0.95 contrast ratio, ASTM D 2805.
12. Impact Resistance: Pass, 80 lbs. in, no visible cracking per ASTM D 2794.
13. Lifting: Can be re-coated, painted or covered with sheet goods without stripping, Fed. Std. 141, Method 6252.
14. Mildew and Fungal Resistance: No growth, ASTM D 3273.
15. Permeability: 5.2 perms (with 100 percent acrylic primer), ASTM D 1653. Master Coating Technologies 09 94 19 - 4 4/1/15 www.zolatone.com
16. Practical Washability of Organic Coatings: Rated 7 or higher for each stain tested, passes LEED requirement of minimum 7 rating, ASTM D 4828.
17. Resistance of Emulsion Paint in the Container to Attack by Micro-Organism: No growth, ASTM D 2574.
18. Resistance to Common Cleaners and Disinfectants: Including, but not limited to, soapy water, liquid cleansers, mild abrasive cleansers, 70 percent isopropyl alcohol solutions, film not affected, ASTM D 1308.
19. Scrubability: 5130 cycles (slight wear), ASTM D 2486. 40,000+ cycles (no wear), Fed. Std. 141 Method 6142.
20. Specular Gloss: Maximum of 10 at 60 degrees, ASTM D 523.
21. Stain Resistance: Resistant to the following: mustard, catsup, butter, orange juice, soda, vegetable oil, acetic acid, gasoline, motor oil, and betadine, ASTM D 1308.
22. VOC: Less than 50 grams/liter, ASTM D 3960.
23. Washability of Paints: No change in specular gloss, Fed. Std. 141, Method 6141.

1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Special Applicator Warranty:
 1. Provide 2-year warranty against defects in workmanship and materials from date of substantial completion.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS – GENERAL

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

- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

2.02 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers.
 - 1. Sherwin Williams (S-W).
 - 2. Benjamin Moore (Moore).
 - 3. Or Approved Equal.

2.03 PRIMERS

- A. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated. Do not use shellac-based sealers in exterior locations.
- B. Exterior Latex Wood Primer: MPI #6.
 - 1. Extractive Blocking Primer: Topcoat manufacturer's recommended acrylic primer for use on wood with high-extractive content that may bleed through finish coats.
- C. Rust-Inhibitive Primer (Water Based): MPI #107.
- D. Waterborne Galvanized-Metal Primer: MPI #134.
- E. Exterior Latex Block Filler: MPI #4.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas and conditions, with the Applicator present, under which painting will be performed for compliance with application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.02 PREPARATION

- A. General: Remove hardware and hardware accessories, plate, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 1. Provide barrier coats over incompatible primers or remove and re-prime.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.03 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
 1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 9. Sand lightly between each succeeding enamel or varnish coat
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
- C. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by

the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions sand between applications.

1. Omit primer on metal surfaces that have been shop primed and touchup painted.
 2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 3. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- E. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- G. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable
- H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.04 QUALITY CONTROL

- A. Painted surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to the Owner:
1. Runs, sags, hiding or shadowing by inefficient application methods;
 2. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles;
 3. Damage due to touching before paint is sufficiently dry or other contributory cause;
 4. Damage due to application on moist surfaces or caused by inadequate protection from the weather;
 5. Damage and/or contamination of paint due to wind blown contaminants (dust, sand blast materials, salt spray, and the like).

- B. Make good painted surfaces rejected by the Architect and/or Owner, at no cost to Owner.
 - 1. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted.
 - 2. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

3.05 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

3.06 PAINT SCHEDULE

- A. Gypsum Board in Dry Areas: INT 9.2M, Institutional Low Odor/VOC, gloss as selected.
 - 1. Premium Grade 3-Coat System: Primer/sealer, intermediate coat, and topcoat.
 - 2. Products by Benjamin Moore, PPG/ICI/Glidden, or S-W.
- B. Gypsum Board in Areas Subject to Moisture (restrooms): INT 9.2B, High Performance Architectural Latex, gloss as selected.
 - 1. Premium Grade 3-Coat System: Primer/sealer, intermediate coat, and topcoat.
 - 2. Products by Benjamin Moore, PPG/ICI/Glidden, or S-W, Premium Grade.
- C. Miscellaneous: Consult MPI Manual for surfaces not scheduled and follow instructions.

3.07 CLEANING

- A. Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- B. Clean equipment and dispose of wash water/solvents as well as other cleaning and protective materials (e.g. rags, drop cloths, masking papers), paints, thinners, paint removers/strippers in accordance with the safety requirements of AHJ.
 - 1. Keep work area free from accumulation of tools, equipment, and debris.

END OF SECTION 09 91 00

SECTION 10 52 00

SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This section includes the following:
 - 1. Fire extinguishers.
 - 2. Fire extinguisher cabinets.
- B. Related Sections:

1.03 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 1. Metal Bollards: Include rating and classification.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ansul, a Tyco Business
 - 2. Amerex
 - 3. Kiddie
 - 4. Or approved equal.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Cartridge Operated: Spun shell.
 - 2. Stored Pressure Operated: Deep Drawn.
 - 3. Class: ABC type.
 - 4. Size: 5 pound (2.27 kg).
 - 5. Finish: Baked polyester powder coat, standard color to be selected.
 - 6. Mounting: Wall hung, provide all brackets and accessories.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Coordinate bollard placement with approved pre-engineered metal building (PEMB) shop drawings and structural foundations prior to installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Comply with manufacturer's written instructions for installing specialties.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

3.03 ADJUSTING, CLEANING, AND PROTECTION

- A. Provide final protection and maintain conditions that ensure that specialties are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10 20 00

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This section includes the following
 - 1. Toilet room accessories
 - 2. Under lavatory guards
 - 3. Toilet paper dispenser, paper towel dispenser, and soap dispenser are to be furnished by Owner and installed by Contractor.
- B. Related Sections:
 - 1. Section 06 10 00 – Rough Carpentry.

1.03 SUBMITTALS

- A. Product data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify products using designation indicated on Drawings.
- C. Setting Drawings: For cutouts required in other work: include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- D. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.04 QUALITY ASSURANCE

- A. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
 - 1. Other manufacturer's products with equal characteristics may be considered. See Section 01 63 00 for Substitutions.
 - 2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.05 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disable persons, proper installation, adjustment, operation, cleaning, and servicing accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:
 - 1. Toilet and Bath Accessories
 - a. Bobrick Washroom Equipment
 - b. Bradley Corporation
 - c. American Specialties, Inc.
 - d. A and J Washroom Accessories.
 - 2. Under lavatory Guards
 - a. Brocar Products, Inc.
 - b. Truebro, Inc
- B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Toilet and Bath Accessory Schedule at the end of Part 3.

2.02 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0323-inch (0.8 mm) minimum nominal thickness, unless otherwise indicated.
- B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16 (ASTM B 16M), rods, shapes, forgings, and flat products with finished edges; ASTM B 30, casting.
- C. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch (0.9 mm) minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish
- D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180)
- E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base material.
- F. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic enamel coating.
- G. Galvanized Steel Mounting Devices: ASTM A 153 A 153/A 153M, hot-dip galvanized after fabrication.
- H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.03 FABRICATION

- A. General: One, maximum 1 ½ inch (38 mm) diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product number.
- B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless steel hinge. Provide anchorage that is fully concealed when unit is closed.
- D. 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

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings.
- B. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site at appropriate time for building-in.
- B. Coordinate blocking requirements in advance. Provide templates and rough-in measurements as required.
- C. Verify exact location of accessories for installation.

3.03 INSTALLATION

- A. Install accessories 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.
- B. Install grab bars to withstand a downward load of at least 250 lbf (1112N), when tested according to method in ASTM F 446.

3.04 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.05 TOILET AND BATH ACCESSORY SCHEDULE

- A. Grab Bar "GB": Where this designation is indicated, provide stainless-steel grab bar complying with the following:
 - 1. Products: Bobrick B-6806
 - 2. Mounting: Concealed with manufacturer's standard flanges and anchors
 - 3. Gripping Surfaces: Manufacturer's standard "peened", slip resistant texture.
 - 4. Outside Diameter: 1-½ inches (38 mm) for heavy-duty applications.
 - 5. Lengths: 18" 36" and 42"
 - 6. Location: as indicated and detailed on the plans
- B. Sanitary Napkin Disposal
 - 1. Bobrick B-270
 - 2. Surface-mounted type
- C. Under Lavatory Guard:
 - 1. Products: Truebro Model No. 103
 - 2. Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.

Division 10 Specifications

Whatcom County Library System

Birch Bay Vogt Library Express

10 28 00

TOILET ROOM ACCESSORIES

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3. Location: as indicated on the plans (minimum – at all exposed domestic hot water piping under lavatories).
- D. Waste Receptacle “WR”: Where this designation is indicated, provide stainless-steel waste receptacle complying with the following:
 1. Products: Bradly Model 346
 2. 12 Gallon Waste Receptacle, Recessed.
 3. Location: One per each toilet room
- E. Mirrors
 1. Bobrick: B165 –channel frame mirror
 2. Size: refer to drawing for size
- F. Toilet Seat Dispensers
 1. Furnished by Owner: Installed by Contractor
- G. Toilet Paper Dispensers
 1. Furnished by Owner: Installed by Contractor
- H. Paper Towel Dispensers
 1. Furnished by Owner: Installed by Contractor
- I. Soap Dispensers
 1. Furnished by Owner: Installed by Contractor

END OF SECTION 10 28 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 07 for Firestopping
 - 2. Division 08 for Architectural Access Doors
 - 3. Division 22 Section General Duty Valves for Piping
 - 4. Division 22 Section Hangers and Supports for Piping and Equipment
 - 5. Division 22 Section Plumbing Insulation
 - 6. Division 22 Section Water Distribution Piping
 - 7. Division 22 Section Water Distribution Piping Specialties
 - 8. Division 22 Section Plumbing Pumps
 - 9. Division 22 Section Drainage and Vent Piping
 - 10. Division 22 Section Drainage Piping Specialties
 - 11. Division 22 Section Domestic Water Heaters
 - 12. Division 22 Section Plumbing Fixtures
 - 13. Division 26 for Electrical connections.

1.2 SUMMARY

- A. The work of Division 22 consists of providing labor and products, and of performing all operations required for the complete operating installation of all mechanical plumbing systems as shown and specified, in strict accordance with this and all sections of these specifications, applicable drawings, terms, and conditions of the contract, and all applicable codes and ordinances governing installation of the various mechanical systems. Coordinate all work fully with the work of other trades. Provide all systems complete and in proper operating order. This section of Division 22 is a part of all other sections of Division 22.
- B. Division 22 generally includes plumbing fixtures, equipment, piping and appurtenances that are not specified in other Divisions and are located within 5' of the building footprint. Systems that extend beyond 5' from the building shall be provided by the Civil trade. Division 22 scope shall interface and coordinate with the Civil scope.
- C. This Section includes the following to complement other Division 22 Sections:
 - 1. Submittals.
 - 2. Record Documents.
 - 3. Maintenance Manuals.
 - 4. Piping materials and installation instructions common to most piping systems.

5. Dielectric fittings.
6. Mechanical sleeve seals.
7. Sleeves.
8. Escutcheons.
9. Grout.
10. Dielectric fittings.
11. Flashing.
12. Nonshrink grout for equipment installations.
13. Equipment installation requirements common to equipment sections.
14. Plumbing demolition.
15. Cutting and patching.
16. Rough-ins.
17. Touch up painting and finishing.

1.3 INTENT

- A. The intent of the Contract Documents is for the Contractor to include all work necessary for the complete plumbing systems, tested and ready for operation.
- B. By submitting a proposal, the Contractor represents that it has made a thorough examination of the site, of the work, and all existing conditions and limitations, and that it has examined the Contract Documents in complete detail and has determined beyond doubt that the drawings, specifications, and existing conditions are sufficient, adequate and satisfactory for the construction of the work under the Contract.
- C. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items, or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments with no added compensation. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Architect for review and approval.
- D. The Drawings are partly diagrammatic and do not show all offsets in piping or exact locations of piping, ducts, etc. Also, the drawings do not necessarily show in detail all features of the installation. It is the responsibility of the Contractor to provide equipment that fits into the space allotted and allows adequate acceptance clearances for installation, replacement, entry, servicing and maintenance.
- E. Refer to details, diagrams and schematics, in addition to all Mechanical Specifications, for detailed requirements for isolating valves, drain valves, vents, instruments, flexible connectors and similar components.
- F. If there appears to be insufficient space to install the mechanical work as shown, the A/E shall be notified prior to proceeding with the work. Failure to comply with this requirement will be considered sufficient cause to require altering the work, at no additional cost to the contract, as directed by the A/E.

1.4 GENERAL REQUIREMENTS

A. Conditions:

1. Conform to all Bidding Requirements, General Conditions and Amendments to the General Conditions, Supplementary Conditions and Special Conditions and General Requirements, Division 01, which govern the work specified herein.
2. The Contractor is obligated to comply with the above in addition to the requirements of this Section.
3. Modifications by this Section do not nullify any other portions of the above referenced conditions.

B. Make complete plumbing installation, connecting to all fixtures and equipment shown on the Drawings, or called for in the Specifications. Plumbing contractor to provide any additional extra valves not shown on plans to obtain design criteria as required by the balancing contractor.

C. Plans and Specifications: Plans and specifications shall be taken together. Drawings and Specifications are complementary, each to the other; what is shown on one is as binding as if called for in both.

1. Contractor shall provide all equipment, materials and work shown on the Drawings and/or called for in these Specifications.
2. Provide work specified and not indicated on Drawings, or work indicated on Drawings and not specified, as though mentioned in both.
3. When discrepancies or conflicts occur within the documents, the Architect shall determine which takes precedence and the Contractor shall perform the selected requirement without additional cost.

D. Plumbing Drawings:

1. Plumbing Drawings do not attempt to show all aspects of building construction, which will affect the installation of plumbing systems. The Plumbing Drawings are diagrammatic and do not intend to show all offsets and fittings that may be required for a complete installation. Locations of equipment, pipes, valves, traps, fixtures, etc. shown on the drawings, shall be followed as closely as conditions will permit. Review all project Drawings, including, but not limited to, architectural, structural and electrical drawings; and coordinate with all trades involved so there is no conflict with work of other trades and so Owner secures best arrangement of work consistent with use of space.
2. Verify exact distances between points shown of drawings by actual measurement at site, as no extra cost will be allowed for differences between actual measurements and scaled measurements.
3. Changes in design, configuration, or location of equipment, piping, or fixtures, advisable in the opinion of Contractor, shall be submitted to Architect for approval before proceeding with work, with written assurance from other trades that such changes will not interfere with their installation, nor cause any extra cost on their part. Such changes shall be made at no additional cost to Owner.

4. Check location of all work of all trades and avoid interferences. Special attention is called to the following items, conflicts shall be reported to Architect for decision and direction:
 - a. Exact locations and elevations of fixtures shown on architectural details.
 - b. Locations of suspended ceilings.
 - c. Locations of pipes, valves and equipment so electrical outlets are clear of these items and in proper relation to same.

1.5 DEFINITIONS

- A. 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.
- B. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.
- E. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- F. The word "provide," as used in Division 22, means "furnish and install."
- G. The word "approved," as used in these specifications, means acceptance by the Architect.
- H. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, or other paragraphs or schedules in the specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.
- I. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted," mean directed by the Architect, requested by the Architect, and similar phrases.
- J. A/E: Architect/Engineer or other appointed Owner's representative.

1.6 CODES, PERMITS AND INSPECTIONS

- A. Codes: Work shall be installed as a minimum in conformity with applicable local ordinances and statutes. Standards and sizes, which exceed preceding requirements, shall be installed as drawn or specified. Nothing in the Specifications shall be construed to permit deviation to less than the requirements of governing codes. Contractor is not relieved from furnishing and installing work shown or specified which may be beyond requirements of ordinances, laws, regulations, and codes.
- B. Codes and Standards: Applicable codes and standards shall include, but not necessarily be limited to:
1. Washington State Energy Code
 2. Uniform Plumbing Code, by International Association of Plumbing and Mechanical Officials.
 3. International Mechanical Code, by International Code Council.
 4. International Building Code, by International Code Council.
 5. International Fire Code, by International Code Council.
 6. Requirements of OSHA, EPA and WISHA.
 7. National Fire Protection Association Codes, including National Electrical Code.
 8. ANSI Accessible and Usable Buildings and Facilities.
 9. ASME codes for boiler and pressure vessels.
 10. All local and state amendments.
 11. Requirements of all agencies have jurisdictional authority over installation of plumbing and plumbing systems.
- C. Permits, Fees and Inspections:
1. Contractor shall arrange and pay for all permits, fees and inspections required in connection with this installation. The Contractor shall present the Owner with properly signed certificates of final inspection before the work will be accepted.
 2. Contractor shall call for all inspections by local building official(s) when they become due and shall not cover any work until approved by these governing authorities.
- D. Underwriters Laboratory Approval: Where Underwriters Laboratories (UL) standards exist, all items of electrical equipment or items partially composed of electrical equipment shall carry Underwriters Laboratories (UL) label either for the entire unit or for the electrical portion of the equipment. If UL standards do not exist, equipment shall be provided that has been labeled by an independent testing agency that is recognized by the authority having jurisdiction.
- E. Nothing in the Drawings or Specifications shall be construed as directing or permitting work which is not fully in conformance with Codes and Regulations.
- F. Where the Drawings or Specifications indicate materials or construction which exceeds the quality or size required by Codes and Regulations, the provisions of the Drawings or Specifications take precedence over the requirements of the Codes and Regulations.

- G. Any variance from code requirements shall be promptly reported to the A/E. No work shall be installed which is not in accordance with Codes and Regulations.

1.7 WORK INCLUDED

- A. Work under this division shall include selective demolition and providing all new materials, labor, equipment, tools, appliances, hoisting, scaffolding, supervision and overhead for the proper execution and completion of the plumbing work.
- B. Should these Specifications or references made therein fail to specify adequately an item of equipment or material required for proper completion of the work in accordance with present day practice, this deficiency shall not relieve Contractor from furnishing and installing same. Call such omissions to attention of Architect and use such equipment or material as approved by Architect.
- C. All new equipment and products as noted in Part 2 of each section shall be installed as per manufacturer's recommendations.

1.8 WORKMANSHIP

- A. This Contractor shall provide completed systems with a neat and finished appearance. If, in the judgment of the Architect, any portion of the work has not been performed in a workman-like manner or is left in a rough, unfinished state, this Contractor will be required to remove, reinstall or replace same and patch and paint surrounding surfaces in a manner acceptable to the Architect, without increase in cost to the Owner.

1.9 SUBMITTALS, GENERAL REQUIREMENTS

- A. General: Follow the procedures for submittals or as described herein and specified in Division 01.
- B. General Requirements for Division 22 Submittals: Provide the following submittals as indicated in each Division 22 section. Additional submittal requirements may be included in the individual sections.
 - 1. Product Data: Submit manufacturer's product data for the items listed in the individual Division 22 sections. Product data shall demonstrate compliance with all specified features and requirements. Submittals for equipment shall include, but not be limited to, data indicating equipment capacity meets the indicated values at specified conditions, equipment drawings indicating all dimensions, connection information, service space requirements, recommended piping and/or wiring diagrams, installation details and extended warranties either offered by equipment manufacturer or required by specifications.
 - 2. Operation and Maintenance Data: Submit proposed Division 22 Operation and Maintenance materials for approval prior to inclusion in the comprehensive final bound edi-

tion. See Article in this section on Operation and Maintenance Manuals for materials required to be included.

- C. Format: Provide submittals arranged with numerical index and tabs containing the total volume of material. All product data shall be submitted complete by system, partial submittals are not acceptable and may be returned unreviewed. Systems are defined here as plumbing systems (Division 22). Reference submittals, including title and location of project, Architect, Contractor, submission date, and Specification paragraph number to indicate clearly the location, service, equipment identification numbers as shown on drawings, and function of each particular item. Where manufacturers' catalogs, pamphlets, or data sheets are submitted, such submissions shall indicate specifically the item for which approval is required in red ink, and submissions showing general information only are not acceptable.
- D. Submittals not in conformance to above paragraphs will be returned unreviewed.

1.10 SUBMITTALS, BASIC PLUMBING MATERIALS

- A. General: See Article in this section, Submittals, General Requirements for general requirements of Product Data and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals of the following:
 - 1. Dielectric fittings.
 - 2. Escutcheons.
 - 3. Mechanical sleeve seals.
 - 4. Sleeves.
 - 5. Nonshrink grout for equipment installations.
- C. Shop Drawings: None required.
- D. Reports and Certificates: None required.

1.11 SUBSTITUTIONS

- A. Substitutions will only be considered after project award. No substitutions will be considered during bid and/or negotiation periods.
- B. In all cases in this specification where an article is followed by the words "or equal," the Engineer is the sole judge of the quality of the proposed substitution.
- C. When the Engineer approves a substitution, the approval is given with the understanding that the Contractor guarantees the article or material substituted to be equal to or better in every respect than the article or material specified. The Contractor shall also assume complete responsibility that the article or material will fit the job as far as space, access and servicing requirements.

- D. Where several materials are specified by name for one use, select for use any of those so specified subject to compliance with specified requirements.
- E. Whenever item or class of material is specified exclusively by detail specification, trade name, manufacturer's name or by catalog reference, use only such item, unless written approval is given. Submit written requests in accordance with Division 01 substitution requirements.
- F. Make no substitutions for materials, articles or process required under contract unless written approval is obtained. See Division 01 for project substitution requirements.

1.12 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 01. In addition to the requirements specified in Division 01, indicate the following installed conditions:
 - 1. Mains and branches of piping systems, with valves and control devices located, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.).
 - 2. Record drawings shall incorporate all accepted change orders and RFIs; reference number on drawings is not acceptable.
 - 3. Equipment and fixture locations (exposed and concealed).
 - 4. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
 - 5. Record the locations and invert elevations of underground installations.

1.13 OPERATION AND MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 01 and the following requirements. Division 22 manuals shall be indexed by system. Pages shall be same size, with exception of allowable foldout pages for control and flow diagrams. Cover shall be inscribed with name of project, Owner, description of contents, Architect, General Contractor, Plumbing Contractor, and date. In addition to the requirements specified in Division 01, include the following information in Division 22 materials:
 - 1. Product Data of all Division 22 equipment provided by the project as indicated in submittal requirements.
 - 2. Manufacturer's Equipment Installation and Start-Up Manuals for all equipment provided by the project. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.
 - 3. Manufacturer's Equipment Service Manuals for all equipment provided by the project, including parts list, troubleshooting list and maintenance procedures for routine preventative maintenance. Include disassembly, repair, and reassembly; aligning and adjusting instructions; servicing instructions and lubrication charts and schedules
 - 4. Reports and Certificates of all Division 22 systems and equipment as required by specifications.

5. Material Safety Data Sheets (MSDS) for all applicable materials used for Division 22 installations.
6. Warranty Certificates for all equipment where extended warranties are either offered or required; provide supplier contact information.

1.14 QUALITY ASSURANCE

- A. Electrical Characteristics for Plumbing Equipment: Equipment of different 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.

1.15 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture. Remove shipping caps and plugs after installation or connection as appropriate, and prior to system startup.
- B. Protect stored equipment, fixtures, pipes and tubes and other materials from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Pipes, fixtures, equipment, and other materials that are damaged due to improper storage shall be replaced at the Contractor's expense.

1.16 SEQUENCING AND SCHEDULING

- A. Coordinate plumbing equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for plumbing installations.
- C. Coordinate installation of required supporting devices and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate requirements for access panels and doors if plumbing items requiring access are concealed behind finished surfaces. Architectural access panels and doors are specified in Division 08.

- F. Coordinate with General Contractor and arrange for continuous freeze protection of liquid-filled mechanical piping and equipment throughout construction.

1.17 DEMOLITION

- A. Demolition of existing plumbing may not be specifically or completely noted on the Drawings. The exact extent of demolition required must be verified by on-site review. The scope of demolition required is as follows:
 - 1. Remove all existing piping and tubing, including hangers, valves, insulation and fittings, which are not to be re-used. Remove water piping back to the main unless shown otherwise, so as not to create dead ends.
 - 2. Remove all existing plumbing equipment, including bases, supports, foundations, frames, vents, piping, electrical devices, control devices, control panels, and accessories, which are not to be reused.
 - 3. Remove and replace or reinstall all equipment, piping, ductwork and accessories which must be moved or disassembled in order to accomplish the work shown.
 - 4. Provide and install new piping connections, valves, fittings, insulation, and hangers, as necessary on any existing piping which is to remain in service, to provide a complete and functional system. Materials shall match existing materials, where possible, or shall be made compatible with existing materials. Insulation thickness shall be in accordance with the insulation specified for new piping.
- B. Where there is any question as to whether materials are to be removed or are to remain, the Architect or Engineer shall be consulted.
- C. Where plumbing materials are removed and the surrounding surfaces are to remain, the surfaces shall be repaired, rebuilt and patched, with the quality of work and materials to be in conformance with the requirements of other sections of the Specifications. Fire rated construction shall be patched to maintain the fire rating.
- D. Removed materials shall be the property of the Contractor and shall be promptly removed from the site and properly disposed of.
- E. Maximum precautions shall be taken to provide protection for the existing building and equipment from damage. Prevent water and dust from entering the existing building.

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, the following:
 - 1. Dielectric Unions:

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- a. Capitol Manufacturing Co.
 - b. Eclipse, Inc.; Rockford-Eclipse Div.
 - c. Epco Sales Inc.
 - d. Hart Industries International, Inc.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Industries, Inc.; Wilkins Div.
- 2. Dielectric Flanges:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Co.
 - c. Epco Sales Inc.
 - d. Watts Industries, Inc.; Water Products Div.
- 3. Dielectric Couplings:
 - a. Calpico, Inc.
 - b. Gene Rich & Co.
 - c. Lochinvar Corp.
- 4. Dielectric Nipples:
 - a. Grinnell Corp.; Grinnell Supply Sales Co.
 - b. Precision Plumbing Products
 - c. Victaulic Co. of America.
- 5. Mechanical Sleeve Seals:
 - a. Calpico, Inc.
 - b. Metraflex Co.
 - c. Thunderline/Link-Seal.
 - d. Innerlynx

2.2 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.

2.3 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. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
- F. Solvent Cements for Joining Plastic Piping:
 - 1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.4 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.

2.5 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit with EPDM rubber links shaped to continuously fill annular space between pipe and sleeve. Stainless steel connecting bolts and composite pressure plates.

2.6 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, 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.

- 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.

2.7 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an inner diameter to closely fit around pipe, tube, and insulation of insulated piping and an outer diameter that completely covers opening.

- B. One-Piece, Cast-Brass Type: With set screw.

- 1. Finish: Polished chrome-plated and rough brass.

- C. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

- 1. Finish: Polished chrome-plated and rough brass.

2.8 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

- 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 COOPERATION WITH OTHER TRADES

- A. This Contractor shall give full cooperation to other trades and shall furnish in writing to other contractors, with copies to the A/E, any information necessary to permit the work of all trades to be installed satisfactorily, with the least possible interference or delay, and with maximum headroom and clearance.
- B. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

3.2 PROTECTION

- A. The Contractor shall protect all work and material from damage by his work or workmen and shall be liable for all damage thus caused.
- B. The Contractor shall be responsible for work and equipment until finally inspected, tested, and accepted; he shall protect work against theft, injury or damage; and shall carefully store material and equipment received on site which are not immediately installed. He shall close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material.

3.3 SCAFFOLDING, RIGGING, HOISTING

- A. The Contractor shall protect all work and material from damage by his work or workmen and shall be liable for all damage thus caused.
- B. The Contractor shall furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

3.4 ELECTRICAL WORK

- A. The Electrical Contractor is responsible for providing circuit protective devices for equipment included in Division 22 unless specified otherwise.
- B. The Electrical Contractor is responsible for providing power outlet boxes for each piece of equipment, installing electrical devices and connecting them to the equipment.
- C. Electrical components provided with plumbing equipment shall be compatible with the electrical services to which they are to be connected.
- D. Interconnecting wiring between components of plumbing equipment, when the wiring is not a part of the power wiring to the equipment, shall be provided by the plumbing Contractor.
- E. All control equipment and wiring, interlock wiring between components, and control sequences shall be provided so that the equipment, including auxiliary devices, operates correctly and completely under all sequences. All control wiring circuits shall be on emergency power when the equipment controlled is on emergency power.

3.5 MATERIAL AND WORKMANSHIP

- A. All materials and apparatus required for the work shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the A/E shall be furnished.

- B. The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welders, helpers and labor required to unload, transfer, erect, connect-up, adjust, start, operate, and test each system.
- C. Unless otherwise specifically indicated on the plans or specifications, all equipment and materials shall be installed with the approval of the A/E in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.
- D. As required by requirements of these Specifications, other portions of the Specifications, and Standards to which reference is made in the Specifications, or where prohibited by Codes, Regulations and Ordinances, no materials shall be installed which exceed the allowable limits of flame-spread or smoke-developed indexes, or which do not meet the requirements for Approved Plastic Materials as defined in the International Building Code. (No exposed PVC materials shall be installed in the building.)

3.6 PLUMBING DEMOLITION

- A. Refer to Division 01 Section Cutting and Patching and Division 02 Section Selective Structure Demolition for general demolition requirements and procedures.
- B. Perform all demolition or interface work required in the existing building for the removal of, or interface with, existing plumbing equipment, fixtures, valves or piping. Relocate or modify the existing piping or valves as required by any general construction alterations or by the installation of new work in the existing building.
- C. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- D. 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.
- E. Reuse of Materials: Reuse of existing materials is prohibited unless specifically indicated or approved by Architect.

- F. Notify Architect in discovery of any hazardous materials.
- G. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational fixtures and equipment indicated for relocation.

3.7 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 01. In addition to the requirements specified in Division 01, the following requirements apply:
 - 1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Perform cutting, fitting, and patching of plumbing equipment and materials required to:
 - 1. Uncover Work to provide for installation.
 - 2. Remove and replace defective Work.
 - 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 - 4. Install equipment and materials in existing structures.
 - 5. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- C. Cut, remove and legally dispose off-site of selected plumbing equipment, components, and materials, including but not limited to removal of piping, plumbing fixtures and trim, and other plumbing items made obsolete by the new Work.
- D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- E. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for plumbing installations. Perform cutting by skilled mechanics of trades involved.
- F. Repair cut surfaces to match adjacent surfaces.

3.8 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. Locate groups of pipes parallel to each other, spaced 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 plus 1-inch clearance around insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install piping tight to slabs, beams, joists, columns, walls, and other building elements.
- M. Install escutcheons for penetrations of walls, ceilings, and floors.
- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- O. 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 Section Penetration Firestopping for materials.
- P. Verify final equipment locations for roughing-in.
- Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements

3.9 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 B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- 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.
 - 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. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- H. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Nonpressure Piping: Join according to ASTM D 2855.
- I. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.10 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. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.11 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data.

- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. 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.
- E. Install equipment giving right of way to piping installed at required slope.

3.12 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with mechanical sleeve seals.
- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- E. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install chrome plated steel escutcheons at finished surfaces.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 22 Section Common Work Results for Plumbing
 - 2. Division 22 Section Hangers and Supports for Piping and Equipment
 - 3. Division 22 Section Plumbing Insulation
 - 4. Division 22 Section Water Distribution Piping
 - 5. Division 22 Section Water Distribution Piping Specialties
 - 6. Division 22 Section Plumbing Pumps
 - 7. Division 22 Section Drainage and Vent Piping
 - 8. Division 22 Section Drainage Piping Specialties
 - 9. Division 22 Section Domestic Water Heaters
 - 10. Division 22 Section Plumbing Fixtures.

1.2 SUMMARY

- A. This Section includes plumbing valves including the following types:
 - 1. Gate valves.
 - 2. Ball valves.
 - 3. Check valves.

1.3 REFERENCES

- A. ASTM International:
 - 1. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
 - 2. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- B. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
 - 2. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.
- B. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- D. Project Record Documents: Record actual locations of valves.
- E. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.

1.6 WARRANTY

- A. Furnish one year manufacturer warranty for valves excluding packing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Apollo: www.conbraco.com.
 - 2. Josam Co.
 - 3. Jay R. Smith Mfg. Co.
 - 4. Mifab, Inc.
 - 5. NIBCO, Inc.: www.nibco.com.
 - 6. Victualic
 - 7. Watts: www.watts.com.
 - 8. Zurn Industries, Inc.; Hydromechanics Div.

2.2 GATE VALVES

- A. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded bonnet, non-rising stem, hand-wheel, inside screw, solid wedge disc, alloy seat rings, solder or threaded ends.

2.3 BALL VALVES

- A. 2 inches and Smaller: MSS SP 110, 400 psi WOG, one piece bronze body, chrome plated brass ball, full port, Teflon seats, blow-out proof stem, solder or threaded ends, lever handle.
- B. 1-1/4 inch up to and including 3 inches: 150 PSI, 600 CWP, bronze, two piece body, 316 stainless steel ball, full port, reinforced PTFE seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends.

2.4 CHECK VALVES

- A. Horizontal Swing Check Valves:
 - 1. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N disc, solder or threaded ends.
 - 2. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast-iron disc, renewable disc seal and seat, flanged ends.
- B. Spring Loaded Check Valves:
 - 1. 2 inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, Teflon disc, integral seat, solder or threaded ends.
 - 2. 2-1/2 inches and Larger: MSS SP 71, Class 125, wafer style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify piping system is ready for valve installation.

3.2 INSTALLATION

- A. Install valves with stems upright or horizontal, not inverted.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install 3/4-inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

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- D. Install valves with clearance for installation of insulation and allowing access.
- E. Provide access where valves and fittings are not accessible.

3.3 VALVE APPLICATIONS

- A. Install shutoff valves at locations indicated on Drawings in accordance with this Section.
- B. Install ball, butterfly or gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Install ball or gate valves for throttling, bypass, or manual flow control services.
- D. Install spring loaded check valves on discharge of water pumps.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 07 for Firestopping
 - 2. Division 22 Section Common Work Results for Plumbing
 - 3. Division 22 Section General Duty Valves for Piping
 - 4. Division 22 Section Plumbing Insulation
 - 5. Division 22 Section Water Distribution Piping
 - 6. Division 22 Section Water Distribution Piping Specialties
 - 7. Division 22 Section Plumbing Pumps
 - 8. Division 22 Section Drainage and Vent Piping
 - 9. Division 22 Section Drainage Piping Specialties
 - 10. Division 22 Section Domestic Water Heaters
 - 11. Division 22 Section Plumbing Fixtures.

1.2 SUMMARY

- A. This Section includes hangers and supports for mechanical system piping and equipment.
 - 1. Pipe hangers and supports.
 - 2. Hanger rods.
 - 3. Inserts.
 - 4. Flashing.
 - 5. Formed steel channel.
 - 6. Firestopping relating to plumbing work.
 - 7. Firestopping accessories.
 - 8. Equipment bases and supports.
 - 9. Seismic attachments.

1.3 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B31.9 - Building Services Piping.
- B. ASTM International:
 - 1. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

2. ASTM E119 - Method for Fire Tests of Building Construction and Materials.
 3. ASTM E814 - Test Method of Fire Tests of Through Penetration Firestops.
 4. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
 5. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- C. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
 3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- D. Underwriters Laboratories Inc.:
1. UL 263 - Fire Tests of Building Construction and Materials.
 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
 4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
 5. UL - Fire Resistance Directory.

1.4 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.
- B. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.
- C. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.5 SYSTEM DESCRIPTION

- A. Provide galvanized steel band or fabricated galvanized angle iron brackets for wall supports.
- B. Firestopping Materials: ASTM E119, ASTM E814, UL 263, UL 1479 to achieve fire ratings as noted on Drawings for adjacent construction, but not less than 1 hour fire rating.
- C. Firestop interruptions to fire rated assemblies, materials, and components.

1.6 PERFORMANCE REQUIREMENTS

- A. Firestopping: Conform to UL for fire resistance ratings and surface burning characteristics.

1.7 SUBMITTALS

- A. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
 - 2. Firestopping: Submit data on product characteristics, performance and limitation criteria.

1.8 QUALITY ASSURANCE

- A. All materials shall be new and manufactured for the specific purpose of supporting systems, equipment, pipes and accessories.
- B. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage (24.9 Pa) minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
 - 2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - a. Floor Penetrations Within Wall Cavities: T-Rating is not required.
- C. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
 - 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
 - 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
- D. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
- E. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.
- F. Surface Burning Characteristics: 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- B. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Seismic Bracing and Supports
 - a. Amber Booth.
 - b. Kinetics Corporation.
 - c. Mason Industries, Inc.
 - d. Vibrex.
 2. Pipe Hangers:
 - a. Anvil Corp.
 - b. B-Line Systems, Inc.
 - c. Erico International Corp.
 - d. National Pipe Hanger Corp.
 - e. Tolco.
 3. Thermal-Hanger Shield Inserts:
 - a. Carpenter & Patterson, Inc.
 - b. PHS Industries, Inc.
 - c. PT&P, Pipe Shields, Inc.
 - d. Rilco Manufacturing Co., Inc.
 - e. Value Engineered Products, Inc.

2.2 MANUFACTURED UNITS

- A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.
1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield.
1. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
 2. Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.

3. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.
4. All insulated pipe supports shall be load rated. Load ratings shall be established by pipe support manufacturer based upon testing and analysis in conformance with the latest edition of the following codes: ASME B31.1, MSS SP-58, MSS SP-69, and MSS SP-89.
5. Load tests shall be made on both supporting materials and configurations. All tests shall be performed by an independent testing laboratory. Results of pertinent tests shall be available, on request, to the purchaser.

2.3 FIRESTOPPING

- A. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
 2. Foam Firestopping Compounds: Single component foam compound.
 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
 4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
 5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
 6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
 7. Firestop Pillows: Formed mineral fiber pillows.
- B. Color: Dark gray.

2.4 FIRESTOPPING ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Dam Material: Permanent:
 1. Mineral fiberboard.
 2. Mineral fiber matting.
 3. Sheet metal.
 4. Plywood or particle board.
 5. Alumina silicate fire board.
- C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

- D. General:
 - 1. Furnish UL listed products or products tested by independent testing laboratory.
 - 2. Select products with rating not less than rating of wall or floor being penetrated.
- E. Non-Rated Surfaces:
 - 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
 - 2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

2.5 MISCELLANEOUS MATERIALS

- A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- B. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive sleeves.
- B. Verify openings are ready to receive firestopping.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Do not drill or cut structural members.

3.3 HANGER AND SUPPORT APPLICATIONS

- A. Provide seismic supports and bracing as required by local code.
- B. Specific hanger requirements are specified in Sections specifying equipment and systems.
- C. Plumbing Piping - DWV:
 - 1. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69, MSS SP89.

2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
 3. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
 4. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
 5. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
 6. Vertical Support: Steel riser clamp.
 7. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.
- D. Plumbing Piping - Water:
1. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69, MSS SP89.
 2. Hangers for Pipe Sizes **1/2 to 1-1/2 inch**: Malleable iron, adjustable swivel, split ring.
 3. Wall Support for Pipe Sizes **3 inches** and Smaller: Cast iron hook.
 4. Vertical Support: Steel riser clamp.
 5. Copper Pipe Support: Copper-plated, Carbon-steel ring.
- E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system specification sections, install the following types:
1. Split ring galvanized: For suspension of pipe sizes under 2" nominal diameter.
 2. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 3. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
- F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification 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.
- G. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification 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.
 3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg f piping installations.
- H. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 2. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Pipe Hanger and Support 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. Install building attachments to attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping.
- C. If concrete inserts cannot be used, install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- D. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- E. 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.
- F. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- G. Place hangers within 12 inches of each horizontal elbow.
- H. Use hangers with 1-1/2 inch minimum vertical adjustment.
- I. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.
- L. Insulated Piping: Comply with the following:
 - 1. Provide clearance in hangers and from structure and other equipment for installation of insulation.
 - 2. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.9.

3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used.
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.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.5 EQUIPMENT SUPPORTS

- A. Use templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- B. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

3.6 FLASHING INSTALLATION

- A. Provide flexible flashing and metal counterflashing where piping penetrates weather or water-proofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash, and seal.
- C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.
- D. Seal floor drains watertight to adjacent materials.

3.7 FIRESTOPPING INSTALLATION

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.

- D. Remove dam material after firestopping material has cured.
- E. Fire Rated Surface:
 - 1. Seal opening at floor, wall, partition, ceiling, and/or roof as follows:
 - a. Install sleeve through opening and extending beyond minimum of **1 inch** on both sides of building element.
 - b. Size sleeve allowing minimum of **1 inch** void between sleeve and building element.
 - c. Pack void with backing material.
 - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
 - 2. Where cable tray, bus, cable bus, conduit, wireway, and/or trough penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.
- F. Non-Rated Surfaces:
 - 1. Seal opening through non-fire rated wall, partition, floor, ceiling, and/or roof opening as follows:
 - a. Install sleeve through opening and extending beyond minimum of **1 inch** on both sides of building element.
 - b. Size sleeve allowing minimum of **1 inch** void between sleeve and building element.
 - c. Install type of firestopping material recommended by manufacturer.
 - 2. Install escutcheons where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
 - 3. Exterior wall openings below grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place, in accordance with manufacturer's instructions.
 - 4. Interior partitions: Seal pipe penetrations at clean rooms, laboratories, hospital spaces, computer rooms, telecommunication rooms, and data rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.8 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- A. Related Sections include the following:
1. Division 22 Section Common Work Results for Plumbing
 2. Division 22 Section General Duty Valves for Piping
 3. Division 22 Section Hangers and Supports for Piping and Equipment
 4. Division 22 Section Water Distribution Piping
 5. Division 22 Section Water Distribution Piping Specialties
 6. Division 22 Section Plumbing Pumps
 7. Division 22 Section Drainage and Vent Piping
 8. Division 22 Section Drainage Piping Specialties
 9. Division 22 Section Domestic Water Heaters
 10. Division 22 Section Plumbing Fixtures.

1.2 SUMMARY

- A. Section Includes:
1. Piping system insulation.
 2. Insulation accessories including vapor retarders.

1.3 REFERENCES

- A. ASTM International:
1. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
 2. ASTM C518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 3. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
 4. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
 5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 6. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

1.4 SUBMITTALS

- A. Provide vendors' submittal data for proposed equipment, materials and accessories in accordance with these specifications to the Architect for approval.
- B. Provide manufacturers' operation and maintenance manuals in accordance with these specifications to the Architect for approval.
- C. Product Data: Submit product description, thermal characteristics and list of materials and

thickness for each service, and location.

- D. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

1.7 WARRANTY

- A. Furnish one year manufacturer warranty for manmade fiber.

PART 2 - PRODUCTS

- 2.1 All insulation materials used on this project shall comply with ASTM E84 with a flame spread/smoke developed index of 25/50 maximum when tested in accordance with the Standard.

2.2 MINERAL FIBER - PIPE INSULATION

- A. Manufacturers:
 - 1. 3M
 - 2. CertainTeed Corporation: www.certainteed.com.
 - 3. Johns Manville Corporation: www.jm.com.
 - 4. Knauf Insulation: www.knaufusa.com.
 - 5. Owens Corning Corp: www.owenscorning.com.
 - 6. Approved equal or better.
- B. Insulation: ASTM C547; rigid, noncombustible.
 - 1. 'K' factor: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum Service Temperature: 850 degrees F.
 - 3. Maximum Moisture Absorption: Less than 5% by weight.
 - 4. Min. Density: 3.5 pounds per cubic foot.
- C. Vapor Retarder Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-

inches.

- D. Facing: 1-inch galvanized steel hexagonal wire mesh stitched on one face of insulation.
- E. Vapor Retarder Lap Adhesive:
 - 1. Manufacturer:
 - a. Foster Model 85-20.
 - b. Childers Vi-Cryl
 - c. Polymer Adhesives
 - 2. Compatible with insulation.
- F. Insulating Cement/Mastic:
 - 1. Manufacturers:
 - a. Johns Manville Model 460
 - b. Knauf
 - c. Owens Corning.
 - 2. ASTM C195; hydraulic setting on mineral wool.
- G. Molded Expanded Perlite Block and Pipe Insulation: ASTM C610, Pipe Insulation.

2.3 ELASTOMERIC CELLULAR FOAM

- A. Manufacturers:
 - 1. Armacell AP Armaflex Model "Armaflex II": www.armacell.com.
 - 2. Halstead; Model "Insul-Tube".
 - 3. Or approved equal.
- A. Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular form: ASTM C534; Type I, Tubular form
 - 1. Minimum Service Temperature: -40 degrees F.
 - 2. Maximum Service Temperature: 220 degrees F.
- B. Elastomeric Foam Adhesive:
 - 1. Air dried, contact adhesive, compatible with insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify piping and equipment has been tested before applying insulation materials.
- B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

- A. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
 - 1. Flexible connectors.
 - 2. Vibration-control devices.
 - 3. Fire-suppression piping.
 - 4. Below-grade piping, unless otherwise indicated.
 - 5. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. Manmade mineral fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 - 3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- E. Manmade mineral fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- F. Inserts and Shields:
 - 1. Application: Piping or Equipment 1-1/2 inches, diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under finish jacket.
 - 4. Insert configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
 - 5. Insert material: Compression resistant insulating material suitable for planned temperature range and service.
- G. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Division 07 Section on Firestopping for penetrations of assemblies with fire resistance rating greater than one hour.
- H. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten

insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

- I. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
- J. Insulated equipment containing fluids below ambient temperature: Insulate entire system.
- K. Mineral fiber insulated equipment containing fluids below ambient temperature: Provide vapor retarder jackets, factory-applied or field-applied. Finish with glass-cloth and vapor barrier adhesive.
- L. Mineral fiber insulated equipment containing fluids above ambient temperature: Provide standard jackets, with or without vapor retarder, factory-applied or field-applied. Finish with glass cloth and adhesive.
- M. Finish insulation at supports, protrusions, and interruptions.

3.3 INTERIOR INSULATION APPLICATION SCHEDULE

- A. Refer to the Drawings and local codes for additional requirements that may be more stringent than the following:
- B. Service: Domestic hot water.
 - 1. Insulation Material: Mineral-fiber, preformed.
 - 2. Insulation Thickness: Apply the following insulation thicknesses:
 - a. Pipe, 1/2-inch – 1-1/4-inch: 1-inch.
 - b. Pipe, 1-1/2-inch and above: 1-1/2-inch.
 - 3. Vapor Retarder Required: No.
 - 4. Insulation Conductivity Range: 0.24 – 0.28 BTU·in/(hr·ft²·°F).
- C. Service: Domestic cold water.
 - 1. Insulation Material: Mineral-fiber, preformed.
 - 2. Insulation Thickness: 1/2-inch.
 - a. Pipe, 1/2-inch – 1-1/4-inch: 1/2-inch.
 - b. Pipe, 1-1/2-inch and above: 1-inch.
 - 3. Vapor Retarder Required: Yes.
 - 4. Insulation Conductivity Range: 0.23 – 0.27 BTU·in/(hr·ft²·°F).
- D. Service: Condensate drain piping.
 - 1. Insulation Material: Flexible elastomeric.
 - 2. Insulation Thickness: 1-inch.
 - 3. Vapor Retarder Required: Yes.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 07 for Firestopping
 - 2. Division 08 for Architectural Access Doors
 - 3. Division 22 Section Common Work Results for Plumbing
 - 4. Division 22 Section General Duty Valves for Piping
 - 5. Division 22 Section Hangers and Supports for Piping and Equipment
 - 6. Division 22 Section Plumbing Insulation
 - 7. Division 22 Section Water Distribution Piping Specialties
 - 8. Division 22 Section Plumbing Pumps
 - 9. Division 22 Section Drainage and Vent Piping
 - 10. Division 22 Section Drainage Piping Specialties
 - 11. Division 22 Section Domestic Water Heaters
 - 12. Division 22 Section Plumbing Fixtures
 - 13. Division 33 for exterior water service piping and water meters.

1.2 SUMMARY

- A. This Section includes water distribution piping from locations indicated to fixtures and equipment inside building.

1.3 DEFINITIONS

- A. Domestic Water Piping: Water piping inside building that conveys potable water to fixtures and equipment throughout the building.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Water Distribution Piping: 125 psig.

1.5 SUBMITTALS

- A. General: See Division 22 Section Common Work Results for Plumbing for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals for the following:
 - 1. Hard copper tubing.
 - 2. Pipe and tube fittings.
- C. Reports and Certificates: Provide submittals of the following:
 - 1. Test Reports specified in "Field Quality Control."

1.6 QUALITY ASSURANCE

- A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.
- B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
- C. Comply with ANSI/NSF 61, "Drinking Water System Components--Health Effects," Sections 1 through 9 for potable-water piping and components.

PART 2 - PRODUCTS

2.1 PIPE AND TUBE MATERIALS

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. Hard Copper Tube: ASTM B 88, Type L , water tube, drawn temper.

2.2 PIPE AND TUBE FITTINGS

- A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
- B. Copper, Solder-Joint Pressure Fittings: ASME B16.18 cast-copper alloy or ASME B16.22 wrought copper and bronze.
- C. Copper Unions: ASME B16.18, cast-copper-alloy, hexagonal-stock body with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Include threads conforming to ASME B1.20.1 on threaded ends.

2.3 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
- B. Refer to Division 22 Section Common Work Results for Plumbing for commonly used joining materials.
- C. Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.
- D. Brazing Filler Metal: AWS A5.8, BCuP, copper phosphorus or BAg, silver classification.
- E. Transition Couplings: Coupling or other manufactured fitting same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Aboveground, Domestic Water Piping: Use the following:
 - 1. Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints.

3.2 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 gate, ball, or butterfly valves.

3.3 PIPING INSTALLATION, GENERAL

- A. Refer to Division 22 Section Common Work Results for Plumbing for basic piping installation.

3.4 DOMESTIC WATER PIPING INSTALLATION

- A. Install piping with 0.25 percent slope downward toward drain.

3.5 JOINT CONSTRUCTION

- A. Refer to Division 22 Section Common Work Results for Plumbing for basic piping joint construction.

3.6 VALVE INSTALLATION

- A. Shutoff Valves: Install shutoff valves on each water supply to equipment, close to main, on each plumbing fixture without supply stops, and where indicated.
- B. Drain Valves: Install hose end 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.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Support pipe in accordance with Division 22 Section Hangers and Supports for Piping and Equipment. Install the following:
 - 1. Riser clamps, MSS Type 8 or Type 42, for vertical runs.
 - 2. Adjustable steel clevis hangers, MSS Type 1, for individual, straight, horizontal runs of cold water and hot water 100 feet and less.
- B. Install seismic restraints according to Division 22 Section Hangers and Supports for Piping and Equipment.
- C. Support vertical piping and tubing at base and at each floor and at maximum distance of 15 feet (whichever is less).
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Horizontal pipe hanger spacing and rod diameters:

Nom. Pipe Size (inches)	Steel Pipe Max. Span (Feet)	Copper Tube Max. Span (Feet)	Min. Rod Diameter (Inches)
Up to 1	7	5	3/8

- F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.8 CONNECTIONS

- A. Connect water distribution piping to the following:
1. Water Heaters: Connect cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 2. Plumbing Fixtures: Connect hot- and cold-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section Plumbing Fixtures.
 3. Equipment: Connect hot- and cold-water supply piping as indicated. Provide shutoff valve and union for each connection.

3.9 FIELD QUALITY CONTROL

- A. Inspect water distribution piping as follows:
1. Do not enclose, cover, or put piping into operation until it is 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 for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test water distribution piping as follows:
1. 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.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
 3. Cap and subject piping to static water pressure of 150 psig or 1-1/2 times the operating pressure, whichever is greater, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 24 hours. Leaks and loss in test pressure constitute defects that must be repaired.
 4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 5. Prepare and submit reports for tests and required corrective action.

3.10 CLEANING

- A. Clean and disinfect potable-water distribution piping as follows:
 - 1. Purge new piping and parts of existing water piping that have been altered, extended, or repaired before using.
 - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, procedure described in either AWWA C651 or AWWA C652 or as described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

3.11 START-UP PROCEDURES

- A. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.
- B. Perform the following steps before putting into operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.
 - 4. Remove and clean strainer screens. Close drain valves and replace drain plugs.
- C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.
- D. Check plumbing specialties and verify proper settings, adjustments, and operation.
 - 1. Water-Pressure Regulators: Set outlet pressure at 80 psig maximum, unless otherwise indicated.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 22 Section Common Work Results for Plumbing
 - 2. Division 22 Section General Duty Valves for Piping
 - 3. Division 22 Section Hangers and Supports for Piping and Equipment
 - 4. Division 22 Section Plumbing Insulation
 - 5. Division 22 Section Water Distribution Piping
 - 6. Division 22 Section Plumbing Pumps
 - 7. Division 22 Section Drainage and Vent Piping
 - 8. Division 22 Section Drainage Piping Specialties
 - 9. Division 22 Section Domestic Water Heaters
 - 10. Division 22 Section Plumbing Fixtures.

1.2 SUMMARY

- A. This Section includes water distribution piping specialties for the following:
 - 1. Water distribution systems.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Water Distribution Piping: 125 psig.

1.4 SUBMITTALS

- A. Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:
 - 1. Water tempering valves.
 - 2. Trap seal primer valves.

3. Hydrants.
 4. Miscellaneous water distribution piping specialties.
- B. Reports: None required.
- C. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 01. Include the following:
1. Water tempering valves.
 2. Trap seal primer valves.
 3. Miscellaneous water distribution piping specialties.

1.5 QUALITY ASSURANCE

- A. Provide listing/approval stamp, label, or other marking on water distribution piping specialties made to specified standards.
- B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Water Tempering Valves:
 - a. Chicago Faucets
 - b. Conbraco Industries, Inc.
 - c. Honeywell Braukmann.
 - d. IMI Cash Valve.
 - e. Leonard Valve Co.
 - f. Watts Industries, Inc.; Water Products Div.
 2. Trap Seal Primer Valves:
 - a. Josam Co.
 - b. Jay R. Smith Mfg. Co.
 - c. MIFAB, Inc.
 - d. Precision Plumbing Products, Inc.
 - e. Zurn Industries, Inc.; Hydromechanics Div.
 3. Trap Seal Primer Systems:

- a. MIFAB, Inc.
 - b. Precision Plumbing Products, Inc.
 - c. Zurn Industries, Inc.; Hydromechanics Div.
4. Hydrants:
 - a. Josam Co.
 - b. Jay R. Smith Mfg. Co.
 - c. MIFAB, Inc.
 - d. Woodford Manufacturing Company, LLCZurn Industries, Inc.; Hydromechanics Div.

2.2 WATER TEMPERING VALVES

- A. General: ASSE 1070, manually adjustable, thermostatically controlled water tempering valve or combination thermostatic and pressure-balanced; bronze body. Must be constructed to control the mixing of hot and cold water and to deliver water at a desired temperature regardless of pressure or input temperature changes. Set tempering valves at 105 degrees F.
- B. Piston or discs or thermostatic wax element controlling both hot- and cold-water flow, capable of limited antiscald protection. Include with integral inlet check valves to prevent cross-flow.
 1. Finish: Rough bronze unless chrome-plated finish is indicated.
 2. Interior parts of brass, bronze, corrosion-resisting steel or copper materials.
- C. Solder-joint or threaded connections and 3/4-inch NPS maximum outlet, with minimum flow rate of 0.35 gpm at a minimum pressure of 20 psi.

TRAP SEAL PRIMER VALVES

- D. Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:
 1. 125-psig minimum working pressure.
 2. Bronze body with atmospheric-vented drain chamber.
 3. Inlet and Outlet Connections: 1/2-inch NPS threaded, union, or solder joint.
 4. Gravity Drain Outlet Connection: 1/2-inch NPS threaded or solder joint.
 5. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
- E. Trap Seal Primer System: Factory-fabricated, automatic-operation assembly for wall mounting with the following:
 1. Piping: 3/4-inch NPS, ASTM B 88, Type L; copper, water tubing inlet and manifold with number of 1/2-inch NPS outlets as indicated.
 2. Cabinet: Steel box with stainless-steel cover.

3. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V, ac power.
4. Water Hammer Arrestor: ASSE 1010.
5. Vacuum Breaker: ASSE 1001.

2.3 HYDRANTS

- A. Exterior walls/unconditioned spaces: Wall hydrant shall be a box type, automatic draining with single check vacuum breaker. ASSE Standard 1019-B approved. 3/4" inlet and outlet. Hardened stainless steel operating stem and one-piece valve plunger to control both flow and drain functions. Exterior finish to be Chrome Plated or Polished Brass. Loose tee key to be furnished with each hydrant.

2.4 MISCELLANEOUS WATER DISTRIBUTION PIPING SPECIALTIES

- A. Hose Bibbs: Bronze body, with renewable composition disc, 1/2- or 3/4-inch NPS threaded or solder-joint inlet, automatic draining with ASSE 1011 anti-siphon vacuum breaker. Provide ASME B1.20.7 garden-hose threads on outlet.
 1. Finish: Chrome or nickel plated.
 2. Operation: Operating-key (handle) type. Include operation key.

PART 3 - EXECUTION**3.1 WATER DISTRIBUTION PIPING SPECIALTY INSTALLATION**

- A. General: Install water distribution piping specialty components, connections, and devices according to manufacturer's written instructions.
- B. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of one percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- C. Fasten wall-hanging water distribution piping specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
- D. Fasten recessed, wall-mounting water distribution piping specialties to reinforcement built into walls.
- E. Secure supplies to supports or substrate.
- F. Install individual stop valve in each water supply to water distribution piping specialties. Use ball, gate, or globe valve if specific valve is not indicated.

- G. Install water-supply stop valves in accessible locations.
- H. Install line size water tempering valves for each lavatory and/or sink faucet as required in restrooms or other public use areas.
- I. 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.
- J. Include wood-blocking reinforcement for recessed and wall-mounting water distribution piping specialties.
- K. Include access for trap primers.
- L. Install hose bibbs with integral or field installed vacuum breaker.
- M. Install wall hydrants with integral or field installed vacuum breaker.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
 - 1. Install piping connections between water distribution piping specialties and piping specified in other Division 22 Sections.
 - 2. Install piping connections indicated as indirect wastes from appliances and equipment specified in other Sections, to spill over receptors connected to plumbing piping systems.
- B. Supply Runouts to water distribution piping specialties: Install hot- and cold-water-supply piping of sizes indicated, but not smaller than required by authorities having jurisdiction.

3.3 START-UP PROCEDURES

- A. Before startup, perform the following checks:
 - 1. System tests are complete.
 - 2. Damaged and defective specialties and accessories have been replaced or repaired.
 - 3. Clear space is provided for servicing specialties.
- B. Before operating systems, perform the following steps:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open general-duty valves to fully open position.
 - 3. Remove and clean strainers.

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WATER DISTRIBUTION PIPING SPECIALTIES
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4. Verify that drainage and vent piping are clear of obstructions. Flush with water until clear.
- C. Startup Procedures: Follow manufacturer's written instructions.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 22 Section Common Work Results for Plumbing
 - 2. Division 22 Section General Duty Valves for Piping
 - 3. Division 22 Section Hangers and Supports for Piping and Equipment
 - 4. Division 22 Section Plumbing Insulation
 - 5. Division 22 Section Water Distribution Piping
 - 6. Division 22 Section Water Distribution Piping Specialties
 - 7. Division 22 Section Drainage and Vent Piping
 - 8. Division 22 Section Drainage Piping Specialties
 - 9. Division 22 Section Domestic Water Heaters
 - 10. Division 22 Section Plumbing Fixtures
 - 11. Division 26 for Electrical for connections.

1.2 SUMMARY

- A. This Section includes pumps for the building plumbing systems.

1.3 SUBMITTALS

- A. General: See Division 22 Section Common Work Results for Plumbing for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals of the following:
 - 1. Submersible sump pumps
 - 2. Packaged, drainage pump units

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of pumps through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect against damage.

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, the following:
 - 1. Submersible Sump Pumps and Packaged, Drainage Pump Units:
 - a. Grundfos Pumps Corp.
 - b. Liberty Pumps.
 - c. Little Giant Pump Co.
 - d. Weil Pump Co.
 - e. Zoeller Pump Co.

2.2 PUMPS, GENERAL

- A. Description: Factory-assembled and -tested, single-stage, centrifugal pump units; complying with UL 778; suitable for potable-water service; with all-bronze or stainless-steel construction and components in contact with water made of corrosion-resistant materials.
- B. Motors: Provide with built-in thermal-overload protection appropriate for motor size and duty.
- C. End Connections for NPS 2 and Smaller: Threaded. Pumps available only with flanged ends may be furnished with threaded companion flanges.
- D. End Connections for NPS 2-1/2 and Larger: Flanged.
- E. Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.
- F. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles.

2.3 SUMP PUMPS, GENERAL

- A. Description: Factory-assembled and -tested, single-stage, centrifugal, end-suction sump pump units complying with UL 778. Include motor, operating controls, and construction for permanent installation.
- B. Discharge Pipe End Connections NPS 2 and Smaller: Threaded. Pumps available only with flanged-end discharge pipe may be furnished with threaded companion flanges.
- C. Discharge Pipe End Connections NPS 2-1/2 and Larger: Flanged.
- D. Motors: Single speed, with grease-lubricated ball bearings, and non-overloading through full range of pump performance curves.
- E. Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.
- F. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembling and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

2.4 COMPACT, SUBMERSIBLE SUMP PUMPS

- A. Description: Simplex, submersible, direct-connected sump pump.
 - 1. Casing: Cast iron with inlet strainer and discharge companion flange suitable for plain-end pipe connection arranged for vertical discharge.
 - 2. Impeller: Cast iron, bronze, brass or stainless steel.
 - 3. Construction: Stainless steel with stainless-steel or other corrosion-resistant impeller, stainless-steel inlet strainer, legs that elevate pump to permit flow into impeller, and discharge companion flange suitable for plain-end pipe connection arranged for vertical discharge.
 - 4. Pump and Motor Shaft: Steel, with factory-sealed, grease-lubricated ball bearings.
 - 5. Seal: Mechanical type.
 - 6. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; and three-conductor waterproof power cable of length required, with grounding plug and cable-sealing assembly for connection at pump.
 - 7. Cover: With holes and gaskets.
 - 8. Controls: NEMA 250, Type 6, 120-V ac, micropressure or mercury-float switches, mounted on discharge piping.

2.5 PACKAGED DRAINAGE PUMP UNITS

- A. Description: Packaged, automatic-operation, pedestal drainage pump; with aluminum or brass impeller, welded-steel or plastic basin, and float switch with 72-inch- minimum power cord and plug.

1. Motor: Mounted vertically on sump with built-in overload protection.
2. Basin: Watertight with inlet pipe connection and gastight cover with vent and pump discharge connections. Plug vent opening if vent piping connection is not required.
3. Controls: Automatic, with mercury-float switches and electrical power cables.
4. Pump Discharge Piping: Manufacturer's standard steel pipe, copper tube, or plastic pipe.
5. Valves: Factory- or field-installed check and shutoff valves on each pump discharge.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of plumbing piping systems to verify actual locations of connections before pump installation.

3.2 SUMP PUMPS INSTALLATION

- A. Install pumps according to manufacturer's written instructions.
- B. Install pumps and arrange to provide access for maintenance, including removal of motors, impellers, couplings, and accessories.
- C. Support piping so weight of piping is not supported by pumps.
- D. Submersible Sump Pumps: Set pumps on basin, pit, or sump floor. Make direct connections to piping.
- E. Sump Pump Basins: Install basins and connect to storm drainage piping. Brace interior of basins according to manufacturer's written instructions to prevent distortion or collapse during concrete placement. Set basin cover and fasten to basin top flange. Install so top surface of cover is flush with finished floor.
- F. Packaged Drainage Pump Units: Install and make direct connections to storm drainage piping.

3.3 SEWAGE PUMP OR SUMP PUMP CONNECTIONS

- A. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements.
 1. Install discharge pipe sizes equal to or greater than diameter of pump nozzles, and connect to storm drainage piping.
 2. Install check valve and gate or ball valve on each automatic, packaged pump discharge.

3.4 START-UP PROCEDURES

- A. Check suction piping connections for tightness.
- B. Controls: Set for automatic starting and stopping operation.
- C. Final Checks before Starting: Perform the following preventive maintenance operations:
 - 1. Verify that pump is free to rotate by hand and that pump for handling hot liquids is free to rotate with pump hot and cold. Do not operate pump if it is bound or drags, until cause of trouble is determined and corrected.
 - 2. Verify that pump controls are correct for required application.
- D. Starting procedure for pumps is as follows:
 - 1. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
 - 2. Open circulating line valve if pump should not be operated against dead shutoff.
 - 3. Start motor.
 - 4. Open discharge valve slowly.
 - 5. Check general mechanical operation of pump and motor.
 - 6. Close circulating line valve once there is sufficient flow through pump to prevent overheating.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining pumps.
 - 1. Review data in maintenance manuals.
 - 2. Schedule training with Owner with at least seven days' advance notice.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 22 Section Common Work Results for Plumbing
 - 2. Division 22 Section General Duty Valves for Piping
 - 3. Division 22 Section Hangers and Supports for Piping and Equipment
 - 4. Division 22 Section Plumbing Insulation
 - 5. Division 22 Section Water Distribution Piping
 - 6. Division 22 Section Water Distribution Piping Specialties
 - 7. Division 22 Section Plumbing Pumps
 - 8. Division 22 Section Drainage Piping Specialties
 - 9. Division 22 Section Domestic Water Heaters
 - 10. Division 22 Section Plumbing Fixtures.

1.2 SUMMARY

- A. This Section includes sanitary drainage and vent piping, and storm drainage piping inside building and to locations indicated.

1.3 SUBMITTALS

- A. General: See Division 22 Section Common Work Results for Plumbing for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals for the following:
 - 1. Copper tubing.
 - 2. PVC piping.

1.4 DEFINITIONS

- A. Soil, Waste, and Vent Piping: Piping inside building that conveys wastewater and vapors from fixtures and equipment throughout the building.
- B. PVC: Poly Vinyl Chloride plastic.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Systems: 10-foot head of water.

1.6 QUALITY ASSURANCE

- A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.
- B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
- C. Comply with the latest version of CISPI 301-04a and ASTM 888-04a.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

2.2 COPPER TUBING

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
 - 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

2.3 PVC PIPING

- A. Schedule 40 PVC pipe, ASTM D1785, solvent welded drainage pattern PVC fittings.
 - 1. Plastic Solvent Cement for PVC Plastic Pipe: ASTM D2564 and ASTM D2855.
- B. Schedule 80 PVC pipe, pressure-rated SDR series: ASTM D2241.
 - 1. Threaded PVC plastic pipe fittings, schedule 80: ASTM D2464.

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PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Aboveground, Soil, Waste, and Vent Piping: Use the following:
 - 1. 1-1/4- and 1-1/2-Inch NPS: Copper drainage tube; wrought copper, solder-joint drainage fittings; and soldered joints.
 - 2. PVC pipe, solvent welded drainage pattern PVC fittings
- D. Indirect Drain Piping: Use the following:
 - 1. Copper drainage tube; wrought copper, solder-joint drainage fittings; and soldered joints.

3.2 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 gate or ball valves.

3.3 PIPING INSTALLATION, GENERAL

- A. Refer to Division 22 Section Common Work Results for Plumbing for basic piping installation.

3.4 DRAINAGE AND VENT PIPING INSTALLATION

- A. Make changes in direction for 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 make change in direction of flow greater than 90 degrees. Use proper size of standard increasers and reducers if different sizes of piping are connected. Reducing size of drainage piping in direction of flow is prohibited.
- B. Install drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. All building drainage systems at 1/4 per foot downward in direction of flow.

2. Vent Piping: 1/8-inch per foot down toward vertical fixture vent.

3.5 JOINT CONSTRUCTION

- A. Refer to Division 22 Section Common Work Results for Plumbing for basic piping joint construction.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 22 Section Hangers and Supports for Piping and Equipment for pipe hanger and support devices. Pipe hangers, inserts, and supports shall conform to MSS SP-58. Install the following:
 1. Riser clamps, MSS Type 8 or Type 42, for vertical runs.
 2. Adjustable steel clevis hangers, MSS Type 1, for individual, straight, horizontal runs 100 feet and less.
- B. Install supports and seismic restraints according to Division 22 Section Hangers and Supports for Piping and Equipment.
- C. Support vertical piping and tubing at base and at each floor (15-ft. maximum).
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for horizontal piping with following maximum spacing and minimum rod sizes:

Nom. Pipe Size (Inches)	Cast-Iron Pipe Max. Span (Feet)	Copper DWVMax. Span (Feet)	Min. Rod Diameter (Inches)
Up to 3/4	7	5	3/8
1	7	6	3/8
1-1/4	7	6	3/8
1-1/2	9	6	3/8
2	10	8	3/8
2-1/2	11	9	1/2
3	12	10	1/2
4	14	12	5/8

1. Support vertical cast-iron pipe and copper tube at each floor, not to exceed 15-feet.
- F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Connect drainage piping to service entrance piping, and extend to and connect to the following:
 - 1. Plumbing Fixtures: Connect soil, waste, and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section Plumbing Fixtures.
 - 2. Plumbing Specialties: Connect soil, waste, and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section Domestic Water Piping Specialties.
 - 3. Equipment: Connect waste piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections 2-1/2-inch NPS and larger.

3.8 FIELD QUALITY CONTROL

- A. Inspect soil, waste, and vent piping as follows:
 - 1. Do not enclose, cover, or put piping into operation until it is 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 for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - 3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
 - 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedure, as follows:
 - 1. 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.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved.
 - 3. Roughing-In Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10 feet of head. Water level must not drop from 15 minutes before inspection starts through completion of inspection (24 hours). Inspect joints for leaks.

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4. Repair leaks and defects using new materials and retest piping or portion thereof until satisfactory results are obtained.
5. Prepare and submit reports for tests and required corrective action.

3.9 CLEANING AND PROTECTING

- A. Clean interior of piping system. 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

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 22 Section Common Work Results for Plumbing
 - 2. Division 22 Section General Duty Valves for Piping
 - 3. Division 22 Section Hangers and Supports for Piping and Equipment
 - 4. Division 22 Section Plumbing Insulation
 - 5. Division 22 Section Water Distribution Piping
 - 6. Division 22 Section Water Distribution Piping Specialties
 - 7. Division 22 Section Plumbing Pumps
 - 8. Division 22 Section Drainage and Vent Piping
 - 9. Division 22 Section Domestic Water Heaters
 - 10. Division 22 Section Plumbing Fixtures

1.2 SUMMARY

- A. This Section includes drainage piping specialties for the following:
 - 1. Soil, waste, and vent systems.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.4 SUBMITTALS

- A. Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:
 - 1. Cleanouts.
 - 2. Drains.
 - 3. Miscellaneous drainage piping specialties.

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- B. Reports: Specified in "Field Quality Control" Article.
- C. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 01. Include the following:
 - 1. Miscellaneous drainage piping specialties.

1.5 QUALITY ASSURANCE

- A. Provide listing/approval stamp, label, or other marking on plumbing specialties made to specified standards.
- B. Listing and Labeling: Provide electrically operated plumbing specialties specified in this Section that are listed and labeled.
 - 1. Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- C. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
- D. Comply with NFPA 70, "National Electrical Code," for electrical components.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cleanouts:
 - a. Josam Co.
 - b. Jay R. Smith Mfg. Co.
 - c. Mifab, Inc.
 - d. Zurn Industries, Inc.; Hydromechanics Div.
 - 2. Drains:
 - a. Josam Co.
 - b. Jay R. Smith Mfg. Co.
 - c. Mifab, Inc.
 - d. Zurn Industries, Inc.
 - 3. Miscellaneous Drainage Piping Specialties:
 - a. Jay R. Smith Mfg. Co.

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- b. Josam Co.
- c. Mifab, Inc.
- d. Zurn Industries, Inc.

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2.2 CLEANOUTS

- A. General: Size cleanouts as indicated on drawings, or where not indicated, same size as connected drainage piping.
 - 1. Provide wall cleanouts on each end of water closet ends and one over main drops in addition, provide all cleanouts required per code.
- B. Cleanouts: ASME A112.36.2M, cast-iron body with straight threads and gasket seal or tapered threads for plug, flashing flange and clamping ring, and a brass closure plug. Cleanouts for installation in floors not having membrane waterproofing may be furnished without clamping ring.
 - 1. Tiled Areas: Round cleanout top with tile recess top.
 - 2. Quarry Tiled Areas: Square nickel-bronze cleanout cover.
 - 3. Walls: Round cleanout cover with stainless steel finish.
 - 4. All Other Areas: Round cleanout top with nickel-bronze finish.

2.3 DRAINS

- A. General: Size outlets as indicated on drawings.
- B. Floor Drains: ASME A112.21.1M, cast-iron body, with seepage flange and clamping device, and trap seal primer valve connection. Floor drains for installation in floors not having membrane waterproofing may have seepage flange with clamping device. Floor drains for use as area drains in exterior slab on grade may be furnished with anchor flange instead of seepage flange and clamping device. Provide the following options as indicated:
 - 1. Trap primer connection.
 - 2. Round strainer with integral funnel.
 - 3. Polished nickel bronze top.
 - 4. Slotted top.

2.4 MISCELLANEOUS DRAINAGE PIPING SPECIALTIES

- A. Roof Flashing Assemblies: Manufactured assembly made of 4-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe with galvanized steel boot reinforcement, and counterflashing fitting.
 - 1. Vent Cap: Open-top, without cap.

- B. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
- C. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.
- D. Hose-End Drain Valves: MSS SP-110, 3/4-inch NPS ball valve, rated for 400-psig minimum CWP. Include 2-piece, ASTM B 62 bronze body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, and vinyl-covered steel handle.
 - 1. Inlet: Threaded or solder joint.
 - 2. Outlet: Short-threaded nipple with ASME B1.20.7 garden-hose thread and cap.

PART 3 - EXECUTION

3.1 DRAINAGE PIPING SPECIALTY INSTALLATION

- A. General: Install drainage piping specialty components, connections, and devices according to manufacturer's written instructions.
- B. Install cleanouts in aboveground piping and building drain piping as indicated, and where not indicated, according to the following:
 - 1. Size same as drainage piping up to 4-inch NPS. Use 4-inch NPS 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 4-inch NPS and smaller and 100 feet for larger piping.
 - 4. Locate at base of each vertical soil and waste stack.
- C. Install cleanout deck plates, of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.
- D. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
- E. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.
- F. Install floor drains according to manufacturer's written instructions, in locations indicated.
- G. Install floor drains at low points of surface areas to be drained as indicated. Set grates of drains flush with finished floor or as indicated. Size outlets as indicated.
- H. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

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- I. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
- J. Position floor drains for easy access and maintenance.
- K. Locate drainage piping as close as possible to bottom of floor slab supporting fixtures and drains.
- L. 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.
- M. Include wood-blocking reinforcement for recessed and wall-mounting drainage piping specialties.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
 - 1. Install piping connections between drainage piping specialties and piping specified in other Division 22 Sections.
 - 2. Install piping connections indicated as indirect wastes from appliances and equipment specified in other Sections, to spill over receptors connected to plumbing piping systems.
- B. Install hoses between drainage piping specialties and appliances as required for connections.
- C. Drainage Runouts to Drainage Piping Specialties: Install drainage and vent piping, with approved trap, of sizes indicated, but not smaller than required by authorities having jurisdiction.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections: The following sections contain requirements that relate to this section.
 - 1. Division 22 Section Common Work Results for Plumbing
 - 2. Division 22 Section General Duty Valves for Piping
 - 3. Division 22 Section Hangers and Supports for Piping and Equipment
 - 4. Division 22 Section Plumbing Insulation
 - 5. Division 22 Section Water Distribution Piping
 - 6. Division 22 Section Water Distribution Piping Specialties
 - 7. Division 22 Section Plumbing Pumps
 - 8. Division 22 Section Drainage and Vent Piping
 - 9. Division 22 Section Drainage Piping Specialties
 - 10. Division 22 Section Plumbing Fixtures
 - 11. Division 26 for Electrical for connections.

1.2 SUMMARY

- A. This Section includes the following for domestic water systems:
 - 1. Tankless, electric water heaters.

1.3 SUBMITTALS

- A. General: See Division 22 Section Common Work Results for Plumbing for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals of the following:
 - 1. Tankless, electric water heaters.
- C. Maintenance Data: For water heaters to include in maintenance manuals specified in Division 01.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of water heaters and heat exchangers through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:
 - 1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.

1.5 WARRANTY

- A. Provide with manufacturer's standard in which manufacturer agrees to repair or replace components of units that fail in materials or in workmanship within their standard warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Point-of-Use, Tankless, Electric Water Heaters:
 - a. Insta-Hot.
 - b. Chronomite Laboratories, Inc.
 - c. Eemax, Inc.
 - d. Hot Aqua, Inc.
 - e. Waste King.

2.2 POINT-OF-USE, TANKLESS, ELECTRIC WATER HEATERS

- A. Description: Comply with UL 499.
- B. Construction: Without hot-water storage.
 - 1. Working-Pressure Rating: 150 psig.
 - 2. Tappings: ASME B1.20.1, pipe thread.
 - 3. Interior Finish: Materials complying with NSF 61, barrier materials for potable-water tank linings.

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- 4. Heating Coils: Stainless steel.
- 5. Jacket: Aluminum or steel, with enameled finish, or plastic.
- C. Heating System: Electric-resistance type.
 - 1. Temperature Control: Factory-set, temperature-control thermostat for fixed, outlet-water temperature.
 - 2. Safety Control: Automatic, high-temperature-limit cutoff device or system.
- D. Mounting: Bracket or device for wall mounting.

PART 3 - EXECUTION**3.1 WATER HEATER INSTALLATION**

- A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- B. Fill water heaters and heat exchangers with water prior to activation.

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 machine to allow service and maintenance.
- C. Connect hot- and cold-water piping with shutoff valves and unions.
- D. Make connections with dielectric fittings where piping is made of dissimilar metal.
- E. Electrical Connections: Power wiring and disconnect switches are specified in Division 26 Sections. Arrange wiring to allow unit service. Ground equipment.

3.3 FIELD QUALITY CONTROL

- A. In addition to manufacturer's written installation and startup checks, perform the following:
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment and retest until satisfactory results are achieved.
 - 2. Verify that piping system tests are complete.
 - 3. Check for piping connection leaks.
 - 4. Energize electric circuits.
 - 5. Adjust operating controls.

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6. Adjust hot-water-outlet temperature settings. Do not set above 105 deg F unless piping system application requires higher temperature.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel on procedures for starting and stopping troubleshooting, servicing, and maintaining equipment.
- B. Review data in maintenance manuals. Refer to Division 01 Sections.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 22 Section Common Work Results for Plumbing
 - 2. Division 22 Section General Duty Valves for Piping
 - 3. Division 22 Section Hangers and Supports for Piping and Equipment
 - 4. Division 22 Section Plumbing Insulation
 - 5. Division 22 Section Water Distribution Piping
 - 6. Division 22 Section Water Distribution Piping Specialties
 - 7. Division 22 Section Plumbing Pumps
 - 8. Division 22 Section Drainage and Vent Piping
 - 9. Division 22 Section Drainage Piping Specialties
 - 10. Division 22 Section Domestic Water Heaters
 - 11. Division 26 for Electrical connections.

1.2 SUMMARY

- A. This Section includes plumbing fixtures and trim, faucets, other fittings, and related components.

1.3 DEFINITIONS

- A. Accessible: Plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped, disabled, and elderly people.
- B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, showerheads and tub spouts, drains and tailpieces, traps and waste pipes. Pipe fittings, tube fittings, and general-duty valves are included where indicated.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

- B. Product Data for each plumbing fixture category and type specified. Include selected fixture, trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
- C. Wiring diagrams from manufacturer for electrically operated units.
- D. Maintenance data for plumbing fixtures and components to include in the operation and maintenance manuals specified in Division 01.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category from one source and by a single manufacturer.
 - 1. Exception: Where fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for this category.
- B. Regulatory Requirements: Comply with requirements of CABO A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; regarding plumbing fixtures for physically handicapped people.
- C. Energy Policy Act Requirements: Comply with requirements of Public Law 102-486, "Energy Policy Act," regarding water flow rate and water consumption of plumbing fixtures.
- D. Backflow Prevention Requirements: Comply with the requirements of Washington State Department of Health regulation for "Backflow Prevention Assemblies Approved for Installation in Washington State".
- E. Listing and Labeling: Provide electrically operated fixtures and components specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver plumbing fixtures in manufacturer's protective packing, crating, and covering.
- B. Store plumbing fixtures on elevated platforms in dry location.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Coordinate roughing-in and final fixture locations and verify that plumbing fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURE STANDARDS

- A. Comply with applicable standards below and other requirements specified.
 - 1. Electric Water Coolers: ARI 1010 and UL 399.
 - 2. Stainless-Steel Fixtures Other than Service Sinks: ASME A112.19.3M.
 - 3. Vitreous-China Fixtures: ASME A112.19.2M.
 - 4. Water-Closet, Flushometer Tank Trim: ASSE 1037.

2.2 LAVATORY/SINK FAUCET STANDARDS

- A. Comply with ASME A112.18.1M and other requirements specified for lavatory, sink, and similar-type-fixture faucet fittings. Include hot- and cold-water indicators; 2.5-gpm- maximum flow rate; and polished, chrome-plated finish; except where otherwise indicated. Coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
 - 1. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 - 2. Pipe Threads: ASME B1.20.1.
 - 3. Sensor-Actuated Faucets and Electrical Devices: UL 1951.

2.3 MISCELLANEOUS FITTING STANDARDS

- A. Comply with ASME A112.18.1M and other requirements specified for fittings, other than faucets. Include polished, chrome-plated finish, except where otherwise indicated. Coordinate fittings with other components and connectors.
 - 1. Atmospheric Vacuum Breakers: ASSE 1001.
 - 2. Automatic Flow Restrictors: ASSE 1028.
 - 3. Brass and Copper, Supplies and Tubular Brass: ASME A112.18.1M.
 - 4. Fixed Flow Restrictors: ASSE 1034.

2.4 FITTINGS

- A. Supply connections for sinks, toilets, lavatories, etc. shall be IAPMO approved, stainless steel braided type.
- B. Fittings for Equipment Specified in Other Sections: Fittings include the following:

1. Supply Inlets: Brass pipe or copper tube, size required for final connection.
2. Supply Stops: Chrome-plated brass, angle or straight; compression, loose-key type; same size as supply inlet and with outlet matching supply riser.
3. Supply Risers: flexible copper tube with knob end. Use chrome-plated tube for exposed applications.
4. Traps: Brass, slip-joint inlet, cleanout, wall flange, escutcheons, and size to match equipment. Use chrome-plated tube for exposed applications.
5. Continuous Waste: Tubular brass with slip-joint inlet, and size to match equipment.
6. Indirect Waste: Tubular brass size to match equipment.

2.5 FIXTURE LISTING

- A. Fixtures and materials shall be per type and standards noted below, which where noted shall serve as the minimum standard, and per notations on the drawings, and in compliance with all applicable regulations and guidelines related to Barrier-Free and Handicapped regulations for the handicapped units and public space fixtures.
1. Drinking Fountain: Dual level bowls, wall mounted with bottle filler, non-filtered, refrigerated.
 2. Floor Drains: Medium duty round units with cast iron body with nickel-bronze strainer and trap primer connection in drain body.
 3. Lavatory: Wall mounted white, china lavatory single-handle faucets, units supported by manufactured wall carriers.
 4. Water closet: Floor mounted, floor outlet, tank type, elongated bowl, white vitreous china.
 5. Wall Hydrants: Self-draining, freeze-proof units with $\frac{3}{4}$ " female pipe thread inlet mounted in chrome finish cabinet with locking cover.

2.6 WATER CLOSET SEATS

- A. Manufacturers: Church, Bemis, Olsonite or approved equal.
- B. Open Front: Heavy duty solid plastic, white, large molded-in bumpers, external check hinges with stainless steel posts, no cover.

2.7 LAVATORY INSULATION KIT

- A. Manufacturers:
1. Truebro Model LavGuard2: www.truebro.com.
 2. Approved equal.
- B. Product Description:
1. Where Lavatories are noted to be insulated for ADA compliance, furnish the following: Safety Covers conforming to ANSI A1777.1 and consisting of insulation kit of molded closed cell vinyl construction, 3/16 inch thick, white or gray color, for insulating tail-

piece, P-trap, valves, and supply piping. Furnish with weep hole and angle valve access covers.

2.8 DRINKING FOUNTAINS (REFRIGERATED)

- A. Shall be accessible high/low wall-mounted, drinking fountain and bottle filler with push button operation.
- B. Provide high side fountain with a shroud as needed to comply with accessibility requirements; this may apply if the fountain is not located in an alcove.
- C. Fountains shall include dual 18-gauge Type 304 Stainless Steel satin finish basins with integral swirl design, polished chrome plated brass vandal resistant bubbler heads with integral laminar anti-squirt flow, chrome-plated brass vandal-resistant waste strainers, stainless steel satin finish back panel and louvered intrusion-proof grill, high and low fountain mounting levels and 1-1/4" NPT traps.
- D. Fountains and bottle filler shall use 100% lead-free waterways, push-button operated stainless-steel valves with front accessible cartridge and flow adjustment, 14-gauge Type 304 Stainless Steel wall brackets and vandal-resistant bottom plates.
- E. The R-134a refrigeration system shall be hermetically sealed and deliver a minimum of 8 gph of water at 50° F, 115 Volts, 60Hz, rated watts: 370, full load amps: 6.
- F. CSA certified and accessible, ANSI/NSF 61, Section 9, lead free. Comply with ARI Standard 1010 and ANSI A117.1 and are listed by Underwriter Laboratories to U.S. and Canadian standards.

2.9 DRAINS

- A. General: Size outlets as indicated on drawings.
- B. Floor Drains: ASME A112.21.1M, cast-iron body, with seepage flange and clamping device, and trap seal primer valve connection. Floor drains for installation in floors not having membrane waterproofing may have seepage flange with clamping device. Floor drains for use as area drains in exterior slab on grade may be furnished with anchor flange instead of seepage flange and clamping device. Provide the following options as indicated:
 - 1. Trap primer connection.
 - 2. Polished nickel bronze top.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for potable, hot- and cold-water supply piping systems; soil, waste, and vent piping systems; and supports. Verify that locations and sizes of piping and locations and types of supports match those indicated, before installing and connecting fixtures. Use manufacturer's roughing-in data when roughing-in data are not indicated.
- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Include supports for plumbing fixtures according to the following:
 - 1. For wall hung lavatories, sinks and drinking fountains, where indicated.
 - 2. Reinforcement: For floor-mounted lavatories and sinks that require securing to wall and recessed, box-mounted, electric water coolers.
 - 3. Fabricate reinforcement from 2-by-4-inch or 1/4-by-6-inch steel plates attached to studs, in wall construction, to secure fixtures to wall. Include length that will extend beyond ends of fixture mounting bracket and attach to at least 2 studs.
- B. Include fitting insulation kits for accessible fixtures according to the following:
 - 1. Lavatories: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.
 - 2. Sinks: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.

3.3 PLUMBING FIXTURE INSTALLATION

- A. Assemble plumbing fixtures and trim, fittings, faucets, and other components according to manufacturers' written instructions.
- B. Install fixtures level and plumb according to manufacturers' written instructions, roughing-in drawings, and referenced standards.
- C. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.
- D. Install toilet seats on water closets.
- E. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

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- F. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.
- G. Fasten floor-mounted fixtures to substrate. Fasten fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.
- H. Fasten recessed, wall-mounted fittings to reinforcement built into walls.
- I. Fasten wall-mounted fittings to reinforcement built into walls.
- J. Fasten counter-mounting plumbing fixtures to casework.
- K. Secure supplies to supports or substrate within pipe space behind fixture.
- L. Install individual stop valve in each water supply to fixture. Use gate or globe valve where specific stop valve is not specified.
- M. Install water-supply stop valves in accessible locations.
- N. Install faucet, laminar-flow fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.
- O. Install supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.
- P. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.
- Q. Install traps on fixture outlets. Omit traps on fixtures having integral traps. Omit traps on indirect wastes, except where otherwise indicated.
- R. Install hose bibs with integral or field-installed vacuum breaker.
- S. Install wall hydrants with integral or field-installed vacuum breaker.
- T. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.
- U. Seal joints between fixtures and walls, floors, and counters using sanitary-type, 1-part, mildew-resistant, silicone sealant according to sealing requirements specified in Division 07 Section Joint Sealants. Match sealant color to fixture color.
- V. Coordinate exact location and mounting height of all fixtures with the architectural drawings.

3.4 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
 - 1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other Division 22 Sections.
- B. Supply and Waste Connections to Plumbing Fixtures: Refer to plumbing fixture schedule on drawings for fitting sizes and connection requirements for each plumbing fixture.
- C. Supply and Waste Connections to Equipment Specified in Other Sections: Connect equipment with supply inlets, supply stops, supply risers, and traps specified in this Section. Use fitting sizes required to match connected equipment. Connect fittings to plumbing piping.
- D. Ground equipment.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- E. Arrange for electric-power connections to fixtures and devices that require power. Electric power is specified in Division 26 Sections.

3.5 FIELD QUALITY CONTROL

- A. Verify that installed fixtures are categories and types specified for locations where installed.
- B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized and demonstrate proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.6 ADJUSTING AND CLEANING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at electric water coolers and faucets having controls, to produce proper flow and stream.
- C. Replace washers and seals of leaking and dripping faucets and stops.

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- D. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Include the following:
 - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
 - 2. Remove sediment and debris from drains.

3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities, except when approved in writing by Owner.

3.8 PLUMBING FIXTURE SCHEDULE

- A. Refer to Plumbing Fixture Schedule on drawings.
- B. Provide all options and accessories as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 23 Section Testing, Adjusting and Balancing for Mechanical
 - 2. Division 23 Section Duct Insulation for Mechanical Systems
 - 3. Division 23 Section Metal Ducts
 - 4. Division 23 Section Air Duct Accessories
 - 5. Division 23 Section Fans
 - 6. Division 23 Section Diffusers, Registers and Grilles
 - 7. Division 23 Section Air-to-Air Energy Recovery Equipment
 - 8. Division 23 Section Split-System Air-Conditioners
 - 9. Division 23 Section Wall and Ceiling Unit Heaters.

1.2 SUMMARY

- A. This Section includes the following to complement other Division 23 Sections:
 - 1. Submittals.
 - 2. Record Documents.
 - 3. Maintenance Manuals.
 - 4. Installation requirements common to equipment specification sections.
 - 5. Mechanical Demolition.
 - 6. Mechanical Installations.
 - 7. Cutting and patching.
 - 8. Touchup painting and finishing.

1.3 GENERAL REQUIREMENTS

- A. Intent:
 - 1. The intent of the Contract Documents is for the Contractor to include all work necessary for the complete mechanical systems, tested and ready for operation.
 - 2. By submitting a proposal, the Contractor represents that it has made a thorough examination of the site, of the work, and all existing conditions and limitations, and that it has examined the Contract Documents in complete detail and has determined beyond doubt that the drawings, specifications, and existing conditions are sufficient, adequate and satisfactory for the construction of the work under the Contract.

3. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items, or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments with no added compensation. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Architect for review and approval.
- B. Conditions:
1. Conform to all Bidding Requirements, General Conditions and Amendments to the General Conditions, Supplementary Conditions and Special Conditions and General Requirements, Division 01, which govern the work specified herein.
 2. The Contractor is obligated to comply with the above in addition to the requirements of this Section.
 3. Modifications by this Section do not nullify any other portions of the above referenced conditions.
- C. Make complete mechanical installation, connecting to all equipment shown on the plans, or called for in the specifications. Mechanical contractor to provide any additional extra dampers and valves not shown on plans to obtain design criteria as required by the balancing contractor.
- D. Plans and Specifications: Plans and specifications shall be taken together. Drawings and Specifications are complementary, each to the other; what is shown on one is as binding as if called for in both.
1. Contractor shall provide all equipment, materials and work shown on the plans and/or called for in these specifications.
 2. Provide work specified and not indicated on plans, or work indicated on plans and not specified, as though mentioned in both.
 3. When discrepancies or conflicts occur within the documents, the Architect shall determine which takes precedence and the Contractor shall perform the selected requirement without additional cost.
- E. Mechanical Drawings:
1. Mechanical drawings do not attempt to show all aspects of building construction, which will affect the installation of mechanical systems. The mechanical drawings are diagrammatic and do not intend to show all offsets and fittings that may be required for a complete installation. Locations of equipment, pipes, valves, traps, ductwork, etc. shown on the drawings, shall be followed as closely as conditions will permit. Review all project drawings, including, but not limited to, architectural, structural and electrical drawings; and coordinate with all trades involved so there is no conflict with work of other trades and so Owner secures best arrangement of work consistent with use of space.
 2. Verify exact distances between points shown of drawings by actual measurement at site, as no extra cost will be allowed for differences between actual measurements and scaled measurements.

3. Changes in design, configuration, or location of equipment, piping, or ductwork, advisable in the opinion of Contractor, shall be submitted to Architect for approval before proceeding with work, with written assurance from other trades that such changes will not interfere with their installation, nor cause any extra cost on their part. Such changes shall be made at no additional cost to Owner.
4. Check location of all work of all trades and avoid interferences. Special attention is called to the following items, conflicts shall be reported to Architect for decision and direction:
 - a. Exact location of outlets shown on architectural details.
 - b. Location of suspended ceilings.
 - c. Location of ducts, grilles, pipes, and other mechanical equipment so electrical outlets are clear of these items and in proper relation to same.

1.4 DEFINITIONS AND ABBREVIATIONS

- A. 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, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical 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 spaces above hard or lay-in type ceilings and in duct shafts.
- 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.
- F. The word "provide," as used in Division 23, means "furnish and install."
- G. The word "approved," as used in these specifications, means acceptance by the Architect.
- H. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, or other paragraphs or schedules in the specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.
- I. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted," mean directed by the Architect, requested by the Architect, and similar phrases.

J. Mechanical Systems - Including but not limited to:

1. Heating, Ventilation and Air Conditioning Systems.
2. Temperature Controls System.

K. Abbreviations:

AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
IBC	International Building Code
IMC	International Mechanical Code
NEBB	National Environmental Balancing Bureau
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc.
UPC	Uniform Plumbing Code
UL	Underwriters Laboratories
WSEC	Washington State Non-Residential Energy Code

1.5 CODES, PERMITS AND INSPECTIONS

- A. Codes: Work shall be installed as a minimum in conformity with applicable local ordinances and statutes. Standards and sizes, which exceed preceding requirements, shall be installed as drawn or specified. Nothing in the specifications shall be construed to permit deviation to less than the requirements of governing codes. Contractor is not relieved from furnishing and installing work shown or specified which may be beyond requirements of ordinances, laws, regulations, and codes.
- B. Codes and Standards: Applicable codes and standards shall include, but not necessarily be limited to:
1. Washington State Energy Code.
 2. Uniform Plumbing Code, by International Association of Plumbing and Mechanical Officials.
 3. International Mechanical Code, by International Code Council.
 4. International Building Code, by International Code Council.
 5. International Fire Code, by International Code Council.
 6. Requirements of OSHA, EPA and WISHA.
 7. National Fire Protection Association Codes, , including National Electrical Code.
 8. ANSI Accessible and Usable Buildings and Facilities.

9. SMACNA HVAC Duct Construction Standards, latest edition.
10. All local and state amendments.
11. Requirements of all agencies have jurisdictional authority over installation of mechanical systems.

C. Permits, Fees and Inspections:

1. Contractor shall arrange and pay for all permits, fees and inspections required in connection with this installation. The Contractor shall present the Owner with properly signed certificates of final inspection before the work will be accepted.
2. Contractor shall call for all inspections by local building official(s) when they become due, and shall not cover any work until approved by these governing authorities.
3. Contractor shall make all arrangements with utility companies for water, steam, gas and drainage services, etc., associated with the work and include required payments for meters, piping, services, connection charges and materials furnished and installed by utility companies. Work and materials shall be in strict accordance with rules of respective authorities.

- D. Underwriters Laboratory Approval: Where Underwriters Laboratories (UL) standards exist, all items of electrical equipment or items partially composed of electrical equipment shall carry Underwriters Laboratories (UL) label either for the entire unit or for the electrical portion of the equipment. If UL standards do not exist, equipment shall be provided that has been labeled by an independent testing agency that is recognized by the authority having jurisdiction.

1.6 WORK INCLUDED

- A. Work under this division shall include selective demolition and providing all new materials, labor, equipment, tools, appliances, hoisting, scaffolding, supervision and overhead for the proper execution and completion of the mechanical work.
- B. Should these specifications or references made therein fail to specify adequately an item of equipment or material required for proper completion of the work in accordance with present day practice, this deficiency shall not relieve Contractor from furnishing and installing same. Call such omissions to attention of Architect and use such equipment or material as approved by Architect.
- C. All new equipment and products as noted in Part 2 of each section shall be installed as per manufacturer's recommendations.

1.7 WORKMANSHIP

- A. This Contractor shall provide completed systems with a neat and finished appearance. If, in the judgment of the Architect, any portion of the work has not been performed in a workman-like manner or is left in a rough, unfinished state, this Contractor will be required to remove, reinstall or replace same and patch and paint surrounding surfaces in a manner acceptable to the Architect, without increase in cost to the Owner.

1.8 SUBMITTALS, GENERAL REQUIREMENTS

- A. General: Follow the procedures for submittals or as described herein and specified in Division 01.
- B. General Requirements for Division 23 Submittals: Provide the following submittals as indicated in each Division 23 section. Additional submittal requirements may be included in the individual sections.
 - 1. Product Data: Submit manufacturer's product data for the items listed in the individual Division 23 sections. Product data shall demonstrate compliance with all specified features and requirements. Submittals for equipment shall include, but not be limited to, data indicating equipment capacity meets the indicated values at specified conditions, equipment drawings indicating all dimensions, connection information, service space requirements, recommended piping and/or wiring diagrams, installation details and extended warranties either offered by equipment manufacturer or required by specifications.
 - 2. Reports and Certificates: Indicate and interpret test results for compliance with performance requirements. Provide performance certificates.
 - 3. Operation and Maintenance Data: Submit proposed Division 23 Operation and Maintenance materials for approval prior to inclusion in the comprehensive final bound edition. See Article in this section on Operation and Maintenance Manuals for materials required to be included.
- C. Format: Provide submittals arranged with numerical index and tabs in 3-ring notebook containing the total volume of material. All product data shall be submitted complete by system, partial submittals are not acceptable and may be returned unreviewed. Systems are defined here as HVAC system and HVAC control system. Reference submittals, including title and location of project, Architect, Contractor, submission date, and specification paragraph number to indicate clearly the location, service, equipment identification numbers as shown on drawings, and function of each particular item. Where manufacturers' catalogs, pamphlets, or data sheets are submitted, such submissions shall indicate specifically the item for which approval is required in red ink, and submissions showing general information only are not acceptable.
- D. Submittals not in conformance to above paragraphs will be returned unreviewed.

1.9 SUBSTITUTIONS

- A. Substitutions will only be considered after project award. No substitutions will be considered during bid and/or negotiation periods.
- B. In all cases in this specification where an article is followed by the words "or equal," the Engineer is the sole judge of the quality of the proposed substitution.
- C. When the Engineer approves a substitution, the approval is given with the understanding that the Contractor guarantees the article or material substituted to be equal to or better in every respect than the article or material specified. The Contractor shall also assume complete re-

sponsibility that the article or material will fit the job as far as space, access and servicing requirements.

- D. Where several materials are specified by name for one use, select for use any of those so specified subject to compliance with specified requirements.
- E. Whenever item or class of material is specified exclusively by detail specification, trade name, manufacturer's name or by catalog reference, use only such item, unless written approval is given. Submit written requests in accordance with Division 01 substitution requirements.
- F. Make no substitutions for materials, articles or process required under contract unless written approval is obtained. See Division 01 for project substitution requirements.

1.10 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 01. In addition to the requirements specified in Division 01, indicate the following installed conditions:
 - 1. Ductwork mains and branches, size and location, for both exterior and interior, locations of dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.
 - 2. Record drawings shall incorporate all accepted change orders and RFIs; reference number on drawings is not acceptable.
 - 3. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 - 4. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
 - 5. Record the locations and invert elevations of underground installations.

1.11 OPERATION AND MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 01 and the following requirements. Division 23 manuals shall be indexed by systems. Pages shall be same size, with exception of allowable foldout pages for control and flow diagrams. Cover shall be inscribed with name of project, Owner, description of contents, Architect, General Contractor, Mechanical Contractor, and date. In addition to the requirements specified in Division 01, include the following information in Division 23 materials:
 - 1. Product Data of all Division 23 equipment provided by the project as indicated in submittal requirements.
 - 2. Manufacturer's Equipment Installation and Start-Up Manuals for all equipment provided by the project. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.
 - 3. Manufacturer's Equipment Service Manuals for all equipment provided by the project, including parts list, troubleshooting list and maintenance procedures for routine preven-

tative maintenance. Include disassembly, repair, and reassembly; aligning and adjusting instructions; servicing instructions and lubrication charts and schedules

4. Reports and Certificates of all Division 23 systems and equipment as required by specifications.
5. Material Safety Data Sheets (MSDS) for all applicable materials used for Division 23 installations.
6. Warranty Certificates for all equipment where extended warranties are either offered or required; provide supplier contact information.

1.12 QUALITY ASSURANCE

- A. Equipment Selection: Equipment allowed by the specifications but with different electrical characteristics, physical dimensions, capacities, and/or ratings than what is shown on the drawings may be furnished, provided such proposed equipment is approved in writing and connecting mechanical and electrical services, such as pipe and/or duct connection sizes, circuit breakers, conduit, motors, bases, and equipment spaces are revised to accommodate such equipment. All expenses shall be borne by the Contractor. Specified minimum energy ratings and/or equipment efficiencies must meet design and commissioning requirements.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture. Remove shipping caps and plugs after installation or connection as appropriate, and prior to system startup.
- B. Protect stored mechanical equipment, ducts, pipes and tubes and other materials from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Pipes, ducts, mechanical equipment, and other materials that are damaged due to improper storage shall be replaced at the Contractor's expense.

1.14 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

- E. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Architectural access panels and doors are specified in Division 08.
- F. Coordinate with General Contractor and arrange for continuous freeze protection of liquid-filled mechanical piping and equipment throughout construction.
- G. Use of the building HVAC systems, including those being provided under this contract, for temporary heating, ventilation or cooling during construction is prohibited. When system installation is complete and ready for start-up, approval to operate the system shall be obtained from the Owner or designated Owner's representative.

PART 2 - PRODUCTS

2.1 PIPING SPECIALTIES

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
 - 1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 - 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 - 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 - 4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with set screws.
- B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
 - 1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
 - 2. OD: Completely cover opening.
 - 3. Cast Brass: One piece, with set screw.
 - a. Finish: Rough brass.
 - b. Finish: Polished chrome-plate.
 - 4. Cast-Iron Floor Plate: One-piece casting.

PART 3 - EXECUTION

3.1 GENERAL MECHANICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
1. Coordinate mechanical systems, equipment, and materials installation with other building components.
 2. Verify all dimensions by field measurements.
 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 7. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
 8. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
 9. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
 10. Install access panel or doors where units are concealed behind finished surfaces. Notify General Contractor of the number, location and size of access panels or doors.
 11. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
 12. Replace all air filters with new filters upon Owner taking occupancy of the building or at a time mutually agreed upon between the Owner and Contractor.
 13. Do not install ductwork in elevator machine rooms, electrical and/or communication rooms unless it directly services that room.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 23 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: 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. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- L. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- M. Install flexible connectors according to manufacturer's written instructions where indicated and specified in other Division 23 sections.
- N. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
 - 1. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
- O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Build sleeves into new walls and slabs as work progresses.
 - 2. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
- P. Verify final equipment locations for roughing-in.

- Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. 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.
- E. Install equipment giving right of way to piping installed at required slope.

3.4 PAINTING AND FINISHING

- A. Refer to Division 09 for paint materials, surface preparation, and application of paint.
- B. Apply paint to exposed piping, ductwork and supports according to the following, unless otherwise indicated:
 - 1. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer. Paint is not required on interior galvanized supports.
 - 2. Exterior, Ferrous Piping and ductwork: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
 - 3. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
- C. Do not paint piping specialties with factory-applied finish.
- D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

3.6 DEMOLITION

- A. Refer to Division 02 Section Selective Structure Demolition for general demolition requirements and procedures.
- B. Perform all demolition or interface work required in the existing building for the removal of, or interface with, existing mechanical equipment, ductwork, tubing, or piping.
- C. Existing Materials, Removal and Disposition:
 - 1. All demolished materials and debris shall be disposed of by the Contractor.
- D. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- E. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches beyond face of adjacent construction. Cap and patch surface to match existing finish.
- F. Reuse of Materials: Reuse of existing materials is prohibited unless specifically indicated or approved by Architect.
- G. Notify Architect in discovery of any hazardous materials.
- H. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.7 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 01. In addition to the requirements specified in Division 01, the following requirements apply:
 - 1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
 - 1. Uncover Work to provide for installation of ill-timed Work.
 - 2. Remove and replace defective Work.
 - 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 - 4. Remove samples of installed Work as specified for testing.
 - 5. Install equipment and materials in existing structures.
 - 6. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- C. Cut, remove and legally dispose off-site of selected mechanical equipment, components, and materials, including but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.

Division 23 Specifications

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Birch Bay Vogt Library Express

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- D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- E. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- F. Repair cut surfaces to match adjacent surfaces.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 23 Section Common Work Results for HVAC
 - 2. Division 23 Section Duct Insulation for Mechanical Systems
 - 3. Division 23 Section Metal Ducts
 - 4. Division 23 Section Air Duct Accessories
 - 5. Division 23 Section Fans
 - 6. Division 23 Section Diffusers, Registers and Grilles
 - 7. Division 23 Section Air-to-Air Energy Recovery Equipment
 - 8. Division 23 Section Split-System Air-Conditioners
 - 9. Division 23 Section Wall and Ceiling Unit Heaters.

1.2 SUMMARY

- A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
 - 1. Balancing airflow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
 - 2. Adjusting total HVAC systems to provide indicated quantities.
 - 3. Measuring electrical performance of HVAC equipment.
 - 4. Setting quantitative performance of HVAC equipment.
 - 5. Verifying that automatic control devices are functioning properly.
 - 6. Measuring sound and vibration.
 - 7. Reporting results of the activities and procedures specified in this Section.

1.3 DEFINITIONS

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to modify fan speed or adjust a damper.
- B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

- C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- E. Report Forms: Test data sheets for recording test data in logical order.
- F. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- G. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- H. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- I. Test: A procedure to determine quantitative performance of a system or equipment.
- J. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.
- K. AABC: Associated Air Balance Council.
- L. AMCA: Air Movement and Control Association.
- M. NEBB: National Environmental Balancing Bureau.
- N. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.
- O. TAB: Testing, Balancing, and Adjusting.

1.4 ACCEPTABLE CONTRACTORS

- A. United Test and Balance
- B. Neudorfer Engineers, Inc.
- C. Hardin and Sons, Inc.
- D. Airtest Co., Inc.
- E. TAC Services, LLC

1.5 SUBMITTALS

- A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.
- B. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3 of this Section.
- C. Report Forms: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.
- D. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.
- E. Balancing Report:
 - 1. Submit completed Balancing Report as indicated, including the following:
 - a. System Diagrams/Floor Plans.
 - b. Air Apparatus Test Reports.
 - c. Electric Coil/Duct Heater Test Reports.
 - d. Fan Test Reports.
 - e. Instrument Calibration Report.

1.6 SEQUENCING/SCHEDULING

- A. Phase in properly with Construction Schedule.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with all applicable city, county, and state codes and ordinances. In case of conflict with drawings or specifications, the codes and ordinances govern.
 - 2. Basis:
 - a. Washington State Energy Code.
 - b. International Building Code.
 - c. Uniform Plumbing Code.
 - d. International Mechanical Code.
 - e. NFPA-90A.
- B. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by AABC or NEBB, not affiliated with mechanical contractor. Certified agent shall be a full-time employee of the TAB contractor.

- C. Experience: Minimum 5 years on projects of similar scope and complexity.
- D. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
 - 2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.
- E. Testing, Adjusting, and Balancing Reports: Use approved AABC forms submitted with the Strategies and Procedures Plan or standard forms from NEBB "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
- F. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."
- G. Instrumentation Calibration: Calibrate instruments as required by AABC or NEBB certification or more frequently if required by the instrument manufacturer.

1.8 PROJECT CONDITIONS

- A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.9 COORDINATION

- A. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.
- B. Perform testing, adjusting, and balancing after leakage and pressure tests on air distribution systems have been satisfactorily completed.

1.10 WARRANTY

- A. General Warranty: The special performance guarantee 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 GENERAL

- A. Comply with "Quality Assurance" provisions, specifications, and manufacturer's data. Where these may be in conflict, the more stringent requirements govern.

2.2 COMMISSIONING

- A. Participate in whole building commissioning of the project with respect to the Division 23 systems and equipment as required by Division 01. Anticipate attendance at a meeting, if needed, and provide information about the mechanical systems to other trades as needed or requested. Provisions for testing of mechanical systems, or isolation of mechanical systems to allow for the testing of other trades' systems, shall be accommodated to the extent required by the Authority Having Jurisdiction.

2.3 TAB INSTRUMENTATION

- A. Furnish materials and equipment necessary to properly measure system capacities, electrical voltage and current, fan speeds, static pressures, air velocities, and other readings necessary to evaluate system performance and adjust quantities to those indicated. TAB Contractor retains possession of materials and equipment after project is completed.
- B. Instrumentation shall be accurate, with calibration histories available for examination upon request.
- C. Instrumentation shall be used in accordance with manufacturer instructions.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not begin work until any unsatisfactory conditions are corrected.

3.2 EXAMINATION

- A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
 - 1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.

2. Verify that balancing devices, such as test ports and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of HVAC systems and equipment.
 - C. Examine equipment performance data, including fan curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
 - E. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
 - F. Examine air-handling equipment to ensure clean filters have been installed and equipment with functioning controls is ready for operation.
 - G. Examine equipment for installation and for properly operating safety interlocks and controls.
 - H. Examine automatic temperature system components to verify the following:
 1. Dampers and other controlled devices operate by the intended controller.
 2. Dampers are in the position indicated by the controller.
 3. Integrity of dampers for free and full operation and for tightness of fully closed and fully open positions.
 4. Thermostats are located to avoid adverse effects of sunlight, drafts, and cold walls.
 5. Sensors are located to sense only the intended conditions.
 6. Sequence of operation for control modes is according to the Contract Documents.
 7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
 8. Interlocked systems are operating.
 9. Changeover from heating to cooling mode occurs according to design values.
 10. Verify minimum outdoor supply air setting.
 - I. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.3 PREPARATION

- A. Field verify locations of new and existing work prior to commencing work of this Section.
- B. Protect surrounding areas and surfaces to preclude damage from work of this Section.

- C. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.
- D. 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. Manual volume dampers are open.
 - 5. Windows and doors can be closed so design conditions for system operations can be met.

3.4 GENERAL TESTING AND BALANCING PROCEDURES

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
- 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 the insulation Specifications for this Project.
- C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, fan-speed-control levers, and similar controls and devices, to show final settings.

3.5 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

- A. 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.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- E. Check dampers for proper position to achieve desired airflow path.
- F. Check for airflow blockages.
- G. Check condensate drains for proper connections and functioning.

- H. Check for proper sealing of air-handling unit components.

3.6 TOLERANCES

- A. Set HVAC system airflow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans: Plus 5 to plus 10 percent.
 - 2. Air Outlets and Inlets: 0 to minus 10 percent.

3.7 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, 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 the instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to the certified field report data, include the following:
 - 1. Fan curves.
- D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
 - 1. Title page.
 - 2. Name and address of testing, adjusting, and balancing Agent.
 - 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 testing, adjusting, and balancing Agent who certifies the report.
 - 10. Summary of contents, including the following:
 - a. Design versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 - 11. Nomenclature sheets for each item of equipment.
 - 12. Data for mechanical equipment, including manufacturer, type size, and fittings.
 - 13. Notes to explain why certain final data in the body of reports vary from design values.

- E. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
1. Unit Data: Include the following:
 - a. System identification.
 - b. Location.
 - c. Coil identification.
 - d. Capacity in Btuh.
 - e. Number of stages.
 - f. Connected volts, phase, and hertz.
 - g. Rated amperage.
 - h. Airflow rate in cfm.
 - i. Face area in sq. ft.
 - j. Minimum face velocity in fpm.
 2. Test Data: Include design and actual values for the following:
 - a. Heat output in Btuh.
 - b. Airflow rate in cfm.
 - c. Air velocity in fpm.
 - d. Entering-air temperature in deg F.
 - e. Leaving-air temperature in deg F.
 - f. Voltage at each connection.
 - g. Amperage for each phase.
- F. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data: Include the following:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 2. Motor Data: Include the following:
 - a. Make and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 3. Test Data: Include design and actual values for the following:
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.

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- d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- G. Instrument Calibration Reports: For instrument calibration, include the following:
 - 1. Report Data: Include the following:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.8 ADDITIONAL TESTS

- A. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 07 for Firestopping.
 - 2. Division 23 Section Common Work Results for HVAC
 - 3. Division 23 Section Testing, Adjusting and Balancing for Mechanical
 - 4. Division 23 Section Metal Ducts
 - 5. Division 23 Section Air Duct Accessories
 - 6. Division 23 Section Fans
 - 7. Division 23 Section Diffusers, Registers and Grilles
 - 8. Division 23 Section Air-to-Air Energy Recovery Equipment
 - 9. Division 23 Section Split-System Air-Conditioners
 - 10. Division 23 Section Wall and Ceiling Unit Heaters.

1.2 SUMMARY

- A. This Section includes semirigid and flexible duct and plenum, insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

1.3 SUBMITTALS

- A. General: See Division 23 Section Common Work Results for HVAC for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals of the following:
 - 1. Mineral Fiber Board Insulation.
 - 2. Mineral Fiber Blanket Insulation.
 - 3. Aluminum Jackets.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory labeled insulation and jacket materials and sealer and

cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

B. Underwriters Laboratories Inc (UL)

1. UL 723, surface burning characteristic per ASTM E 84
2. UL 1479, Through-Penetration firestop test.

C. American Society for Testing and Materials (ASTM):

1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.
2. ASTM E119, Standard Method of Fire Tests of Building Construction and Materials.
3. ASTM E814, Standard Method of Fire Tests of Through-Penetration Fire Stops.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.6 COORDINATION

- A. Coordinate clearance requirements with duct installer for insulation application.

1.7 SCHEDULING

- A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame Spread/Smoke Developed Index of 25/50 maximum, when tested in accordance with ASTM E 84.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mineral-Fiber Insulation:
 - a. 3M
 - b. CertainTeed Manson.
 - c. Johns Manville.
 - d. Knauf FiberGlass GmbH.
 - e. Owens-Corning Fiberglas Corp.

2.3 INSULATION MATERIALS

- A. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
- B. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

2.4 FIELD-APPLIED JACKETS

- A. Aluminum Jacket: Sheets manufactured from aluminum alloy complying with ASTM B 209 and having an integrally bonded moisture barrier over entire surface in contact with insulation.
 - 1. Finish: Embossed finish.
 - 2. Thickness: 0.04-inch thick.

2.5 ACCESSORIES AND ATTACHMENTS

- A. Bands: 3/4-inch wide, aluminum band, minimum 0.007-inch thick.
- B. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.
 - 1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb for direct pull perpendicular to the adhered surface.

2.6 VAPOR RETARDERS

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates. Perm rating not greater than 0.5 and all joints sealed.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Verify that ducts have been tested before applying insulation materials.
- C. Verify that surfaces are clean, foreign material removed, and dry.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

- A. Install in accordance with manufacturer's instructions.
- B. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.
- C. Refer to schedules at the end of this Section for materials, jackets, and thicknesses required for each duct system.
- D. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- E. Apply multiple layers of insulation with longitudinal and end seams staggered.
- F. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
- G. Keep insulation materials dry during application and finishing.

- H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- I. Apply insulation with the least number of joints practical.
- J. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
- K. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
- L. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
- N. Install vapor-retarder mastic on supply and outside air ducts and plenums.
 - 1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
 - 2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.
 - 3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- O. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- P. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.
 - 1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.4 MINERAL-FIBER INSULATION APPLICATION

- A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with anchor pins and speed washers.
 - 1. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, along longitudinal center-line of duct. Space 3 inches maximum from insulation end joints, and 16 inches on center

- b. On duct sides with dimensions larger than 18 inches. Space 16 inches on center each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
 - c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 2. Impale insulation over anchors and attach speed washers.
 3. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1-inch on center, and cover with pressure-sensitive tape having same facing as insulation.
 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches on center
 6. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches on center
 8. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.
- B. Board Applications for Ducts and Plenums: Secure board insulation with anchor pins and speed washers.
 1. Space anchor pins as follows:
 - a. On duct sides with dimensions 18 inches and smaller, along longitudinal center-line of duct. Space 3 inches maximum from insulation end joints, and 16 inches on center
 - b. On duct sides with dimensions larger than 18 inches. Space 16 inches on center each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
 - c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 2. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 3. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1-inch on center, and cover with pressure-sensitive tape having same facing as insulation.
 4. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to out-

side and inside radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

5. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches on center
6. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 FIELD-APPLIED JACKET APPLICATION

- A. Apply jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.
 1. Apply jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 2. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.
 3. Seal outdoor jacket watertight.
 4. Round Ducts: Overlap seams 45 degrees from bottom.

3.6 DUCT SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.
- C. Insulated ducts conveying air below ambient temperature:
 1. Provide insulation with vapor barrier jackets.
 2. Finish with tape and vapor barrier jacket for continuous vapor barrier.
 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 4. Insulate entire system including fittings, joints, flanges, and flexible connections.
- D. Insulated ducts conveying air above ambient temperature:
 1. Provide with or without standard vapor barrier jacket.
 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
 3. Where ducts convey air for the purpose of both heating and cooling functions, refer to requirements above for ducts conveying air below ambient temperature.
- E. Duct and Plenum Liner Application:
 1. Adhere insulation with adhesive for 100 percent coverage.
 2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.
 3. Seal and smooth joints. Seal and coat transverse joints.
 4. Seal liner surface penetrations with adhesive.

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5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.
- F. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
1. Metal ducts with duct liner, unless required to meet the Energy Code requirements.
 2. Factory-insulated flexible ducts.
 3. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
 4. Flexible connectors.
 5. Testing agency labels and stamps.
 6. Nameplates and data plates.
 7. Access panels and doors in air-distribution systems.
 8. Toilet exhaust ducts in conditioned spaces.
 9. General exhaust ducts in conditioned spaces.
 10. Exposed ducts within a space that serves that space only.

3.7 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

- A. Duct insulation shall be provided as required by the Energy Code or as follows, whichever is most stringent.
- B. Ducts exposed to view are not required to be insulated.
- C. Service: Round, supply and return-air ducts, conditioned space.
1. Material: Mineral-fiber blanket.
 2. Thickness: 1-1/2-inch.
 3. Minimum Installed Insulation R-Value: 3.3.
- D. Service: Rectangular, supply and return-air ducts, conditioned space.
1. Material: Mineral-fiber board.
 2. Thickness: 1 inch.
 3. Minimum Installed Insulation R-Value: 3.3.
- E. Service: Round, outside-air ducts, downstream of damper.
1. Material: Mineral-fiber blanket.
 2. Thickness: 3-inches.
 3. Minimum Installed Insulation R-Value: 7.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 07 for Firestopping.
 - 2. Division 08 for Access Doors and Frames
 - 3. Division 08 for Louvers and Vents
 - 4. Division 23 Section Common Work Results for HVAC
 - 5. Division 23 Section Testing, Adjusting and Balancing for Mechanical
 - 6. Division 23 Section Duct Insulation for Mechanical Systems
 - 7. Division 23 Section Air Duct Accessories
 - 8. Division 23 Section Fans
 - 9. Division 23 Section Diffusers, Registers and Grilles
 - 10. Division 23 Section Air-to-Air Energy Recovery Equipment
 - 11. Division 23 Section Split-System Air-Conditioners
 - 12. Division 23 Section Wall and Ceiling Unit Heaters.

1.2 SUMMARY

- A. This Section includes fabrication and installation of rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 2-inch water gauge.

1.3 SYSTEM DESCRIPTION

- A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 PERFORMANCE REQUIREMENTS

- A. Duct Pressure Classifications
 - 1. Low Pressure Duct Static-Pressure Classifications: Construct ducts to the following:
 - a. Supply Ducts, unless indicated otherwise: 2-inch water gauge.

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- b. Return Ducts: 2-inch water gauge, negative pressure.
- c. Exhaust Ducts: 2-inch water gauge, negative pressure.
- d. Outside Air Intake Ducts: 2-inch water gauge, negative pressure.

B. Pressure Classification:

- 1. Positive Pressure Exhaust Ducts: Seal Class A; all transverse joints, longitudinal seams and duct wall penetrations.
- 2. Below 3-inch wg: Seal Class B; all transverse joints and longitudinal seams.

1.5 SUBMITTALS

- A. General: See Division 23 Section Common Work Results for HVAC for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals of the following:
 - 1. Duct Liner and adhesives.
 - 2. Joint Sealants.
 - 3. Gaskets joint systems.

1.6 QUALITY ASSURANCE

- A. Fabricate ducts and fittings according to SMACNA "HVAC Duct Construction Standards--Metal and Flexible" unless otherwise indicated.
- B. Comply with NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems" unless otherwise indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Keep metal ducts and duct liner dry and dust free during fabrication and storage at factory.
- B. Before shipment shrink-wrap all openings of ducts fabricated with duct liner. During shipment, protect all metal ducts from weather.
- C. Store all metal ducts in dry location on-site on elevated dunnage. Protect metal ducts from moisture, dirt, and dust.
- D. Retain shrink-wrap protection of openings (where required to be protected) until immediately prior to connection of that opening to erected duct system.
- E. On the event that any duct liner does get wet, dry duct liner within 48-hours using forced air heater. Ducts detected with moist fiberglass liner will be required to be replaced at no additional cost to the Owner.

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- F. Remove dust from the inside of metal duct sections as they are erected. Cover all openings with 6-mil poly and duct tape at the end of each workday to prevent dust migration into ducts.
- G. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation.

PART 2 - PRODUCTS**2.1 SHEET METAL MATERIALS**

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
- B. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

2.2 DUCT LINER

- A. Fibrous Glass Duct Liner: Comply with NFPA 90A and NAIMA AH124 "Fibrous Glass Duct Liner Standard." Can operated in temperatures up to 250-Degrees F and air velocities up to 5,000 fpm. ASTM C 1071 with coated surface exposed to airstream to prevent erosion of glass fibers. Coating contains EPA registered anti-microbial agent so it will not support the growth of fungus or bacteria and is water repellent. Antimicrobial compound shall be tested for efficacy by the EPA for use in HVAC systems.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation; Insulation Group.
 - b. Johns Manville.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - 2. Thickness: See Duct Schedule.
 - 3. Density: Minimum 2 lb per cubic foot.
 - 4. Maximum Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
 - 5. Fire-Hazard Classification: Maximum flame-spread rating of 25 and smoke-developed rating of 50, when tested according to ASTM E 84 and UL 723.
 - 6. Minimum Noise Reduction Criteria (NRC): 0.55 for 1/2-inch, 0.70 for 1-inch, 0.90 for 1-1/2-inch and 1.0 for 2-inch tested per ASTM C 423 using Type A mounting.
 - 7. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.
 - a. Tensile Strength: Indefinitely sustain a 50-lb-tensile, dead-load test perpendicular to duct wall.

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- b. Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.
 - c. Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.
 - 8. Johns Manville Spiracoustic Plus Round Duct Lining System. See Duct Schedule for thickness; preformed liner for ducts 8-inch through 18-inch diameter.
- B. Natural-Fiber Duct Liner: 85 percent cotton, 10 percent borate, and 5 percent polybinding fibers, treated with a microbial growth inhibitor and complying with NFPA 90A.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acoustical Surfaces Quiet Liner
 - b. Bonded Logic, Inc.
 - c. Reflectix Inc.
 - d. Second Skin EcoVerb
 - 2. Maximum Thermal Conductivity: 0.24 Btu x in./h x sq. ft. x deg F (0.034 W/m x K) at 75 deg F (24 deg C) mean temperature when tested according to ASTM C 518.
 - 3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to ASTM E 84; certified by an NRTL.
 - 4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A.

2.3 SEALANT AND ADHESIVE MATERIALS

- A. Joint and Seam Sealants:
 - 1. Joint and Seam Sealant: Water-based vinyl or acrylic copolymer mastic formulated to withstand temperatures from minus 20 to plus 180 Degrees F, minimum of 65 percent solids, water resistant, VOC: maximum 75g/L (less water).
 - 2. Flanged Joint Gasket Material: Elastomer butyl.
- B. Duct Liner Adhesive: Water-based vinyl copolymer adhesive formulated to withstand temperatures from minus 20 to plus 160 Degrees F. Comply with NFPA 90A and ASTM C 916.

2.4 HANGERS, SUPPORTS AND RESTRAINTS

- A. Building Attachments: Concrete inserts, stud-wedge or female wedge, mechanical-anchor bolts, or structural-steel fasteners appropriate for building materials. Powder actuated concrete fasteners are not allowed.
 - 1. If concrete inserts cannot be used, install mechanical-anchor (stud-wedge or female wedge type) bolts in concrete after concrete is placed and completely cured. Install fas-

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teners according to manufacturer's written instructions. Concrete inserts and mechanical-anchor fasteners shall be made of steel. Stainless steel for outdoor applications.

- B. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.
 - 1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.
 - 2. Straps and Rod Sizes: Comply with SMACNA "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel 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.

2.5 RECTANGULAR DUCT AND FITTING FABRICATION

- A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA "HVAC Duct Construction Standards--Metal and Flexible," based on indicated static pressure class, unless indicated otherwise. Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
 - 1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
 - 2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
 - 3. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Prefabricated transverse joints shall comply SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," for static-pressure class, leakage rating.
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a) Duct Mate Industries, Inc.
 - b) Omni Duct Systems
 - c) Ward Flange.
 - 4. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

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5. Material Thickness: For SMACNA "HVAC Duct Construction Standard – Metal and Flexible," but not less than 26 gauge.
- B. 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 unbraced panel area, unless ducts are lined.
- C. Elbow Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
- D. Branch Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Conical or Bellmouth.

2.6 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

- A. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness is not allowed.
- B. Apply adhesive to liner facing in direction of airflow not receiving metal nosing.
- C. Butt transverse joints without gaps and coat joint with adhesive.
- D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted edge overlapping.
- E. Do not apply liners in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.
- F. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profile or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 1. Fan discharge.
 2. Intervals of lined duct preceding unlined duct.

- G. Terminate liner with duct buildouts installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct wall with bolts, screws, rivets, or welds. Terminate liner at fire dampers at connection to fire-damper sleeve.

2.7 ROUND DUCT FABRICATION

- A. General: Diameter as applied to flat-oval ducts in this Article is the diameter of the size of round duct that has a circumference equal to perimeter of a given size of flat-oval duct. Minimum 26-gauge duct wall thickness.
- B. Round Ducts: Fabricate supply ducts of galvanized steel according to SMACNA "HVAC Duct Construction Standards--Metal and Flexible," unless indicated otherwise.
- C. Elbow Configuration:
 - 1. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - a. Round Elbows, 8 Inches and Smaller: Fabricate stamped elbows for 45- and 90-degree elbows and pleated elbows for 30-, and 60-degree elbows. Stamped elbows shall be 20-gauge thick minimum with two-piece welded construction. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with mitered construction.
 - b. Round Elbows, 9 through 12 Inches: Fabricate segmented (mitered) or pleated elbows for 30, 45, 60, and 90 degrees. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with mitered construction.
- D. Branch Configuration:
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are not permitted.
 - a. 90-degree Tee Fittings:
 - 1) Main to Branch (branch greater than $\frac{2}{3}$ the diameter of main or 12-inch diameter branch): Use 90-degree conical tee fitting. 90-degree conical taps or 90-degree lateral fittings can be used for all others.
 - 2) 45-degree lateral tee and 45-degree elbow in lieu of 90-degree tee fitting or tap on supply ductwork where space allows.
 - b. 45-degree Tee Fittings:
 - 1) Main to Branch (branch greater than $\frac{2}{3}$ the diameter of main or 12-inch diameter branch): Use 45-degree lateral fitting. 45-degree lateral taps or 45-degree lateral can be used for all others.

3.1 DUCT INSTALLATION, GENERAL

- A. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.
- B. Provide access panels every 50 feet on all medium pressure ductwork for inspection and duct clearing.
- C. Construct and install each duct system for the specific duct pressure classification indicated.
- D. Install round ducts in lengths not less than 12 feet, unless interrupted by fittings.
- E. Install ducts with fewest possible joints.
- F. Install fabricated fittings for changes in directions, changes in size and shape, and connections.
- G. Install couplings tight to duct wall surface with a minimum of projections into duct.
- H. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.
- I. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- J. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- K. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.
- L. Coordinate layout with suspended ceiling, control dampers, lighting layouts, and similar finished work. Allow for post-construction access to air terminals, volume dampers, and other components requiring maintenance and/or readjustment.
- M. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures, unless ductwork is intended to serve these spaces.
- N. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.
- O. Provide duct liner at the following locations:
 - 1. Within 10' of fan locations.
 - 2. Duct liner shall be only used near air handlers and mechanical rooms where access is readily available and listed hatches are installed.

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3. Duct liner coatings shall be fiber free in airstream with EPA approved biocide.
4. Duct liner is prohibited in exhaust ducts and outside air intake ducts where moisture can deteriorate the liner.

3.2 SEAM AND JOINT SEALING

- A. General: Seal duct seams and joints according to the duct seal class described in SMACNA "HVAC Duct Construction Standards--Metal and Flexible" corresponding to the pressure class given below.
- B. Pressure Classification:
 1. Positive Pressure Exhaust Ducts: Seal Class A; all transverse joints, longitudinal seams and duct wall penetrations.
 2. Below 3-inch wg: Seal Class B; all transverse joints and longitudinal seams.
- C. Seal externally insulated ducts before insulation installation.

3.3 HANGING, RESTRAINING, AND SUPPORTING

- A. Install rigid round, rectangular, and flat-oval metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards--Metal and Flexible."
- B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Support vertical ducts at a maximum interval of 16 feet and at each floor.
- D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
- E. Install concrete inserts before placing concrete.
- F. Install mechanical-anchor fasteners after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

3.4 CONNECTIONS

- A. Unless indicated otherwise, connect metal ducts to rotating equipment with flexible connectors according to Division 23 Section Air Duct Accessories.
- B. For branch, outlet and inlet, and terminal unit connections, comply with SMACNA "HVAC Duct Construction Standards--Metal and Flexible," unless indicated otherwise.

3.5 ADJUSTING

- A. Refer to Division 23 Section Testing, Adjusting, and Balancing for HVAC for detailed procedures.

3.6 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel.
- B. Liner:
 - 1. Supply-Air Ducts: Fibrous glass or natural fiber, 1 inch thick. Use perforated metal liner for all supply ducts above 2500 fpm.
 - 2. Return-Air Ducts: Fibrous glass or natural fiber, 1 inch thick, unless noted otherwise.
 - 3. Exhaust Air: Fibrous glass or natural fiber, 1 inch thick, unless noted otherwise.
 - 4. Outdoor Return-Air and Fan Plenum: Fibrous glass or natural fiber, 2 inches thick, unless noted otherwise.
 - 5. Transfer Ducts: Fibrous glass or natural fiber, 1 inch thick, unless noted otherwise.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 08 for Architectural Access Doors.
 - 2. Division 23 Section Common Work Results for HVAC
 - 3. Division 23 Section Testing, Adjusting and Balancing for Mechanical
 - 4. Division 23 Section Duct Insulation for Mechanical Systems
 - 5. Division 23 Section Metal Ducts
 - 6. Division 23 Section Fans
 - 7. Division 23 Section Diffusers, Registers and Grilles
 - 8. Division 23 Section Air-to-Air Energy Recovery Equipment
 - 9. Division 23 Section Split-System Air-Conditioners
 - 10. Division 23 Section Wall and Ceiling Unit Heaters
 - 11. Division 26 for Electrical connections.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Backdraft dampers.
 - 2. Manual-volume dampers.
 - 3. Electric duct heaters.
 - 4. Duct-mounted access doors.
 - 5. Flexible connectors.
 - 6. Duct accessory hardware.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Backdraft dampers.
 - 2. Manual-volume dampers.
 - 3. Electric duct heaters.
 - 4. Duct-mounted access doors and panels.
 - 5. Flexible connectors.

- B. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Comply with the following NFPA standards:
 - 1. NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Backdraft Dampers:
 - a. Ruskin
 - b. American Warming & Ventilating
 - c. Greenheck.
 - 2. Electric Duct Heaters:
 - a. Indeeco
 - b. King
 - c. Renew Aire.

2.2 SHEET METAL MATERIALS

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

2.3 BACKDRAFT DAMPERS

- A. Description: Suitable for horizontal or vertical installations as indicated.
- B. Counterbalance Type: Extruded aluminum with counterbalanced blades; blades begin to open at minimum 0.01 inches water gauge and be fully open at minimum 0.05 inches water gauge. Designed for maximum 3500 feet per minute spot velocity and up to 4-inches water gauge back pressure.
 - 1. Frame: Minimum 0.125 inches thick extruded aluminum, braced at corners.

2. Blades: Minimum 0.070 inches thick extruded aluminum. Blade seals extruded vinyl, mechanically attached.
3. Bearings: Corrosion resistant, long life synthetic.
4. Linkage: 1/2-inch diameter tie bar with stainless steel pivot pins; mounted on blades. Adjustable counterbalance.

2.4 MANUAL-VOLUME DAMPERS

- A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
- B. Steel Standard Volume Dampers: Multiple- or single-blade, opposed-blade design unless indicated otherwise, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
 1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 16 gauge thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
 2. Roll-Formed Steel Blades: 16 gauge thick, galvanized, sheet steel.
 3. Blade Axles: Galvanized steel.
 4. Tie Bars and Brackets: Galvanized steel.
- C. Jackshaft: 1-inch diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.
- D. Damper Regulators: Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.5 ELECTRIC DUCT HEATERS

- A. Duct heater shall be Slip-in and shall be UL approved for zero clearance to combustible surfaces. The heater shall bear a UL/CSA label. Control panel and element housing shall be constructed of heavy gauge galvanized steel. All heating elements shall be made of nickel/chromium resistance wire with ends terminated by means of staking and heliarc welding to machine screws. Heating element support structure shall consist of galvanized steel wire formed and constructed to support ceramic bushings through which the heating element passes. Control cabinet shall be constructed of heavy gauge galvanized steel with multiple knockouts for field wiring. Control cabinet shall have a solid cover also of heavy gauge galvanized steel and held in place with hinges and tool-release latches.

- B. Duct heater shall be supplied with primary over temperature protection by built in disc type automatic reset thermal cutouts and secondary over temperature protection by built in disc type manually resettable thermal cutouts. These devices must function independently of one another and are not acceptable if series connected in the control circuit wiring. A disconnecting magnetic control circuit is required. All duct heaters will require either a fan interlock circuit or an airflow switch.
- C. Over-current protection by means of factory-installed fusing within the control cabinet shall be provided for heaters rated at more than 48 amps. Heating elements shall be subdivided and fused accordingly.
- D. All wiring, component sizing, component spacing and protective devices within the control cabinet shall be factory installed and comply with NEC and UL standards. All heaters shall function properly with a 50 or 60 HZ power supply.
- E. A rating plate label shall be affixed to the exterior of the control cabinet cover which states model number, serial number, volts, amps, phase, frequency, control volts, volt-amps and minimum airflow requirements.

2.6 CAP TERMINATIONS

- A. Pitched Roof Cap: Steel construction with black enamel finish, integral flashing flange, built in birdscreen with damper. Greenheck RJ (6x9 or larger) or approved equal.
- B. Wall Cap (round connection): Aluminum construction, aluminum finish, built in birdscreen with damper. Greenheck WC or approved equal.

2.7 DUCT-MOUNTED ACCESS DOORS

- A. General: Fabricate doors and panels airtight and suitable for duct pressure class. 14-inch by 14-inch, unless indicated otherwise.
- B. Frame: Unless indicated differently, minimum 24-gauge thick galvanized, sheet steel, with bend-over tabs and foam gaskets.
- C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include piano hinge and cam latches. Multiple cam latches used on doors greater than 12-inches in height.
- D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
- E. Insulation: 1-inch-thick, fibrous-glass.

2.8 FLEXIBLE CONNECTORS

- A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1. Fabricate designed to meet UL 214, NFPA 90A, airtight and waterproof.
- B. Conventional, Indoor System Flexible Connector Fabric: Woven nylon/polyester blend with vinyl coating.
 - 1. Minimum Weight: 22 oz./sq. yd.
 - 2. Tensile Strength: 240 lbf/inch in the warp, and 220 lbf/inch in the filling.

2.9 SCREENED OPENINGS

- A. Screened Openings: 16-gauge steel angle frame enclosing 1/2-inch mesh, 14-gauge galvanized steel wire screen.

2.10 ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.
- B. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches to suit duct size.
- C. Concealed Damper Regulators: Gear operated linkage, minimum 3/8-inch diameter, steel rod, chrome plated ceiling cover, flush mount.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.
- B. Volume Dampers:
 - 1. Install volume dampers at all diffuser and grille duct connections. Place as far upstream as layout and accessibility allow.
 - 2. Install manual volume dampers in lined duct; avoid damage to and erosion of duct liner.
- C. Concealed Damper Regulators: Install concealed damper regulators in locations where manual volume dampers are inaccessible above ceilings or behind walls.
- D. Damper Actuators: Actuators shall not be mounted in the air stream.

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- E. Maximum length of flexible duct is six feet.
- F. Install duct access panels for access to both sides of duct coils for general inspection. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
 - 1. Install access panels on side of duct where adequate clearance is available.

3.2 ADJUSTING

- A. Adjust duct accessories for proper settings.
- B. Final positioning of manual-volume dampers is specified in Division 23 Section Testing, Adjusting, and Balancing for HVAC.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 23 Section Common Work Results for HVAC
 - 2. Division 23 Section Testing, Adjusting and Balancing for Mechanical
 - 3. Division 23 Section Duct Insulation for Mechanical Systems
 - 4. Division 23 Section Metal Ducts
 - 5. Division 23 Section Air Duct Accessories
 - 6. Division 23 Section Diffusers, Registers and Grilles
 - 7. Division 23 Section Air-to-Air Energy Recovery Equipment
 - 8. Division 23 Section Split-System Air-Conditioners
 - 9. Division 23 Section Wall and Ceiling Unit Heaters
 - 10. Division 26 for Electrical connections.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Ceiling Cabinet Fans.

1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base air ratings on actual site elevations.
- B. Operating Limits: Classify according to AMCA 99.
- C. Fan Schedule: The following information is described in an equipment schedule on the Drawings.
 - 1. Fan performance data including capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
 - 2. Fan arrangement including wheel configuration, inlet and discharge configurations, and required accessories.

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1.4 SUBMITTALS

- A. General: See Division 23 Section Common Work Results for HVAC general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals of the following:
 - 1. Ceiling Cabinet Fans.

1.5 QUALITY ASSURANCE

- A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL.
- B. ETL Listed and complies with UL705 (electrical) Standards and CSA Std C22.2, No 113.
- C. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled by UL.
 - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
- D. AMCA Compliance: Provide products that meet performance requirements and are licensed to use the AMCA Seal.
- E. NEMA Compliance: Provide components required as part of fans that comply with applicable NEMA standards.
- F. Testing Requirements: The following factory tests are required as indicated:
 - 1. Sound Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings From Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA Seal.
 - 2. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements. Verify clearances.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with moisture proof protective crating and covering.

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- B. Lift and support units with the manufacturer's designated lifting or supporting points.
- C. Fans shall not be exposed to moisture or dust during construction or storage.

1.8 WARRANTY

- A. Provide with manufacturer's standard in which manufacturer agrees to repair or replace components of units that fail in materials or in workmanship within their standard warranty period.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceiling Cabinet Fans:
 - a. Broan
 - b. Greenheck: www.greenheck.com.
 - c. Panasonic
 - d. Penn
 - e. Approved equal or better.

2.2 CEILING EXHAUST FANS

- A. Construction: Enamel painted galvanized steel with built in backdraft damper, mounting bracket and detachable ceiling grille.
- B. Certification:
 - 1. Energy Star Rated.
 - 2. UL listed
 - 3. HVI rated 0.5 sones max 0.1 inches water gage.
- C. Control:
 - 1. Automatic speed control to adjust fan speed to desired cubic feet per minute airflow independent of static pressure.
 - 2. Variable speed controls shall be built-in allowing low speed continuous cubic feet per minute airflow setting and time delay high speed timer.
- D. Motor: Electronically commutated motor with manufacturer's speed controller.
- E. Accessories:

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1. Gravity backdraft damper
2. Motion sensor
3. Hooded wall cap

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PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine areas and conditions for compliance with requirements of installation tolerances and other conditions affecting performance of the fans. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install fans according to manufacturer's written instructions, drawings, specifications, manufacturer's installation manual, and all applicable building codes.
- B. Install units with clearances for service and maintenance.

3.3 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.
- B. Electrical: Conform to applicable requirements in Division 26 Sections.
- C. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 CLEANING

- A. Clean fan interiors to remove foreign material and construction debris. Vacuum clean fan wheel and cabinet.

3.5 START-UP PROCEDURES

- A. Final Checks before Startup: Perform the following operations and checks before startup:
 1. Verify that shipping, blocking, and bracing are removed.

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2. Verify that unit is secure on mountings and supporting devices and that connections for piping, ducts, and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnects.
 3. Perform cleaning and adjusting specified in this Section.
 4. Verify that manual and automatic control in connected ductwork systems are in the fully open position.
- B. Starting procedures for fans are as follows:
1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.
 2. Measure and record motor voltage and amperage.
 3. Shut unit down and reconnect automatic temperature-control operators.
- C. Refer to Division 23 Section Testing, Adjusting, and Balancing for HVAC for procedures for air-handling-system testing, adjusting, and balancing.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 08 for Louvers and Vents
 - 2. Division 23 Section Common Work Results for HVAC
 - 3. Division 23 Section Testing, Adjusting and Balancing for Mechanical
 - 4. Division 23 Section Duct Insulation for Mechanical Systems
 - 5. Division 23 Section Metal Ducts
 - 6. Division 23 Section Air Duct Accessories
 - 7. Division 23 Section Fans
 - 8. Division 23 Section Air-to-Air Energy Recovery Equipment
 - 9. Division 23 Section Split-System Air-Conditioners
 - 10. Division 23 Section Wall and Ceiling Unit Heaters.

1.2 SUMMARY

- A. This Section includes ceiling-mounted diffusers and sidewall grilles.

1.3 DEFINITIONS

- A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.
- B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, sill, or floor.

1.4 SUBMITTALS

- A. Product Data: For each model indicated, include the following:
 - 1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
 - 2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.

3. Schedule of diffusers and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
4. Manufacturer's color chart showing standard and custom color options for selection by the Architect.

1.5 QUALITY ASSURANCE

- A. NFPA Compliance: Install diffusers and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Air Systems Components; Krueger.
 2. Titus.
 3. Price Companies.

2.2 MANUFACTURED UNITS

- A. Diffusers and grilles are scheduled on Drawings.

2.3 SOURCE QUALITY CONTROL

- A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

2.4 SUPPLY GRILLES

- A. Performance: Provide supply grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.
- B. Wall Compatibility: Provide grilles with border styles that are compatible with wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction, which will contain each type of wall grille.
- C. Types: Provide supply grilles of type, construction, capacity, and with accessories and finishes as indicated.

1. Supply Grille – Louvered
 - a. Materials: 22 gauge roll formed steel frame and blades or 0.040 minimum extruded aluminum frame and blades.
 - b. Grille Construction: 1-1/4-inch wide border, corners assembled with full penetration resistance welds. Screw holes countersunk. Double deflection 35 degree angle fixed blades, parallel to the short dimension, spaced on 3/4-inch centers.
 - c. Finish: To be selected from manufacturer's standard color options by the Architect.
 - d. Accessories: Opposed blade damper, operable from the face of the grille (OBD).

2.5 EXHAUST/RETURN GRILLES

- A. Performance: Provide exhaust and return grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.
- B. Wall Compatibility: Provide grilles with border styles that are compatible with wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction, which will contain each type of wall grille.
- C. Types: Provide exhaust and return grilles of type, construction, capacity, and with accessories and finishes as indicated.

1. Exhaust/Return Grille – Louvered
 - a. Materials: 22-gauge roll formed steel frame and blades or 0.040 minimum extruded aluminum frame and blades.
 - b. Grille Construction: 1-1/4-inch wide border, corners assembled with full penetration resistance welds. Screw holes countersunk. Blades at 35 degree deflection at 3/4-inch spacing. Blades fixed in place, parallel to the long dimension of the grille.
 - c. Finish: To be selected from manufacturer's standard color options by the Architect.
 - d. Accessories: Opposed blade damper, operable from the face of the grille (OBD).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers and grilles level and plumb, according to manufacturer's written instructions, project Coordination Drawings, original design, and referenced standards.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Duct-Mounted Supply and Exhaust/Return Grilles: Mount to duct branch with 16-gauge steel angle collar. Mounting screws to match grille frame. Screws shall not protrude more than 1/4-inch past angle collar.
- D. Install diffusers and grilles with airtight connection to ducts and to allow service and maintenance of dampers.
- E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified or shown as part of the diffuser, or grille and register assembly.
- F. Paint ductwork visible behind air outlets and inlets matte black.
- G. Provide seismic clips or chains anchored to structure for all lay-in air devices and all air devices not otherwise secured to structure.

3.3 ADJUSTING

- A. After installation, adjust diffusers and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

- A. After installation of diffusers and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers and grilles that have damaged finishes.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 23 Section Common Work Results for HVAC
 - 2. Division 23 Section Testing, Adjusting and Balancing for Mechanical
 - 3. Division 23 Section Duct Insulation for Mechanical Systems
 - 4. Division 23 Section Metal Ducts
 - 5. Division 23 Section Air Duct Accessories
 - 6. Division 23 Section Fans
 - 7. Division 23 Section Diffusers, Registers and Grilles
 - 8. Division 23 Section Split-System Air-Conditioners
 - 9. Division 23 Section Wall and Ceiling Unit Heaters
 - 10. Division 26 for Electrical Connections.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Packaged energy recovery units.
 - 2. Dedicated Outside Air Systems (DOAS).

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- B. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain air-to-air energy recovery units through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of air-to-air energy recovery units and are based on the specific system indicated. Refer to Division 01 Section Product Requirements.

- C. 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.
- D. ASHRAE Compliance: Capacity ratings for energy recovery devices shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."
- E. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.
- F. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.
- G. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

1.5 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: Furnish one set of each type of filter needed for first change out by Owner.

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, the manufacturers specified.
- B. Manufacturers:
 - 1. Greenheck
 - 2. Lossnay
 - 3. Renew Aire
 - 4. Approved equal

2.2 ENERGY RECOVERY VENTILATORS (ERVs)

- A. Description:
 - 1. Air Handler: Factory assembled, wired and run tested, designed for continuous operation and consisting of outside air (supply) fan and exhaust fan, heat exchanger with outside air bypass damper and energy recovery ventilation, filters, and dampers.

2. The units shall be rated in accordance with Air-conditioning Refrigeration Institute's (ARI) Standard 1060 and bear the ARI Certification label.
 3. Unit shall include heat exchanger with outside air bypass damper and energy recovery ventilation.
- B. Construction:
1. Unit shall be completely factory assembled and wired and shipped in one section.
 2. The cabinet shall be fabricated of galvanized steel, and covered with polyurethane foam insulation as necessary with steel mounting points securely attached.
 3. The ERV shall require neither a condensate pan nor receptacle nor condensate drain nor piping. Mounting may be horizontal or vertical and the unit may be inverted as required by ductwork connection.
- C. Outside Air (Supply) and Exhaust Fans:
1. Blowers, drives, and motors shall be dynamically balanced. The blower motors shall be directly connected to the blower wheels and have permanently lubricated bearings.
 2. The fans shall be direct drive centrifugal type. A back draft damper shall be included with the exhaust fan.
- D. Energy Recovery:
1. Heat exchanger element shall be constructed of specially treated cellulosic fiber membrane separated by corrugated layers to allow total heat (sensible and latent) energy recovery.
 2. Supply and return air thermistors shall control the bypass damper.
- E. Filters:
1. The ERV shall be equipped with factory installed air filters located at each intake face (both supply and exhaust sides) of the heat exchanger to clean the air and prevent clogging.
- F. Controls:
1. Provide time clock.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install floor-mounted units on 4-inch- (100-mm-) high base designed to withstand, without damage to equipment, seismic force required by code.
- B. Install units with clearances for service and maintenance.
- C. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

3.2 CONNECTIONS

- A. Duct and fan installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts, fittings, and specialties.
- B. Ground equipment according to Division 26 Section Grounding and Bonding.
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 1. Adjust seals and purge.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Set initial temperature and humidity set points.
 - 4. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 01 Section Demonstration and Training.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 1. Division 23 Section Common Work Results for HVAC
 - 2. Division 23 Section Testing, Adjusting and Balancing for Mechanical
 - 3. Division 23 Section Duct Insulation for Mechanical Systems
 - 4. Division 23 Section Metal Ducts
 - 5. Division 23 Section Air Duct Accessories
 - 6. Division 23 Section Fans
 - 7. Division 23 Section Diffusers, Registers and Grilles
 - 8. Division 23 Section Air-to-Air Energy Recovery Equipment
 - 9. Division 23 Section Wall and Ceiling Unit Heaters
 - 10. Division 26 for Electrical Connections.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Ductless Split System Heat Pumps.
 - 2. Refrigerant Pipe and Fittings.
 - 3. Condensate Drain Piping.

1.3 SUBMITTALS

- A. General: See Division 23 Section Common Work Results for HVAC for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals of the following:
 - 1. Ductless Split System Heat Pumps.
 - 2. Refrigerant Line Sets.
 - 3. Condensate Drain Piping.
- C. Reports and Certificates: Provide submittals of the following:
 - 1. Start-up and reports. See "Field Quality Control" article.

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. Performance Requirements: Energy Efficiency Rating (EER) not less than prescribed by ASHRAE 90.1 when used in combination with compressors and evaporator coils when tested in accordance with ARI 210/240 or ARI 340/360.
- C. Comply with Federal Clean Air Act and Washington State Clean Air Act.
- D. Units shall be designed to operate with HCFC-free refrigerants.
- E. Cooling Capacity: Rate in accordance with ARI 210/240, ARI 340/360, ARI 365.
- F. Sound Rating: Measure in accordance with ARI 270.

1.5 COORDINATION

- A. Coordinate size and location of bases for units. All powered equipment shall be installed above the flood zone level.

1.6 WARRANTY

- A. Provide with manufacturer's standard in which manufacturer agrees to repair or replace components of units that fail in materials or in workmanship within their standard warranty period.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductless Split System Heat Pumps
 - a. Carrier Air Conditioning; Div. of Carrier Corporation
 - b. Daikin.
 - c. Mitsubishi.
 - d. Trane Company (The); Unitary Products Group.
 - e. York International Corp.

2.2 DUCTLESS SPLIT-SYSTEM HEAT PUMPS WITH WALL MOUNTED INDOOR UNIT

A. Indoor Fan Coil Unit:

1. The wall-mounted indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
2. Unit Cabinet:
 - a. All casings, regardless of model size, shall have the same Munsell 1.0Y 9.2/0.4 white finish
 - b. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining are required.
 - c. There shall be a separate back plate which secures the unit firmly to the wall.
3. Fan:
 - a. The indoor fan shall be statically and dynamically balanced to run on a single motor with permanently lubricated bearings.
 - b. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
 - c. An integral, motorized, multi-position, horizontal air sweep vane shall provide for uniform air distribution, up and down. Vane shall have 5 selectable positions plus AUTO (Controls position based upon mode, microprocessor shall automatically determine the vane angle to provide the optimum room temperature distribution) and SWING (Continuously moves up and down). In OFF mode the horizontal vane shall return to the closed position.
 - d. The indoor unit shall include an AUTO fan setting capable of maximizing energy efficiency by adjusting the fan speed based on the difference between controller set-point and space temperature. The indoor fan shall be capable of five (5) speed settings, Low, Mid1, Mid2, High and Auto.
4. Filter:
 - a. Return air shall be filtered by means of an easily removable, washable filter.
5. Coil:
 - a. The indoor unit coil shall be of nonferrous construction with smooth plate fins on copper tubing.
 - b. The tubing shall have inner grooves for high efficiency heat exchange.
 - c. All tube joints shall be brazed with silver alloy.
 - d. The coils shall be pressure tested at the factory.
 - e. A sloped, corrosion resistant condensate pan with drain shall be provided under the coil.

- f. A drain pan level switch (SS610E), designed to connect to the control board, shall be provided, if required, and installed in the condensate pan to prevent condensate from overflowing.
- 6. Electrical:
 - a. The unit electrical power shall be 208-230 volts, 1-phase, 60 hertz.
 - b. The system shall be equipped with A-Control – a system directing that the indoor unit be powered directly from the outdoor unit using a 3-wire, 14 gauge AWG connections plus ground.
 - c. The indoor unit shall not have any supplemental electrical heat elements.
- 7. Controls:
 - a. The unit shall include an IR receiver for wireless remote control flexibility
 - b. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
 - c. Control board shall include contacts for control of external heat source. External heat may be energized as second stage when the space temperature is 1.8°F from set point.
- B. Outdoor Condensing Unit:
 - 1. The connected indoor unit shall be of the same capacity as the outdoor unit. The outdoor units must have a thermally fused powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.
 - 2. Outdoor unit shall have a sound rating no higher than 58 dB(A).
 - 3. Refrigerant lines from the outdoor unit to the indoor units shall be insulated in accordance with the installation manual.
 - 4. The outdoor unit shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.
 - 5. The outdoor unit shall be capable of guaranteed operation in heating mode down to -13°F ambient temperatures and cooling mode up to 115°F without additional restrictions on line length & vertical separation beyond those published in respective product catalogs. Models with capacity data for required temperature range published as "for reference only" are not considered capable of guaranteed operation and are not acceptable. If an alternate manufacturer is selected, any additional material, cost, and labor to meet ambient operating range and performance shall be incurred by the contractor.

6. Four-legged outdoor unit mounting systems shall be provided by manufacturer. Stand shall be made from 7 gauge plate steel with thermally fused polyester powder coat finish that meets ASTM D3451-06 standards. Stands shall be provided with galvanized mounting hardware and meets all ASCE 7 overturning safety requirement.
7. Unit Cabinet:
 - a. The casing shall be fabricated of galvanized steel, bonderized, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection. Assembly hardware shall be cadmium plated for weather resistance.
 - b. Cabinet color shall be Munsell 3Y 7.8/1.1.
 - c. Easy access shall be afforded to all serviceable parts by means of removable panel sections.
 - d. Two (2) mild steel mounting feet, traverse mounted across the cabinet base pan, welded mount, providing four (4) slotted mounting holes shall be furnished. Assembly shall withstand lateral wind gust up to 155 MPH to meet applicable weather codes. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.
 - e. Outdoor unit components shall be coated with the Seacoast Protection Coating (Brine Spray – BS coating) to protect components from premature corrosion due to a seacoast environment. Coating shall be applied to components before original outdoor unit assembly to ensure manufacturer quality standards are not compromised and shall meet the following minimum requirements:
 - 1) Acrylic-Polyester Resin coating on External Panels
 - 2) Acrylic Resin coating on External Panel Base, Support Plate and Compressor Cover
 - 3) Anti-Corrosion, Hydrophilic coating on heat exchanger fins
 - 4) Anti-Humidification paint coating on printed circuit boards
 - f. The outdoor unit shall be tested in compliance with JRA9002 such that no unusual rust shall develop after 960 hours of salt spray testing.
 - g. Panels on the outdoor unit shall be scratch free at system startup. If a scratch occurs the salt spray protection is compromised and the panel should be replaced immediately.
8. Fan:
 - a. 1, 1.5, 2 and 2.5 ton units shall be furnished with a single direct drive propeller type fan.
 - b. The outdoor unit fan motor(s) shall be a direct current (DC) motor and have permanently lubricated bearings.
 - c. The fan motor shall be mounted for quiet operation.
 - d. The fan shall be provided with a raised guard to prevent contact with moving parts.
 - e. The outdoor unit shall have horizontal discharge airflow.
9. Refrigerant and Refrigerant Piping

- a. Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
 - b. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the equipment manufacturer and installed in accordance with manufacturer recommendations.
 - c. All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.
 - d. Refrigerant line sizing shall be in accordance with manufacturer specifications.
10. Coil:
- a. The outdoor unit coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
 - b. The coil shall be protected with an integral metal guard.
 - c. Refrigerant flow from the outdoor unit shall be regulated by means of an electronically controlled, precision, linear expansion valve.
 - d. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102.
 - e. All refrigerant connections between outdoor and indoor units shall be flare type.
11. Compressor:
- a. The compressor shall be a high performance, hermetic, inverter driven, variable speed, dual rotary type.
 - b. The compressor motor shall be direct current (DC) type equipped with a factory supplied and installed inverter drive package.
 - c. The compressor will be equipped with internal thermal overload protection.
 - d. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.
 - e. Filters, sight glasses, and traps shall not be used, and no additional refrigerant oil shall be required.
 - f. The compressor shall be mounted so as to avoid the transmission of vibration.

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- g. The outdoor unit shall have an accumulator and high pressure safety switch.

12. Operating Range:

- a. Operating Range shall be in accord with the Table below:

Operating Range		Indoor Intake Air Temp	Outdoor Intake Air Temp
Cooling	Maximum	90°F (32°C) DB, 73°F(23°C) WB	115°F (46°C) DB
	Minimum	66°F (19°C) DB, 59°F(15°C) WB	23°F (-5°C) DB 0°F (-18°C) DB*
Heating	Maximum	82°F (28°C) DB	70°F (21°C) DB, 59°F(15°C) WB
	Minimum	50°F (10°C) DB	12°F (-11°C) DB, 10°F(-12°C) WB -4°F (-20°C) DB, -4°F(-20°C) WB** -13°F (-25°C) DB, -13°F(-25°C) WB***

*If wind baffle is installed

**For 2, 2.5, 3 and 3.5 Ton standard models

***For Hyper Heat models

13. Electrical:

- The outdoor unit electrical power supply shall be 208/230 volts, 1-phase, 60 hertz.
- The unit shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts.
- The outdoor unit shall be controlled by microprocessors located in the indoor unit and outdoor unit. A 12 to 24 volt DC data stream shall communicate between the units providing all necessary information for full function control.
- The outdoor unit shall be equipped with Pulse Amplitude Modulation (PAM) compressor inverter drive control for maximum efficiency with minimum power consumption.

2.3 REFRIGERANT PIPING

A. Copper Tube and Fittings

- Drawn-Temper Copper Tube: ASTM B 88, Type L.
- Wrought-Copper Fittings and Unions: ASME B16.22.
- Brazing Filler Metals: AWS A5.8, Classification BAg-1 (silver)
- Flexible Connectors: 500-psig (3450-kPa) minimum operating pressure; seamless tin-bronze core, high-tensile bronze-braid covering, and solder-joint end connections; dehydrated, pressure tested, minimum 7 inches long.

2.4 CONDENSATE DRAIN PIPING

- A. Schedule 40 PVC with solvent fittings, drainage pattern, for drain piping, ANSI B16.22.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install ground-mounting, compressor-condenser components on polyethylene mounting base.
- D. Install seismic restraints.

3.2 CONNECTIONS

- A. Install piping adjacent to unit to allow service and maintenance.
- B. Ground equipment according to Division 26 Section Grounding and Bonding for Electrical Systems.
- C. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Remove and replace malfunctioning units and retest as specified above.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 01 Section Demonstration and Training.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 23 Section Common Work Results for HVAC
 - 2. Division 23 Section Testing, Adjusting and Balancing for Mechanical
 - 3. Division 23 Section Duct Insulation for Mechanical Systems
 - 4. Division 23 Section Metal Ducts
 - 5. Division 23 Section Air Duct Accessories
 - 6. Division 23 Section Fans
 - 7. Division 23 Section Diffusers, Registers and Grilles
 - 8. Division 23 Section Air-to-Air Energy Recovery Equipment
 - 9. Division 23 Section Split-System Air-Conditioners
 - 10. Division 26 for Electrical Connections.

1.2 SUMMARY

- A. Section includes wall heaters with electric-resistance heating coils.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Operation and Maintenance Data: For wall heaters to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Berko; Marley Engineered Products.

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2. Chromalox, Inc.
3. Indeeco.
4. King Electrical Manufacturing Company
5. Markel Products Company; TPI Corporation.
6. Marley Engineered Products.
7. QMark; Marley Engineered Products.
8. Trane Inc.

2.2 DESCRIPTION

- A. Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Heaters shall be completely factory wired and assembled, with all required electrical power devices and accessories, including automatic re-setting overheat control, contactors, fuses, transformer, and terminal blocks.
- D. Unit shall be equipped with disconnect and UL approved.
- E. Three Piece Design: The heater shall be made up of a back box, a heater assembly and a front panel.

2.3 CABINET

- A. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.
- B. Finish: Epoxy powder-coated with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
- C. Surface- or Recessed-Mounted Cabinet Enclosure: Steel with finish to match cabinet.

2.4 COIL

- A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high-temperature protection. Provide integral circuit breaker for overcurrent protection.

2.5 FAN AND MOTOR

- A. Fan: Aluminum propeller directly connected to motor.
- B. Motor: Permanently lubricated.

2.6 CONTROLS

- A. Controls: Unit-mounted, integral thermostat or wall mounted. Refer to the Drawings for more detail.
- B. Wall Mounted Thermostats: 24/7 programmable wall-mounted thermostats with enclosure, wall plate and lockable Lexan plastic cover. Provide temperature range from 50 to 90 deg F, and 2.5 deg F throttling range. Provide with tamper proof cover.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive wall heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical connections to verify actual locations before heater installation.
- C. For recessed units, verify recess dimensions are correct size.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Mount heaters as required by their manufacturer's installation instructions.
- B. Install wall heaters to comply with NFPA 90A.
- C. Install wall heaters level and plumb.
- D. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.
- E. Ground equipment according to Division 26 Section Grounding and Bonding for Electrical Systems.

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- F. Connect wiring according to Division 26 Section Low-Voltage Electrical Power Conductors and Cables.
- G. Connect heaters and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Testing: After installing heaters and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
- B. Remove and replace malfunctioning units with new units and retest.

END OF SECTION

PART 1 - GENERAL**1.01. APPLICABLE PROVISIONS**

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the electrical work.
- B. Coordinate electrical work with related work shown and specified elsewhere.
- C. Work Included: The Contractor shall perform all the Work required (including the furnishing of all supervision, labor, services, tools, materials and equipment and the performance of all operations and incidentals necessary) for a complete, safe and reliable electrical installation, adjusted, tested and ready for operation. The electrical work (new and modification of existing) is generally described as follows:
 - 1. Scheduling and coordination of all phases/sequences of the project.
 - 2. Maintaining, modifying, and temporary work to accommodate all phases/sequences of the project.
 - 3. Demolition.
 - 4. Electric service to point of connection with Puget Sound Energy. (including all necessary coordination with the utility).
 - 5. Power distribution system including panelboards, circuit breakers, disconnect switches, fuses, feeders, etc.
 - 6. Surge arrestor.
 - 7. Grounding.
 - 8. Wiring devices and special purpose receptacles.
 - 9. Lighting fixtures.
 - 10. Lighting controls and devices.

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11. Branch circuit wiring system for lighting, outlets, equipment, etc., including reconnection of existing circuits.
12. Disconnecting means, switches, receptacles, motor starters, control devices, etc. (installation only if furnished with the equipment), and final power and line voltage (120 volt or greater) control connections to equipment and devices provided by the Owner, General Contractor or other Sub-Contractors, including the following:
 - a. HVAC equipment, and their line voltage control devices,
 - b. Plumbing systems equipment and their line voltage control devices,
 - c. Heat tape and freeze protection,
 - d. Appliances.
 - e. Motorized doors, etc.
13. Starters, contactors, relays, etc.
14. Line voltage (120 volt or higher) control stations, devices, conduit, boxes, wiring, etc. (installation only, if furnished with mechanical equipment).
15. Motorized doors low voltage control conduit, boxes, wiring, etc. (except, control stations and devices will be furnished with the doors for installation by Contractor).
16. Electric Vehicle (EV) Chargers.
17. Audio-Video systems, backing, raceways, boxes, etc.
18. Security alarm system raceways, boxes, etc.
19. Access Control system raceways, boxes, etc.
20. Surveillance system raceways, boxes, etc.
21. Fire detection and alarm system.
22. Telecommunications (e.g. voice, data/computer network, cable television) equipment racks, patch panels, terminal blocks, outlets, conduit, cables, etc.
23. Telecommunications systems equipment backboards.
24. Supports.

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25. Pull strings and ropes.
26. Cutting and patching for underground electrical work, including temporary work.
27. Moisture, fire and dust stopping and sealing.
28. Temporary construction power & lighting.
29. Testing and completing.
30. Obtaining and paying for all required licenses, permits, inspections and fees.

D. Work not included: The following electrical system related work will be provided by the Owner, General Contractor, other Subcontractors, or Systems Contractors working directly with the Owner:

1. Mechanical Contractor: Mechanical equipment and systems low voltage control wiring, conduits, devices, etc. See mechanical specification sections and schedule on drawings.
2. Doors Supplier: Motorized (power assisted ADA type, etc.) door control stations, devices, etc. (except, installation by Contractor).
3. Door Hardware Supplier: Electric strikes power supplies, door strikes, automatic openers and pushbuttons, wiring diagrams, etc., (except, installation by Contractor per door hardware supplier submittals).
4. Owner: Appliances.
5. Owner: Wireless Access Points devices and installation.
6. Owner: AV wiring, Flat Panel Displays and installation.
7. Owner: Security system panel, wiring, devices and installation.
8. Owner: Access Control system panel, wiring, devices and installation.
9. Owner: Surveillance system wiring, devices and installation.
10. Owner: Payment of utility service charges.

1.03. ALTERNATES

- A. See Section 01 23 00 for description of Alternates. Include work associated with each alternate in the alternate bid price.

1.04. EXISTING CONDITIONS

- A. Before submitting bid, examine existing site (and building or equipment) conditions to determine effect on execution of the electrical work and include costs in bid.
- B. Existing circuits indicated on the plan are based on what was shown on the original building construction drawings and may not be exactly how the actual construction was done. The contractor shall expect that an extensive amount of circuit tracing to determine how the actual circuits are installed will be required.
- C. Underground utilities (electrical, water, sewer, cable television, etc.) are known to exist in the area of construction. The location of existing utilities shown on the drawings is approximate only and is not guaranteed to be an indication of all utilities in the area. The contractor is responsible for contacting the Owner and all utility companies and for field location of all utilities prior to construction. The one-call number for underground utility location services is 1-800-424-5555. The Contractor shall promptly notify the Engineer of any conflicts between the contract documents and field location of existing utilities. The Contractor is responsible for maintaining the integrity of all existing utilities during construction.
- D. Damaged electrical and telecommunications (telephone, computer/data, television, fiber, copper, etc.) cables shall be replaced in their entirety. Splicing will not be allowed.
- E. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.
- F. Restore site soils and plantings in trenching and backfilling areas and extend site restoration into adjoining areas to remain in a manner that eliminates evidence of trenching and backfilling.

1.05. SPECIAL AREAS

- A. Telecommunications rooms shall be treated as clean room type environments. Food, drink, dirt, dust, metal shavings and the like shall not be permitted in telecommunications rooms.

1.06. PLAN REVIEW AND PERMITS

- A. The Contractor shall arrange for inspections and pay for all required licenses, permits, inspections, plan reviews and any other fees (except the owner will pay for L&I plan review fee).

1.07. DEFINITIONS

- A. The term "Contractor" used throughout Division 26, 27 and 28 and all its sections of these specifications and on the electrical drawings shall be understood to mean the Electrical Contractor. All other work shall be called out by name.
- B. "Approved" means approved by the Architect. "For approval" means for the Architect's approval.
- C. "Furnish" means to supply and deliver to the Project, ready for installation and in operable condition.
- D. "Install" means to incorporate in the work in final position, complete, anchored, connected, and in operable condition.
- E. "Provide" means furnish and install.
- F. "As directed" means as directed by the Architect.
- G. "Concealed" means hidden from sight in trenches, walls, chases, ceilings, etc.
- H. "Exposed" means within sight; that is, not concealed as defined above, and installed on the surface of walls, ceilings, etc.
- I. "C.O." means conduit only; that is, without cable (except, provide pull string or rope).
- J. "F.O.I.C." means Furnished by Others (e.g. general contractor, other subcontractors, equipment suppliers, Owner, systems contractors working directly with the Owner, etc.), Installed by Contractor.
- K. "N.I.C." means Not in Contract.
- L. See telecommunications section 27 05 00 for additional definitions.
- M. Definitions of all other terms, etc. are in accordance with AIA, ANSI, IEEE, IES, NEMA, etc. standard definitions.

1.08. DRAWINGS & SPECIFICATIONS

- A. The electrical plan drawings are general in form and do not attempt to show complete details or list every item of the electrical systems, the building construction or the various equipment (new or existing); however, the routing of raceways and circuits, and the locations of equipment, devices, fixtures, etc. represent the desired finished arrangement; except, as governed by structural or mechanical conditions or obstructions.
- B. Specifications are, in some cases, written in an abbreviated form. Words such as shall, shall be, the Contractor shall, and similar mandatory phrases are supplied by inference.

- C. Investigate the structural and finish conditions affecting the work. Refer to the architectural, structural and mechanical drawings, supplier shop drawings and submittals, etc. for additional details, equipment ratings, dimensions, location and swing of doors, location and size of partitions, cabinets, etc. and similar features. Verify all dimensions, equipment ratings, etc. with the actual before installation. Arrange the work accordingly.
- D. The intent of the drawings and specifications is to include all items necessary for the proper execution and completion of the Work; however, any item or detail not specifically mentioned in the specifications or shown on the drawings, but which is necessary to produce the intended results shall be included.
- E. The Contractor shall bring to the Engineer's attention any discrepancies, inconsistencies, conflicts, errors, or omissions within the Contract Documents, between the Contract Documents and field conditions, and any design and layout changes required due to specific equipment selection, etc. prior to equipment and material purchasing and installation. If Contractor purchases any equipment or materials and performs any construction activity, and it knows or reasonably should have known that the documents contain a discrepancy, inconsistency, conflict, error or omissions, corrective work shall be at the Contractor's expense.
- F. Verify all equipment and device locations with the Owner and Architect prior to rough-in.
- G. Verify exposed raceway routing with the Owner, Architect and Engineer prior to rough-in.

1.09. SUBMITTALS

- A. Provide submittals for the equipment, boxes, devices, fixtures, special raceways, systems and their components, etc. as directed in the various sections of the specifications.
- B. Prepare detail layout drawings to a larger scale than the contract drawings in areas where the work is of sufficient complexity to warrant additional detailing.
- C. Submittal drawings shall be on standard size sheets no larger than the contract drawings.
- D. Submit M.S.D.S. (Manufacturer's Safety Data Sheets) for all chemicals or hazardous materials. All chemicals and hazardous materials to meet NIOSH Permissible Exposure Levels (P.E.L.) and OSHA Time Weighted Average (T.W.A.) requirements before commencing work.
- E. If requested by the Owner, provide samples of materials for evaluation.
- F. Submittals shall provide sufficient detail so compliance with the drawings and specifications can be ascertained. Clearly identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and review materials and equipment. Catalog pages containing more than one product shall be marked with arrows to indicate the proposed product.

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- G. Obtain approval before purchasing any products. Items not in accordance with the drawings and specifications will be rejected.
- H. Forward all submittals to the Architect, together, at one time, in bound folders or three-ring binders with tabs and index for each section. Each tabbed section shall be provided with a front page with space for review comments. Individual or incomplete submittals are not acceptable.
- I. The Contractor shall establish quantities, check drawings and data, verify space requirements, dimensions, and possible interferences prior to submittal.
- J. The Architect and Engineer will review each submittal, mark to indicate action taken, and return. Compliance with specified characteristics is the Contractor's responsibility.
- K. Approval of submittals does not release the Contractor from a proper installation, compliance with the drawings, specifications, codes, standards, etc. or coordination of the work.
- L. Allow two weeks turnaround time for each submittal from the time of receipt at the engineer's office, except the engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until the related submittals are received.

1.10. SUBSTITUTE PRODUCTS APPROVAL

- A. During Bidding:
 - 1. Substitutions for equipment and materials other than that specified will be considered if equal (or better and/or higher) in quality, ratings and function; and similar in type, style, size and appearance.
 - 2. Submit written requests to Owner, Architect and Engineer.
 - a. If received no later than 7 work days prior to Bid opening, requests will be considered, but not thereafter.
 - b. Bidders will be informed by Addendum of any approved items.
 - c. No responses will be provided for rejected items.
 - 3. Requests shall be accompanied by complete specifications, samples, record or performance, certified tests by impartial, recognized laboratories, and other such information as required to clearly represent the proposed substitution.
 - 4. Lighting fixture substitution requests shall include photometric data.

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5. Final decisions as to quality and suitability of proposed substitutions rest solely with the Owner, Architect and Engineer, and will be based on proof submitted.
6. The cost of changes required in order to incorporate the proposed substitution, such as revisions to controls, raceways, wiring, openings, appurtenances, etc., shall be included in the bid. Any cost reduction resulting from substitutions shall benefit the Owner through a reduced bid.
7. When Owner, Architect and Engineer approve a proposed substitution, it is with the understanding that Bidder certifies that substitute articles or materials are equal to or better than those specified and that no exception is taken with any of the performance objectives, service or warranty requirements or features herein specified.

B. After Bidding:

1. Substitute products requests will not be considered.
2. Product substitutions are allowed solely under the conditions stated in Division 1 Section "Product Requirements."

1.11. RECORD DOCUMENTS

- A. Submit record documents at completion of the project in accordance with the specific submittal requirements listed elsewhere in these documents.
- B. Provide "as-built" drawings in both full size reproducible form and in software form as AutoCAD .dwg type files.
- C. All record documents in software form shall be provided on a single CD-ROM. Include the necessary program(s) to read test results. Separate submittals for the various disciplines will not be accepted.

1.12. "AS BUILT" DRAWINGS

- A. The Contractor shall continuously maintain a marked job set of as-built drawings as the work progresses, to indicate deviations from the original design, including change orders. Maintain records of all concealed wiring and of actual equipment, device, etc. locations. Provide dimensions from accepted reference lines as needed. The as-built drawings shall be kept on-site and available for inspection by the Owner.
- B. Include any detailed equipment, raceway, wiring, etc. diagrams and layouts prepared by Contractor or his subcontractors, suppliers, etc.
- C. At substantial completion, Contractor shall modify one complete set of reproducible copies, with all "as built" information and submit these drawings to the Owner for approval. Each sheet shall be marked

"CORRECTED TO AS BUILT"; or, if there are no changes, drawings shall be marked "NO CHANGES, INSTALLATION PER PLAN".

- D. After approval, Contractor shall transfer all "as built" information from the marked job set and other information as appropriate to AutoCAD .dwg type files. (Consultant/Engineer will provide construction drawings AutoCAD files to contractor.) Utilize the layering scheme, font types, line types, title block, etc. provided in the AutoCAD drawing files. All drawings shall be noted as "As-Built" with a stamp and date. After adding the "as-built" information, return the AutoCAD files to the Consultant/Engineer for inclusion into the final project record set.
- E. "As-built" drawings for all portions of the work shall be combined into a single set matching the contract documents. Separate submittals for the various disciplines will not be accepted.

1.13. OPERATION AND MAINTENANCE MANUALS

- A. Following installation of the electrical systems, but prior to acceptance of the work, Contractor shall submit to Architect one loose-leaf volume with information systematically segregated and indexed for easy reference to be reviewed by the Owner, Architect and Engineer. This submittal copy will be returned to the Contractor, and the material can be used in preparation of final volumes. After approval of preliminary copy, but prior to project completion, submit 3 finished copies.
- B. Format shall be 8¹/₂" x 11" size with neat, clean copies, drawings (accordion folded), etc. Manuals shall have a typewritten index, and divider sheets with identification tabs between categories. Manuals shall be in hard cover 3 ring binders with titles permanently embossed on the cover face and the spine. The front of each volume shall be imprinted with the project name, title (e.g. "Electrical Equipment and Devices Operating Instructions and Maintenance Manual"), Owner, Architect, Electrical Engineer and Contractor.
- C. Manuals shall include:
 - 1. Record documents (see above); except, full size reproducible bond paper copy of drawings to be provided separately.
 - 2. Submittals, updated to "as built" conditions.
 - 3. Test results; except, telecommunications equipment, cables, etc. test results shall be in a separate binder.
 - 4. Description of systems configuration and operation including component identification and interrelations, including diagrams and supplementary drawings where necessary.
 - 5. Installation, operation, maintenance and programming manuals covering the installed systems, equipment and materials.

6. Maintenance instructions (frequency of service, type of service, etc.).
 7. Parts lists for all equipment; including recording information, recommended spares and anticipated useful life.
 8. Supplier's names, addresses, telephone and reference order numbers for all equipment and materials.
 9. Warranties and Bonds.
 10. Copies of final inspection certificates from the authorities having jurisdiction.
- D. Omit non-applicable data.

1.14. WARRANTY

- A. The complete installation shall be guaranteed for a period of one (1) year after date of project completion. For warranty purposes, the date of project completion shall be considered the date of final acceptance of the installation by the Owner certified in writing, and after Owner has received all project close-out requirements. All corrective work, if needed and requested by the Owner, shall be provided without cost to the Owner during the guarantee period.
- B. All corrective work performed by the Contractor in remedying defective work during the guarantee period following the Owner's acceptance of the project shall be subject to the same guarantee requirements of the original work for a period as specified from the date of completion of the corrective work.
- C. Corrective work shall include on-site service by the Contractor, subcontractor or supplier (e.g. fire alarm and telecommunications systems), and/or nearest technical service representative of the equipment manufacturer. Service shall be provided within 24 hours from the time of request for warranty service by the Owner.

1.15. TRAINING/INSTRUCTION AND ASSISTANCE

- A. After the installation is complete and operating, and prior to acceptance of the work, conduct a minimum of a one (1) hour training/instruction period at the site for each type of system to point out locations of service and maintenance and instruct the Owner's in the operation of all systems and equipment.
- B. The person(s) who conduct these instructions and demonstrations shall be a qualified representative(s) of the manufacturer with substantial training and operating experience on this equipment and project, and shall be versed in the operating theory as well as practical operation and maintenance work. Instructor(s) shall have the necessary educational and interpersonal skills, as well as proven ability to

effectively perform the training. Their qualifications shall be submitted to the Owner before conducting the instruction period.

- C. Each period shall include preliminary discussion and presentation of information using the actual maintenance manuals required for this project. Contractor shall notify Owner and Engineer at least 48 hours in advance of readiness to conduct the instruction period. The actual time and date of instruction period shall be acceptable to the Owner and Engineer.
- D. All training material shall be furnished and supplied by the Contractor.

1.16. QUALITY ASSURANCE

- A. The Contractor and Contractor's personnel shall be experienced, thoroughly trained and completely familiar with the systems, equipment, devices, fixtures, materials, etc. and the required methods of installation.
- B. The Contractor shall provide, upon request, after bid opening and prior to notice to proceed, a company resume including a list of project personnel with years of experience and qualifications/certifications, a list of similar projects completed within the past 5 years with contact information for the Owners and Engineers for each project and any other information which may be pertinent to the project. If requested, the Contractor shall provide a similar resume for sub-contractors.
- C. The Contractor shall provide proof, upon request, that all personnel are licensed according to Washington State RCW19.28.161.
- D. All materials, equipment and workmanship shall be properly inspected by the Contractor and shall at all times be subject to inspection by the Owner, Architect and Engineer. Contractor shall provide all samples, data and documents necessary for such inspection. Owner, Architect and Engineer shall be afforded full and free access at the jobsite and the shops and places of business of the Contractor for such inspection and to determine the status of the work. If Contractor covers all or any part of the work prior to any inspection or test specifically requested by Owner, Architect and/or Engineer, the cost of any necessary uncovering and replacing shall be borne by the Contractor.
- E. Neither the failure to make inspections or tests, nor to discover defective workmanship, materials or equipment, shall prejudice the rights of the Owner, Architect or Engineer thereafter to reject the work and/or require its correction.
- F. The completed installation shall comply with the more stringent of the requirements of the drawings and specifications, the authorities having jurisdiction, and all laws, ordinances, rules, regulations and requirements in effect at the site, including current editions of the following:
 - 1. NEC - National Electrical Code.
 - 2. National Electrical Safety Code.
 - 3. OSHA - Occupational Safety and Health Act (and its Washington State equivalent).

4. ADA - Americans with Disabilities Act (and its Washington State equivalent).
 5. International Fire Code (and its Washington State equivalent).
 6. International Building Code (and its Washington State equivalent).
 7. Washington State Rules and Regulations for Installing Electrical Wires and Equipment (WAC 296-46).
 8. Washington State Safety Standards for Electrical Workers (WAC 296-45).
 9. Washington State Energy Code.
- G. The following standards establish the minimum requirements for the equipment and installation, unless exceeded by the requirements of the drawings or specifications:
1. ANSI - American National Standards Institute.
 2. BICSI – Building Industry Consulting Service International
 3. ICEA - Insulated Cable Engineers Association.
 4. IEEE - Institute of Electrical and Electronics Engineers.
 5. NEMA - National Electrical Manufacturers Association.
 6. NEIS – National Electrical Installation Standards
 7. NFPA - National Fire Protection Association.
 8. NECA – National Electrical Contractors Association
 9. EIA - Electronic Industries Association.
 10. TIA - Telecommunications Industry Association.
- H. In addition, telephone/voice & computer/data pathways & wiring shall be in accordance with the following:
1. ANSI/NECA/BICSI 568-2001 – Installing Commercial Building Telecommunications Cabling.
 2. ANSI/TIA/EIA 526-7-98 – Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 3. ANSI/TIA/EIA 526-14-A-98 – Optical Power Loss Measurements of Installed MultiMode Fiber Cable Plant
 4. TIA/EIA TSB-125 – Guidelines for Maintaining Optical Fiber Polarity Through Reverse-Pair Positioning.
 5. TIA/EIA TSB-140 – Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
 6. ANSI/TIA/EIA 568-B.1 - Commercial Building Telecommunications Cabling Standard, General Requirements.
 7. ANSI/TIA/EIA 568-B.2 - Commercial Building Telecommunications Cabling Standard, Balanced Twisted Pair Cabling Components.
 8. ANSI/TIA/EIA 568-B.3 – Optical Fiber Cabling Components Standard.
 9. ANSI/TIA/EIA 569-B - Commercial Building Standard for Telecommunication Pathways and Spaces.
 10. ANSI/TIA/EIA 570-A – Residential Telecommunications Cabling Standard.
 11. ANSI/TIA/EIA 598-B – Optical Fiber Cable Color Coding.
 12. ANSI/TIA/EIA 606-A – Administration Standard for Commercial Telecommunications Infrastructure.

13. ANSI/TIA/EIA 607-A - Commercial Building Grounding and Bonding Requirements for Telecommunications.
 14. ANSI/TIA/EIA 758 – Customer-Owned Outside Plant Telecommunications Cabling Standard.
 15. IEEE 802.3-2002 – IEEE Standard for Information Technology, Part 3: CSMA/CD.
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- I. Nothing in the drawings or specifications shall be construed to direct or permit work not conforming to applicable laws, ordinances, rules, regulations, requirements or standards. Discrepancies or conflicts shall be brought to the attention of the Owner and Engineer promptly for resolution.
 - J. The Owner and Engineer shall be advised prior to any inspection being requested. The Owner and Engineer shall be provided the opportunity to inspect the installation prior to wallboard, ceiling or finish installation. Any materials, equipment or workmanship that is not (in the opinion of the Owner, Engineer or Inspector) as it should be, shall be taken out and replaced without cost to the Owner.

PART 2 - PRODUCTS**2.01. GENERAL**

- A. Coordinate the features of materials and equipment so they form an integrated system.
- B. Contractor shall make certain that all materials selected by him, his subcontractors or by his suppliers, conform exactly to requirements of the drawings and specifications. Transmittal of such specifications and drawing information to subcontractors, person manufacturing and/or supplying materials to the project, and rigid adherence thereto, is the Contractor's responsibility.
- C. All equipment, devices, luminaires, materials, etc. shall be UL (Underwriter's Laboratories, Inc.) listed, labeled and approved for the service intended where UL standards have been established. If no UL label is available, the label of a testing agency or conformance to national standards recognized and approved by the electrical inspector having jurisdiction is required.
- D. All equipment, devices, fixtures, materials, etc. shall be new and installed only if in first class condition.
- E. All equipment, devices, etc. and their components shall be designed for continuous duty without degradation of function or performance.
- F. In the event that any item is not available exactly as specified, the Contractor shall so notify the Owner and Engineer in writing prior to bidding as early as possible to allow ample time for an alternate item to be selected without delay to the project.

2.02. EQUIPMENT MANUFACTURERS

- A. Unless specifically noted otherwise, all references to manufacturer's or supplier's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality.
- B. All equipment, devices, materials, etc. shall be of a type manufactured by reputable recognized vendors. Each type or groups of items, system components, etc. having the same or similar function shall be the same manufacturer, make and quality throughout the facility.
- C. Approval of a manufacturer's name and/or type does not release the Contractor of the responsibility for providing materials which comply in all details with requirements in the contract documents.

2.03. SPARE CAPACITY

- A. Unless sizes and/or quantities are specifically indicated, provide at least 20% spare wiring capacity in all cabinets, panels and raceways.

2.04. LOCKS

- A. All equipment, panels, etc. shall be provided with suitable locks, keyed alike.
- B. Provide a minimum of 2 keys for each lock.

2.05. ENCLOSURES

- A. Equipment, devices, luminaires, boxes, etc. located indoors shall have general purpose (NEMA 1) enclosures, except:
- B. Equipment, devices, luminaires, boxes, etc. located outdoors shall be provided with weatherproof (NEMA 3R) enclosures. Surface finish shall be a rust inhibiting primer followed by an epoxy or polyurethane polyester top coat.
- C. Provide gaskets, seals, etc. as required to prevent the entrance of moisture, debris, insects, etc.
- D. Enclosures and boxes shall be fabricated from code gauge, or heavier, galvanized steel. Surface preparation and finish shall be manufacturer's standard unless noted otherwise.
- E. Include all necessary mounting, etc. accessories.

2.06. SUPPORT CHANNEL

- A. Channel, framing members, etc. shall be 12 gauge steel, galvanized, 1⁵/₈ inch channel width with all necessary accessories.
- B. Beam clamps shall be steel, minimum 500 lb load rated.
- C. Threaded rod shall be steel, minimum 3/₈ inch diameter.
- D. Rooftop mounted conduit support bases shall be nonmetallic, UV resistant, and approved for use on the roofing material. Provide minimum 6 inches of space between bottom of conduits and roof surface. Rooftop support bases shall be Cooper B-Line C Series (or equal) with suitable support channel.

2.07. EQUIPMENT BACKBOARDS

- A. Equipment backboards shall be 3/₄ inch plywood, void free, interior grade, good one side, fire resistant treated, bearing a quality mark indicating compliance with American Wood Preservers Assoc. (AWPA) standards.
- B. Paint with minimum two coats of light colored fire resistant paint on all sides and edges.

2.08. ANCHORS AND FASTENERS

- A. Anchors and fasteners used shall be of a type designed for use in the base material to which the item is to be attached. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts.
- B. Pad and floor mounted equipment shall be secured with suitable hot dipped galvanized steel anchor bolts, washers, hex nuts, etc.
- C. Powder actuated fasteners, plastic expansion type anchors, nails and toggle bolts are not permitted.
- D. Anchors shall be non-corrosive or have suitable corrosion resistant coatings or treatment.
- E. Bolts, nuts, screws and other threaded devices shall have standard threads and heads, unless required for tamper-proof installation.

2.09. IDENTIFICATION

- A. Provide nameplates for all equipment (e.g. switchboards, panels, disconnecting means, control panels, control stations, emergency systems, etc.) and other devices used for the control of circuits, equipment,

etc. Nameplates shall adequately describe the function or operation of the identified equipment, devices, etc. and include the panel and circuit number(s) from which it is fed. Nameplate designations shall be consistent with the project documents. Submit proposed inscriptions for approval.

- B. Definite purpose devices shall be labeled with a description of the device's function, rating and include the panel and circuit number(s) from which it is fed.
- C. All equipment and outlets shall be labeled with the panel and circuit number(s) from which it is fed.
- D. Nameplates shall be laminated plastic, with lettering etched through the outer covering. Character size as appropriate for the application, approved by Engineer; except minimum $\frac{1}{8}$ inch. Nameplates shall be securely fastened with suitable adhesive or self tapping screws. Character and background colors shall conform to the following system color code:

<u>Background.</u>	<u>Char.</u>	<u>System</u>
Black	White	Power & Lighting
Red	White	Fire Alarm
Blue	White	Security
Orange	White	Data Cabling & Equipment Systems*
Green	White	Voice Cabling & Equipment Systems*
Purple	White	Television Cabling & Equipment Systems*

* These are sub-systems of the general telecommunications distribution system. All cabling and equipment for the general telecommunications distribution system shall be identified with nameplates, etc. consistent with the data cabling and equipment systems (e.g. orange and white).

- E. Identification tags shall be plastic, flexible type with a label. Identification tags shall be securely fastened with cable ties. Tags shall be mounted so as to be clearly visible.
- F. Labels shall be heavy duty adhesive type, clear background with black letters on light colored devices and clear background with white letters on dark colored devices; except, labels on devices connected to the emergency power system shall have red letters. Lettering shall be appropriately sized for the application, except minimum $\frac{1}{8}$ inch.

PART 3 - EXECUTION

3.01. CONSTRUCTION/WIRING METHODS

- A. Wiring methods shall be as follows:
 - 1. Service - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows) and GRS conduit above grade.

2. Feeders - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows) and EMT above grade.
 3. Branch circuits - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows for conduits 2" and larger) and EMT above grade.
 4. Telecommunications - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows) and EMT above grade; except, suitable cables run "open" in accessible locations above t-bar ceilings or within attic space.
 5. Fire alarm, class 2 control, etc. - PVC conduit below grade (with GRS conduit risers and elbows) and EMT above grade; except, suitable cables run "open" in accessible locations above t-bar ceilings or within attic space.
- B. All wire and cable shall be enclosed within the raceway system; except, "open cable wiring" will be permitted for Class 2 signal and control, fire alarm, security, telecommunications, etc. cables approved for the purpose when run concealed in an accessible location above the ceilings or in the attic.
- C. Conduit and cable shall be run concealed in the walls (including within CMU and similar construction), above the ceiling, or below the floor with all devices, etc. flush mounted; except, in the Mechanical and Electrical Rooms, conduit drops to panels, equipment, etc. may be run exposed.
- D. Equipment shall be surface mounted unless noted otherwise.
- E. Devices, etc. shall be flush mounted unless noted otherwise.

3.02. CONTRACTOR CONTROL AND SUPERVISION

- A. 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. Performance of the work shall be directly supervised by a competent superintendent (and/or foreman) who is satisfactory to Owner and has authority to act for Contractor. The superintendent (and/or foreman) shall constantly supervise the work and check all materials prior to installation for conformance with the Contract Documents. The superintendent (and/or foreman) shall not be changed without the prior written consent of Owner.
- C. Contractor shall enforce strict discipline and good order among Contractor's employees and other persons performing the Work. Contractor shall not permit employment of unfit persons or 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.

- D. Inappropriate activity or comments by Contractor, Contractor's employees and other persons performing the work will result in immediate removal from the site.

3.03. GENERAL

- A. The installation shall be done in a neat and workmanlike manner and shall be suitable for the location. Conduit stub-ups, sleeves and ends left open for future connection, unused hubs in fittings and unused holes in boxes shall be plugged or capped to prevent the entrance of moisture and debris.
- B. For the actual fabrication, installation and testing use only persons thoroughly trained, experienced and completely familiar with the items required and with the manufacturers' recommended methods of installation. In acceptance or rejection of the work, no allowance will be made for lack of skill or experience.
- C. Circuits shall be run from equipment to equipment, outlet to outlet, luminaire to luminaire, device to device, etc. and all homeruns shall be run exactly as shown on the drawings unless permission is obtained from the Engineer to alter the arrangement.
- D. Changes in location (e.g. equipment and devices up to 10 feet, trench and raceway routing, cable tray locations, etc.) made before installation and deviations to avoid interferences shall be made without increase in Contract Sum.
- E. The Contractor shall conduct operations in a manner to avoid the risk of bodily harm to persons or damage to any property. Construction equipment and tools shall be in good operating condition and be designed to perform the work required. The Contractor shall continuously inspect all work to discover any unsafe conditions and be solely responsible for their correction.
- F. Use all means necessary to protect the equipment and materials and the work, materials, etc. of the other trades before, during and after installation. Do all cutting carefully to prevent damage to the work. Correct lifting, jacking and/or moving methods shall be used. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and Engineer without increase in Contract Sum.
- G. The Contractor shall provide all cutting, patching, core drilling, etc. as required for the work. Use only journeymen skilled in the necessary cutting or patching operation. Patching shall match adjacent work. Structural members shall not be cut without approval of the Architect. Where penetrations in structural members for conduits, cables, etc. are allowed, the holes shall be no larger than absolutely necessary.
- H. The premises shall be kept free from the accumulation of rubbish and debris caused by the work.

- I. The Contractor shall provide all backboards, hangers, supports, chases, anchor bolts, inserts, sleeves and other openings in the construction required for the electrical work.
- J. Wall, ceiling and floor penetrations by raceways (both inside and outside the raceway), cables, etc. shall be sealed to maintain the original moisture, dust and fire resistance to the approval of the Architect. Flash and counter-flash all roof penetrations.

3.04. PROTECTION OF PERSONS, FACILITIES & UTILITIES

- A. Provide all traffic control, flagging, barricades, barriers, guards, warnings, notifications, etc. at equipment, materials, open excavations, open trenches, etc.
- B. Provide devices and methods and proceed with sufficient caution to preclude damaging any facilities, utilities (e.g. power, water, sewer, natural gas, telecommunications, etc.) or similar, above ground or underground, concealed or exposed, known or unknown, located or not located. In the event unidentified utilities are encountered, notify the utility, Owner and Engineer.
- C. Unless otherwise provided by the drawings or specifications, do not cut or alter any existing utility or similar without authorization of the Owner and Engineer. The Contractor shall pay all costs, as determined by the Engineer, of remedial work necessitated by unauthorized or accidental cutting, patching, trenching, excavating, backfilling, etc. which damages and/or impairs the performance of existing utilities or similar (e.g. power, water, sewer, natural gas, telecommunications, etc.), above ground or underground, concealed or exposed, known or unknown, located or not located.
- D. All such work shall be verified with Owner and Engineer before execution of replacement, re-routing, relocation, repair or termination commences.
- E. Notify Regulating Agencies, Locator Service, Utility Companies, Engineer and Owner's Project Manager a minimum of a minimum of fourteen (14) days in advance and re-confirmed a minimum of 48 hours in advance, or as mutually agreed upon with Owner, prior to commencement of any such work. Submit procedures to assure safe and continuous operation of the utilities for approval.
- F. Provide adequate means of support and protection during earthwork operations.
- G. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of Owner and utility, without increase in Contract Sum.
- H. Damaged electrical and telecommunications (telephone, computer/data, television, fiber, copper, etc.) cables shall be replaced in their entirety. Splicing will not be allowed.

3.05. COORDINATION AND SCHEDULING

- A. The Contractor shall coordinate the work and cooperate with the Owner, other trades and System Contractors to have the work completed to the best advantage, insure there are no interferences, provide reasonable opportunity for the other trades and Contractors to complete their work and to not delay the work.
- B. The existing building shall be maintained and modified for demolition, temporary and new work.
- C. See Division 01 specifications for project schedule and work sequence.
- D. Contractor shall coordinate work to avoid disturbance to building operations and personnel, and to allow access for both persons to and within all portions of the facility and vehicles to the facility.
- E. Contractor shall schedule all equipment, utility, electrical, telecommunications, fire alarm, fire protection, etc. interruptions with the Owner in accordance with the scheduling requirements. Interruptions and closures shall not be extended overnight.
- F. Contractor shall schedule building closures, complete or partial, with the Owner in accordance with the scheduling requirements in Section 01500 (e.g. for x-raying).
- G. Any and all costs incurred for non-standard hours, double-shifts, overtime, etc. or any other costs associated with completing the project within the completion times required shall be included without increase in contract sum.

3.06. DELIVERY, STORAGE AND HANDLING

- A. All equipment and materials shall be stored neatly and out of the way. Conduit, fittings, cable, etc. shall be stored off the ground, protected from the weather in racks or bins or on shelves. Equipment, panelboards, fixtures, devices, etc. shall be stored indoors in a dry, warm area, free of dust and one in which condensation will not occur.
- B. Ship equipment in its original package to prevent damage or entrance of foreign matter. Perform all handling and shipping in accordance with manufacturer's recommendations and packing label instructions. Provide protective coverings during construction.
- C. Following installation, protect materials and equipment from corrosion, condensation, physical damage, and the effects of moisture. Keep openings in boxes or equipment closed when work is not being done in them during construction.
- D. Identify materials and equipment delivered to the site and storage organized to permit checking against approved material lists and submittals.

3.07. TEMPORARY POWER

- A. The Contractor shall provide all temporary power services, facilities, equipment, devices, material, etc. required for the construction; including adequate lighting, outlets, balancing, testing, etc. as may be necessary for the proper performance and inspection of the work.
- B. The temporary power system shall be provided in a neat and safe manner, in compliance with governing codes and good working practice.
- C. The temporary power system shall be removed when no longer required.

3.08. DEMOLITION

- A. Where buildings are to be removed, disconnect all power, lighting, ancillaries, and telecommunications, etc., systems that connect to other buildings, remove all below grade cables, cut below grade conduits flush with top of concrete and abandon remaining items in place for building demolition by general contractor, unless otherwise directed.
- B. Existing cables shall be removed or replaced. Provide pull strings in existing conduits being abandoned in place. Existing below grade conduits shall be cut off and capped flush with the floor. Existing concealed boxes shall be provided with suitable blank covers and/or wallplates.
- C. Label the ends of conduits abandoned in place with origin and destination description, and note locations on the as-built drawings.
- D. Where existing equipment, fixtures, devices, etc. are indicated to be replaced, remove and dispose of the existing and provide new in its place.
- E. Contractor shall coordinate demolition with hazardous materials abatement work. Where electrical devices and wiring are contaminated with hazardous material, or where new raceways penetrate through hazardous materials, demolition shall be performed in accordance with Division 02.
- F. Dispose of fluorescent light tubes and lighting ballasts in accordance with Division 02 and applicable regulations.
- G. For all items indicated as to be removed or re-wired, Contractor shall remove all associated conduit, boxes, cables, etc. back to their point of origin &/or destination; except, concealed conduits & boxes may be abandoned in place &/or existing conduits & boxes may be re-used if in good condition & appropriate for the new installation, at the option of the Contractor. Existing cables shall be removed or replaced.
- H. Existing equipment, fixtures, devices, etc. to remain shall be protected as required during demolition and construction. In the event of damage, immediately make all repairs and/or replacements necessary to the approval of the Owner and Engineer without increase in Contract Sum.

- I. Existing equipment, fixtures, devices, etc. to be re-used in the new work shall be removed carefully, and protected as required during demolition and construction. In the event of damage, immediately make all repairs and/or replacements necessary to the approval of the Architect and Engineer without increase in Contract Sum.
- J. Items not indicated shall remain "as is"; except, shall be re-connected as required if its circuit is interrupted during the demolition.
- K. Holes, openings, etc. where existing raceways, cables, boxes, outlets, etc. are removed and not replaced shall be patched to match adjacent surface.
- L. All surplus materials removed during the demolition shall be inspected by the Owner and those items selected shall remain the property of the Owner. All remaining surplus materials shall be removed from the site and disposed of by the Contractor without increase in Contract Sum.

3.09. INTERRUPTIONS

- A. Power, fire alarm, controls, telecommunications and other systems interruptions, whether to individual equipment or to the entire system, shall not be done without prior approval and scheduling with the Owner. Power, fire alarm and/or telecommunications interruptions required to facilitate construction work and that affect operation of the existing facility shall not be done during normal working hours. Some working of non-standard or longer than standard hours will be required, without increase in Contract Sum.
- B. As much as possible, items shall be pre-assembled and systems prefabricated to minimize the change-over time.
- C. Shutdowns will not be allowed to extend beyond the time Contractors personnel are present.
- D. Provide generator, temporary power, etc. for power outages lasting longer than 2 hours.

3.10. WORK SEQUENCE

- A. The existing site shall be maintained and modified for demolition, temporary and new work.
- B. See Division 01 specifications for project schedule and work sequence.

3.11. LOCATIONS

- A. Locations and mounting heights of equipment, devices, etc. shall be consistent, and in accordance with the requirements of NFPA, ADA and the authority having jurisdiction.

- B. Devices and associated wallplates shall be located so as to not span different types of building finishes.
- C. In general, exposed raceways shall be mounted as unobtrusively as possible, tight against whiteboard trim, chair rails, in room corners, against ceilings, against chases, etc. and other breaks in the construction.
- D. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices, and the proposed routing of raceways. Obtain specific approval for the location of each from the Owner, Architect and Engineer before rough-in.
- E. Changes in location (e.g. equipment and devices up to 10 feet, trench and conduit routing, etc.) made before installation and deviations to avoid interferences shall be made without increase in Contract Sum.

3.12. EQUIPMENT, LUMINAIRES AND DEVICES

- A. Equipment, luminaires, devices, etc. shall be installed plumb and true, and shall be square with the adjacent walls, ceilings, structural members and other equipment; in a horizontal or vertical position as intended. The location of similar items shall be consistent.
- B. Light standards (poles), luminaires, etc. shall be set to stand plumb and true and shall be square with the adjacent buildings, property lines, sidewalks, roadway, etc.
- C. Equipment, cabinets, boxes, fixtures, devices, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.
- D. The correct lifting, jacking and/or moving gear which will prevent damage shall be used.
- E. All bolts, nuts, screws and other fastenings shall be tightened in accordance with manufacturers or listing instructions and all covers replaced on equipment and boxes. All electrical connections, particularly those on bus work in panelboards, etc. shall be checked to ensure tightness and electrical conductivity.
- F. Follow manufacturer's installation details wherever available. Provide supports, boxes, mountings, wiring, fittings, etc. as required, standard or special. Wherever any conflict arises between manufacturer's instructions, codes and regulations, and these Contract Documents, follow Owner's decision.
- G. Following installation, protect materials and equipment from corrosion, condensation, physical damage, and the effects of moisture. Keep openings in boxes or equipment closed when work is not being done in them during construction.
- H. Provide gaskets, seals, etc. as required to prevent the entrance of moisture, debris, insects, etc. Check for proper fit.

3.13. SUPPORTS

- A. Provide all necessary supports, anchors, fasteners, and backing for all raceways, cable racks, boxes, enclosures, fixtures and equipment.
- B. Hangers and supports shall be made from standard structural shapes and hardware or systems of shapes, fittings and hardware designed for the purpose.
- C. Hangers and supports shall be adequately and safely attached to the building structure. Equipment or materials to be supported shall be securely fastened to the supporting means. Use size and number of attachments as required for a safety factor of at least four. In addition to the weight of the material, consideration shall be given to the weight of the support itself, the weight of materials within, vibration, external operational forces, shock load, etc.
- D. Brace all equipment, cable racks, etc. as required to meet the requirements of seismic zone 3.
- E. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts.
- F. Pad and floor mounted equipment shall be secured with suitable hot dipped galvanized steel anchor bolts, washers, hex nuts, etc.
- G. Rooftop mounted conduit shall be supported with suitable support channel mounted on rooftop support bases. Provide minimum 6 inches of space between bottom of conduits and roof surface.

3.14. CORROSION PROTECTION

- A. Maintain the integrity of factory provided corrosion protection. Repair damaged corrosion protection and touch-up paint all scratched, marred or damaged factory finish on equipment, devices, luminaires, enclosures, etc.; per manufacturer's instructions where available.
- B. Paint field cuts with a suitable cold galvanizing compound.

3.15. APPROVALS

- A. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices, and the proposed routing of raceways, cables, etc. Obtain specific approval for the location of each from the Owner, Architect and Engineer before rough-in.

- B. Prior to beginning installation of cables, obtain approval of concealed raceway installation from the Owner, Architect and Engineer.
- C. Prior to beginning installation of cables, obtain approval of the raceway installation from the Owner, Architect and Engineer.

3.16. CLEANING

- A. Remove trash, combustible material, and other debris from areas around equipment.
- B. Remove shipping materials, supports, spacers, etc. from equipment, devices, etc.
- C. Remove all debris from equipment, devices, etc. including all scraps of wire, plaster, dust, and other foreign material. Vacuum cabinet clean and wipe down with a clean, dry, lint-free cloth or soft bristled brush.
- D. Clean screens, louvers, baffles, etc. covering ventilation openings to ensure they are clear.
- E. Remove paint splatters and other spots, dirt, and debris.
- F. Touch up scratches to match original finish.
- G. Remove all traces of soil, dirt, dust, smudges, fingerprints and other foreign matter from visible surfaces of equipment, devices, luminaires, etc. Pay close attention to highly finished surfaces such as glass and polished metals. Wipe lamps clean.
- H. Maintain adequate ventilation during cleaning.
- I. Follow manufacturer's instructions. Failure to follow manufacturer's recommendations when cleaning equipment can result in damage from the use of improper cleaning methods or agents.

3.17. VISUAL AND MECHANICAL INSPECTION

- A. Verify that all equipment and their components are sized properly for the load and the types, sizes, etc. are in accordance with the contract documents, approved submittals, etc.
- B. Visually inspect equipment for physical damage. Repair physical damage, if practical and approved by the manufacturer. Consult Owner, Engineer and manufacturer for recommendations for suitable protective barriers to prevent future damage.
- C. Inspect molded and formed equipment and components (e.g. circuit breaker cases, fuses, starters, relays, insulators, supports, etc.) for cracks or other defects.

- D. Check all bolts, connections, cable terminations, etc. for tightness using a calibrated torque wrench or screwdriver. Refer to manufacturer's instructions and markings for proper torque values.
- E. Visually check the equipment, its components and associated raceways, conductors, etc. for proper grounding and bonding. Ensure that grounding and bonding terminal bars, bus bars, straps, and conductors are properly connected.
- F. Verify that cables do not contact live parts and that cables are properly secured to withstand the effects of fault currents.
- G. Check equipment anchorage, mounting, clearances, alignment and fit of components.
- H. Check that phase barriers are in place, if applicable.
- I. Visually check disconnect switch blade alignment, blade penetration, travel stops, and mechanical operation.
- J. Inspect each fuse holder to determine whether it seems to be adequately supporting the fuse and that the fuse holders are securely attached to the mounting base. Verify fuses are set tightly in the clips provided.
- K. Operate equipment and components (e.g. disconnect switches, circuit breakers, etc.) to insure smooth operation.
- L. Compare all circuits (internal and external) with wiring and/or control diagrams to verify they are installed correctly.
- M. Confirm correct operation and sequencing of electrical and mechanical interlock systems, if so equipped. Attempt closure on locked-open devices. Attempt to open locked-closed devices.
- N. Confirm that equipment nameplates and safety labels are provided.

3.18. TESTING

- A. The Contractor shall perform all tests required in the various sections of the specifications and in accordance with manufacturer's recommendations. Record test results and include in operation and maintenance manuals.
- B. The Owner and Engineer shall be notified one week prior to any testing so that the testing may be witnessed.
- C. All testing shall be performed by personnel that are trained in the specific task to be performed
- D. Do not proceed with tests until previously identified deficiencies are corrected.

- E. Test equipment in accordance with manufacturer's recommendations. Maintain test results for future comparisons. Include in operation and maintenance manuals.
- F. Upon completion, all equipment and systems shall be tested for functional operation, including all intended modes and sequences of operation.
- G. Readings of the voltage and amperage shall be taken on each phase at each panelboard and at the end of the longest branch circuit at no load and full load conditions.
- H. All systems shall test free from shorts and grounds and shall be without mechanical and electrical defects. If any test indicates a failure, in the opinion of the Engineer; the item shall be replaced or suitably repaired to the approval of the Owner, Architect and Engineer, and the test repeated without additional cost to the Owner.

3.19. ENERGIZING

- A. Energize equipment in accordance with manufacturer's recommendations.
- B. Energize equipment, feeders, circuits, etc. from the source end and working to the load. Close main devices, feeder devices, motor/branch circuit devices, etc. in sequence.
- C. Verify all temporary grounding, etc. connections are removed prior to energizing.
- D. Verify that all load disconnecting, etc. devices are open, padlocked and tagged prior to energizing.
- E. After energization, equipment shall be observed for unusual conditions such as vibration, noise, excessive temperature rise, etc.

3.20. CONTRACT CLOSE-OUT

- A. Upon completion of the work, and prior to final acceptance, the Contractor shall thoroughly check the installation. Checking shall consist of visual inspection and manual adjustment to confirm correct installation and arrangement and to assure the intended function, response and operability. Checking shall include, as a minimum, the following:
 - 1. Check that equipment, devices, etc. are of the correct type and rating.
 - 2. Check that all raceways, fittings, devices, boxes, enclosures, etc. are secure and that all conduit connections are tight.
 - 3. Check that all electrical connections are correctly tightened.

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4. Check that equipment, devices, panelboard circuit directories, etc. are correctly labeled.
 5. Check that equipment, fixtures, devices, etc. are clean with all unnecessary labels removed.
- B. Upon completion of the work, and before final acceptance and payment, the Contractor shall:
1. Remove from the site and dispose of all surplus and discarded equipment, materials, rubbish, and debris which may have accumulated during the execution of the work.
 2. Submit approved "As Built" Drawings, Record Documents, Test Records, Manuals, etc.
 3. Submit written warranty statements for equipment, materials and installation.
 4. Conduct system tests.
 5. Obtain final inspections from the authorities having jurisdiction.
- C. Subsequent to final completion and testing operations, instruct Owner's authorized representatives as required in operation, adjustment and maintenance of equipment and systems.

End of Section 26 00 10

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the electrical work.
- B. Coordinate electrical work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. SUBMITTALS

- A. Provide submittals for the following:
 - 1. Surface Metal Raceway.
 - 2. Low voltage cables.
 - 3. Floor boxes.

PART 2 - PRODUCTS

2.01. RACEWAYS

- A. Raceways, where required, shall be of the types listed below, unless noted otherwise:
 - 1. Electrical Metallic Tubing (EMT) - Concealed above grade and exposed in Utility Rooms and other Non-Public Areas not readily visible to building occupants, except as noted below.
 - 2. Surface Metal Raceway System (SMR) - Exposed in Public Areas, Offices, Rooms, Corridors and the like where readily visible to building occupants.

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3. Polyvinyl Chloride Conduit (PVC) - below grade, except as noted below.
4. Galvanized Rigid Steel Conduit (GRS) - Below grade conduit bends and risers.
5. Galvanized Rigid Steel Conduit (GRS):
 - a. Below grade conduit bends (or may be fiberglass) and risers.
 - b. Above grade service entrance conduits.
 - c. Sewer Pump Station, above and below grade.
 - d. Exterior exposed conduits, above grade.
 - e. Within, or passing through, Classified (Hazardous) locations.
 - f. Conduits containing low voltage service and outside transformer secondary cables, above grade.
6. Galvanized Rigid Steel Conduit, PVC Coated (GRS/PVC): Within the Sewer Pump Station wet and dry wells.
7. Flexible Metal Conduit (FLEX) - final connections to vibrating equipment and for fixture whips. Also, FLEX may be substituted for EMT for branch circuits between wiring devices and boxes concealed inside frame walls and ceilings. FLEX shall not be used for any homeruns, conduit stub-ups into accessible ceiling spaces, nor for any exposed or surface conduit runs except as final connections to vibrating equipment.
8. Type MC Cable - may be substituted for EMT for branch circuits concealed inside walls and ceilings, as follows:
 - a. From junction boxes to devices, luminaires, etc.
 - b. Between devices.
 - c. Type MC cable shall not be used for any homeruns.
 - d. Type MC cable shall not be used for any runs between junction boxes.
 - e. Type MC cable shall not be used any exposed or surface conduit runs.
 - f. Type MC cable shall not be used for any Health Care Facility emergency circuits.
9. Type NM Cable – is not allowed.

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- B. Raceways shall be sized so that the cable fill does not exceed 40%; except, minimum conduit sizes shall be as follows:
 - 1. $\frac{3}{4}$ inch – above grade branch circuits, ancillary systems circuits or similar, except as noted below.
 - 2. 1 inch – branch circuit homeruns.
 - 3. 1 inch – below grade.
 - 4. 1 inch – telecommunications circuits terminating in a single outlet.
 - 5. $1\frac{1}{4}$ inch - telecommunications circuits terminating in two devices.
 - 6. $\frac{3}{8}$ inch - fixture whips furnished by the manufacturer with the fixtures.
- C. PVC conduit shall be heavy-wall (Schedule 40), flame-retardant, suitable for use with 90°C cable, shall not distort from heat it will normally encounter and shall be resistant to low temperature and sunlight effects, impact and crushing.
- D. PVC conduit installed in shallow trenches (less than 24" deep) shall be same as above, except, heavy wall Schedule 80 grade.
- E. Rigid steel conduit shall be hot-dipped galvanized with threaded couplings and connectors. Below grade steel conduits shall be coated with a suitable asphalt (or equivalent) compound for corrosion protection.
- F. Rigid steel conduit shall be hot-dipped galvanized (coated with minimum of 40 mils of PVC within the Sewer Pump Station wet and dry wells) with threaded couplings and connectors. Below grade steel conduits shall be coated with a suitable asphalt (or equivalent) compound for corrosion protection.
- G. Electrical metallic tubing shall be electro-galvanized steel.
- H. Flexible metal conduit shall be helically wound galvanized steel, type FMC; except outdoors, liquidtight flexible metal conduit shall have a liquidtight, non-metallic, sunlight-resistant jacket over a flexible galvanized steel metal core, type LFMC. Flexible conduit connections shall be a minimum of 18 inches long.
- I. Conduit elbows and bends in conduits 2 inch diameter and smaller shall be not less than 6 times the conduit diameter and bends in larger conduits shall be not less than 10 times the conduit diameter; except, minimum 36 inch radius when containing 15 KV cables.
- J. Telecommunications (with or without cables), spare, c.o., etc. conduits shall be provided with pull rope below grade and pull string above grade.

- K. Telecommunications wall sleeves shall be 3" x 3" metallic wireways (sized to match the required raceways) which contain an intumescent insert material that adjusts automatically to cable additions or subtractions, Specified Technologies EZ Path, 3M Fire Barrier Pass-Through, or approved equal. Provide suitable wall brackets, gang kits, mounting hardware, etc. as required.
- L. Below grade telephone, computer/data, communications, spare, c.o., etc. conduits shall be plugged at both ends and their location properly marked.
- M. Surface metal raceways shall be heavy-gauge zinc plated or galvanized steel; Wiremold or Mono-Systems series 700, 2000 or larger as required or approved equal. Color shall be manufacturer's standard color closest to matching surface color as possible.
- N. Surface metal raceway boxes and raceway to be added to the existing shall match the existing and be specifically designed for use with the existing raceway system.
- O. Surface metal raceways for Telecommunications wiring shall be heavy-gauge zinc plated or galvanized steel; Wiremold series 4000, or approved equal; except Wiremold series 2400 surface metal raceways may, at the option of the Contractor, be used for drops to a single outlet. Color shall be manufacturer's standard color closest to matching surface color as possible.

(Note: Mono-Systems Snapmold and Thomas & Betts surface metal raceways are approved as equal to Wiremold surface metal raceways, if provided with 2 inch bend radius fittings not reducing the cable fill capacity. Inserts into the raceway providing the 2 inch bend radius will not be allowed.)

2.02. RACEWAY FITTINGS

- A. Fittings for steel conduit shall be steel, galvanized or cadmium plated, threaded type. Couplings shall be galvanized steel. Locknuts and bushings shall be galvanized steel.
- B. Connectors, couplings, etc. for EMT shall be steel set-screw type; except, steel raintight compression type in potentially wet or damp locations (e.g. outdoors).
- C. Fittings, mounting brackets, etc. for surface metal raceways shall be grounding type, of the same manufacturer and specifically designed for the purpose and use with the particular type of raceway. Telecommunications surface metal raceway system fittings (and power surface metal raceway fittings when installed adjacent to the telecommunications raceway) shall have rounded corners to allow telecommunications cables a minimum 2 inch bending radius without reducing the raceway cable fill capacity. Fittings for non-standard angles less than 90° shall be field bent/fabricated as required. Angles, bends, etc. in raceways greater than 90° and inserts into the raceways providing the 2 inch bend radius will not be allowed. Color shall match raceways.
- D. Sleeves connecting surface metal raceways on opposite sides of walls shall be as detailed on drawings.

- E. Fittings for flexible metal conduit shall be of a type specifically designed for the purpose.
- F. Fittings for type MC cable shall be of a type specifically designed for the purpose.
- G. Fittings for nonmetallic conduits shall be of same manufacturer and material as the conduit.
- H. End bells and/or insulated bushings shall be used on all underground conduit system terminations at vaults, junction boxes, padmounted equipment, etc. Conduit terminations at equipment, etc. shall be suitably sealed and/or plugged at both ends to prevent the entrance of moisture. Spare, c.o., etc. conduits shall be provided with removable gasketed covers at the high end to prevent the flow of moisture from one box to another.
- I. "Open" end of ancillary, telecommunications, spare, c.o., etc. conduits shall be provided with insulated bushings.
- J. "Open" ends of telecommunications conduits entering the telecommunications room shall be provided with bonding bushings & bonded to the ground bar.
- K. "Open" ends of telecommunications conduits stubbed to cable trays shall be provided with bonding bushings & bonded to the cable tray.
- L. Telecommunications conduits entering the telecommunications room floors shall extend up from the floor between 1" and 3".
- M. Telecommunications conduits entering the telecommunications room walls and ceilings shall extend a maximum of 2" into the room.
- N. Connectors at sheet metal enclosures shall have insulated throats.
- O. Openings in surface metal raceways, etc. through which cables are intended to pass shall be provided with suitable nonmetallic grommets before installing cable.
- P. Provide approved properly bonded expansion fittings (capable of expansion and contraction as required), deflection couplings, etc. wherever conduits pass over or through joints or other locations where raceways may be affected by dissimilar movements of the supporting structure.

2.03. BOXES

- A. The use of exposed boxes in areas readily visible to building occupants shall be kept to a minimum. Except in telecommunications raceways, use conduit outlet bodies (e.g. T, LB, LR, etc.) at conduit intersections unless specifically noted or approved otherwise.
- B. Boxes shall accommodate any devices to be installed and shall be sized as required by the applicable codes for number and size of conduits and cables entering and leaving; except minimum as noted below.

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- C. Indoor boxes above grade in dry locations shall be standard stamped galvanized steel type, suitable for embedment in concrete and/or masonry where required.
- D. Exterior outlet boxes shall be recessed mounted boxes to allow for flush mount while-in-use covers, with back box, gaskets, mounting rings, covers and all necessary mounting accessories. Provide trim rings suitable for use with the type of siding specified. Boxes shall be Intermatic model WP1000RC or approved equal.
- E. Unless noted otherwise, boxes installed in wet or damp locations and outdoors shall be threaded rigid body type, cast aluminum or galvanized iron.
- F. Surface metal raceway system boxes shall be of the same manufacturer and specifically designed for the purpose and use with the particular type of raceway and/or device to be mounted onto the box. Color shall match raceways.
- G. Unless noted otherwise, larger size pull and junction boxes shall be fabricated from code gauge galvanized steel.
- H. Unless noted otherwise, larger size pull, splice and terminal boxes shall be fabricated from code gauge galvanized steel, with full access screw type cover unless noted otherwise. Sizes shall be as required, except minimum as indicated. Terminal boxes shall be provided with power distribution type terminal blocks, with main and branch lugs sizes and quantities as required.
- I. Switch, power outlet, device, etc. boxes shall be single or ganged to accommodate the required number of devices; except, flush mounted boxes shall be minimum 4 inches square for conduits 1 inch or less and $4\frac{11}{16}$ inches square for larger conduits. Boxes containing a single device shall be minimum $1\frac{1}{2}$ inches deep. Boxes containing multiple devices shall be minimum $2\frac{1}{8}$ inches deep. Flush mounted boxes shall be equipped with plaster rings and suitable wallplates. Surface mounted boxes shall have raised surface type covers.
- J. A/V Input/Output Station boxes shall be 2-gang, $3\frac{1}{2}$ " deep, with the face set flush to the face of the wall.
- K. Telecommunications, etc. outlet boxes shall be minimum 4 inch square by $2\frac{1}{8}$ inches deep, equipped with single-gang plaster rings and proper wallplates. Provide a 1 inch EMT conduit up to an accessible location above the ceiling or to the telephone terminal board from each outlet box unless noted otherwise.
- L. Individual telecommunications (voice, data, television, combination voice/data/television, etc.) outlets in new walls and partitions shall be mounted in boxes, minimum 4 inch square by $2\frac{1}{8}$ inches deep, equipped with single-gang plaster rings; except:
 - 1. Surface mounted outlet boxes not containing a television receptacle may be $4\frac{5}{8}$ " high x $2\frac{7}{8}$ " wide x $2\frac{1}{4}$ " deep.

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- M. Individual telecommunications outlets in existing non-fire rated frame walls where cables are "fished", screw on type low voltage cut-in type mounts (Caddy type MPLS or MPLS2 as required, or equal) without boxes may be used. Surface mounted boxes shall be surface metal raceway style to match the surface metal raceways. Flush mounted boxes shall be cut-in style where required.
- N. Telecommunications outlets mounted on face of surface metal raceway shall have a shallow box or extension mounted on the cover of the raceway, with access holes as required, of sufficient depth so cable connectors at rear of receptacles do not extend into the raceway and restrict the raceway cable capacity.
- O. Junction and pull boxes shall be sized as required by the NEC except the minimum size shall be 4 inch, square or octagonal as required, by 1½ inches deep. Junction and pull boxes shall have full-access screw covers.
- P. Ancillary systems (e.g. fire alarm, security, etc.) outlet, device, junction, etc. boxes shall be in accordance with the requirements of the respective supplier; except, minimum as specified above.
- Q. Boxes shall be equipped with mud rings where required and proper wallplates and/or covers.
- R. Unused flush mounted boxes, including existing abandoned in place, shall have blank wallplates or ceiling box type covers. Color shall match existing surface paint color as close as possible with manufacturer's standard colors.
- S. Openings in boxes, etc. through which cables are intended to pass shall be provided with suitable nonmetallic grommets.
- T. Device, junction, etc. boxes (other than the surface raceway type) for fire alarm systems shall be substantially red in color, both inside and outside.
- U. Device, junction, etc. boxes (other than the surface raceway type) for emergency systems shall be substantially orange in color, both inside and outside.
- V. Floor Boxes:
 - 1. Stand-alone floor boxes shall be "in floor" type, steel, 2 compartment, rectangular, 3½" deep, water and concrete tight, fully adjustable before and after concrete pour. Wiring/device compartment shall be rectangular, minimum with space for 1 duplex power receptacle and 1 telecommunications faceplates located inside the compartment. Include device brackets, grommets, and all necessary accessories. Floor boxes shall be Wiremold Resource RFBA type or approved equal.

2. Covers shall be die-cast aluminum with brushed aluminum finish, flanged, UL scrub water approved with dual blank access doors and carpet/tile cutouts. Covers shall be Wiremold FloorPort series or approved equal.

2.04. HAND HOLES

- A. Hand holes shall be precast concrete, 22 $\frac{1}{2}$ " wide x 33" long x 12" deep, open bottom, in accordance with the Washington State Department of Transportation type J-11A, type 2. Covers shall be diamond plated galvanized steel, with lettering "Electric", "Lighting" or "Communications" according to wiring enclosed within.
- B. Mounting hardware (unless specifically noted otherwise), bolts, nuts, washers, etc. shall be stainless steel. All steel parts (except stainless steel) shall be hot-dipped galvanized after fabrication.

2.05. WIRE AND CABLE

- A. Wire and cable sizes indicated and/or specified are minimums only and shall be increased as required due to NEC, system, load, voltage drop, etc. requirements.
- B. All wire and cable (power, control, ancillary systems, etc.) installed in below grade conduit shall be suitable for wet locations.
- C. All wire and cable (power, control, ancillary systems, etc.) shall be suitable for wet or dry locations, in conduit, above ground and underground.
- D. Ground electrode conductors shall be copper, bare below grade.
- E. Service and below grade feeder cable shall be single conductor stranded copper with 600 volt type XHHW insulation.
- F. Branch circuit cable, above grade feeder cable and equipment ground cable, where run in raceways, shall be single conductor copper with 600 volt type XHHW or THWN/THHN insulation. The minimum conductor size shall be #12 AWG; except, fixture whips provided as an assembly by the fixture manufacturer with the fixtures may be #14 AWG. Conductors shall be stranded, except #12 AWG lighting and general purpose receptacle branch circuit conductors are allowed to be solid.
- G. Type MC cable shall consist of multiple individually insulated circuit conductors (with 600 volt type XHHW or THWN/THHN insulation) and a green insulated grounding conductor bundled together with fillers as necessary, binder tape and interlocking armor (aluminum or steel) wrapped around the assembly. MC cable shall be suitable for installation in wet or dry locations, at maximum conductor temperatures of 90°C for continuous normal operation, 130°C for emergency overload conditions and 250°C for short circuit conditions. MC cable shall pass the IEEE vertical cable tray flame test and be listed to UL 1, 2, and

3 hour through-penetration fire wall ratings. Conductors shall be stranded, except #12 AWG lighting and general purpose receptacle branch circuit conductors may be solid.

1. Conductors within MC cables shall be color coded to be consistent with the building color coding scheme as indicated elsewhere in these specifications. Identifying conductors with colored tape or paint is not acceptable.
- H. Line voltage (Class 1) control cable shall be single conductor stranded copper with 600 volt type XHHW or THWN/THHN insulation. The minimum conductor size shall be #14 AWG.
- I. Low voltage (Class 2) control cable shall be single conductor copper with 600 volt type XHHW or THWN/THHN insulation if installed in conduit. Low voltage (Class 2) control cable run "open" shall be multi-conductor copper with 300 volt insulation and an overall jacket, type CL2, listed as being resistant to the spread of fire; except in air handling plenums, cable shall be plenum rated, be listed as being resistant to the spread of fire and bear flammability testing ratings as cable type CL2P. The minimum conductor size shall be #16 AWG.
- J. Cords shall be multi-conductor stranded copper with a green insulated grounding conductor, 600 volt type SO insulation and an overall neoprene jacket. The minimum conductor size shall be #14 AWG.
- K. Fixture cable, where supplied by the Contractor, shall be stranded copper with 600 volt type PF insulation.
- L. Instrument cable, unless otherwise required by the particular instrument, shall be 2 conductor (twisted pair) solid copper with 300 volt PVC insulation, 100% aluminum polyester shield, stranded copper drain wire, and an overall PVC jacket. The minimum conductor size shall be #18 AWG.
- M. See section 27 05 00 for Telecommunications Systems cables.
- N. See Section 27 51 23 for School Clock & Intercom cables.
- O. See Section 28 31 00 for Fire Detection & Alarm System cables.
- P. Color coding for power cable shall be as follows:
1. 208Y/120 volt, 3 phase, 4 wire:
Phase A = black, B = red, C = blue, N = white;
 2. 120/240 volt, 1 phase, 3 wire:
Phase A = black, B = red, N = white;
 3. 120/240 volt, 3 phase, 4 wire:
Phase A = black, B = orange, C = blue, N = white;
 4. Equipment ground cables shall be green.

5. Switch legs shall be the same color as the phase conductors. Switch travelers shall be purple.

- Q. Cable pulling lubricants shall be gel type, of the best quality and shall not have any damaging effect on the insulation. (Ideal Yellow 77 is not approved.)

2.06. CABLE SUPPORTS

- A. Supports for cables run "open" above ceilings and the like shall be wide base type J-hook assemblies capable of supporting up to 50 category 5 UTP cables, Erico CablCat series or equal. Support spacing shall not exceed 5 feet.
- B. Cable ties shall be utilized in panelboards, etc. to group and support conductors. Multi-wire branch circuits shall be grouped together as required. All cable shall be fanned-out to terminals and identified by labels; or, if terminated on circuit breakers or control devices, by typewritten indexes or nameplates.
- C. Cable ties shall be utilized in cable trays to group and support conductors. Cables for similar purposes shall be bundled together. Feeder conductors for each panel shall be bundled together along the entire length of the cables. Cables shall be arranged in cable trays in accordance with the requirements of NEC 392.
- D. Cord drops from ceilings or similar shall have suitable stainless steel basket weave support/strain relief grips, Kellems or approved equal. Cord connectors shall liquidtight type.

2.07. LOW VOLTAGE CONNECTIONS AND TERMINATIONS

- A. Taps and splices shall be kept to a minimum.
- B. Taps and splices in #8 AWG, and smaller, branch and fire alarm circuit cable shall be made with twist-on spring type wire nuts. Taps and splices in telecommunications cables, ancillary systems cables, larger branch circuit cables, feeder cables, control cables, etc. or below grade will not be allowed without specific approval from the Engineer.
- C. Taps and splices in #8 AWG and larger cable, where allowed, shall be made with proper size squeeze-type copper compression tap and splice connectors. (Mechanical set-screw type connectors will not be allowed.) Wrap completely with suitable electrical insulating tape or shrink-wrap in accordance with manufacturers instructions.
- D. Taps and splices in handholes shall be made with proper size squeeze-type copper compression tap and splice connectors. (Mechanical set-screw type connectors will not be allowed.) All splices and taps in handholes shall be watertight, suitable for direct burial use, with an abrasion, UV and impact resistant cover pre-filled with chemically cross-linked silicone elastomer and silicon oil gel sealant. The gel and its cover shall completely encapsulate the splice and/or tap area. Tyco Electronics GelWrap or equal.

- E. Fittings for type MC cable shall be of a type specifically designed for the purpose, and include a non-metallic anti-short bushing.

2.08. WARNING TAPE

- A. Yellow 3" wide polyethylene metalized warning tape shall be direct buried 12 inches above the topmost underground conduits. For multi-use excavations and trenches, provide multiple tapes.
- B. Tape shall be printed with the words:
 - 1. "Caution, Buried Power Line Below" or similar above electrical conduits.
 - 2. "Caution, Buried Lighting Line Below" or similar above lighting conduits.
 - 3. "Caution, Buried Data Line Below" or similar above telecommunications conduits.

2.09. PULL STRING AND ROPE

- A. Telecommunications (with or without cables), spare, c.o., etc. conduits shall be provided with pull rope below grade and pull string above grade.
- B. Pull string shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, etc.
- C. Pull rope shall be twisted polypropylene treated with ultraviolet stabilizers, minimum $\frac{1}{4}$ inch diameter. Rope shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, etc.
- D. Pull rope shall be flat, woven polyester tape, minimum 1800 tensile strength. Rope shall be pre-lubricated to reduce pulling tension and shall be durably printed with sequential footage markings. Rope shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, lubricants, etc. Where installed in underground conduits, the pull rope shall have a # 22AWG detectable tracer wire woven into the tape. Pull rope shall be Neptco Muletape, or equivalent.

2.10. CONCRETE

- A. Concrete shall be ready-mix type, minimum 5½ sack, 1 inch maximum aggregate size, 4 inch maximum slump, developing 3000 psi strength at 28 days.
- B. Concrete exposed to weather shall be air entrained.
- C. Testing is not required.

PART 3 - EXECUTION

3.01. RACEWAYS

- A. Raceways shall be run concealed in the walls (including within CMU and similar construction), soffits (new and existing), above the ceiling or below the floor unless indicated otherwise; except, exposed within utility rooms and other similar type spaces. Raceways may be run exposed within public spaces, classrooms, offices, and the like only where indicated and with prior approval of the Owner and Architect. Exposed raceways shall be run as neatly and unobtrusively as possible, to the approval of the Owner, Architect and Engineer.
- B. Raceways shall be installed straight, plumb and true and shall be without kinks or sags.
- C. Exposed raceway runs shall be either parallel or at right angles to walls and structural members, as neatly and unobtrusively as possible (e.g. adjacent to window and door trims and base, at wall/wall or wall/ceiling intersections, etc.). Exposed parallel or banked raceways shall be run together.
- D. Below grade conduits shall be direct buried between 24 and 30 inches below grade (except, conduits below the building concrete floor slab may be run immediately below the floor) and/or as required to bury conduits below footings, grade beams, etc., and spaced a minimum of 2 inches between conduits.
- E. Below grade conduits shall be direct buried between 24 and 30 inches below grade and spaced a minimum of 2 inches between conduits, except:
 - 1. Conduits for Puget Sound Energy (PSE) primary power system 15 kv cables shall be direct buried a minimum of 36 inches below grade.
 - 2. Conduits below the building concrete floor slab may be run immediately below the floor) and/or as required to bury conduits below footings, grade beams, etc.,
 - 3. Where required to avoid interferences with existing utilities and where rock is encountered, conduit depth may be reduced to 24 inches below grade in roadways and parking areas, and 18 inches below grade elsewhere.
- F. Underground conduits extending into the building and at transformers, panels, etc. shall be suitably sealed or plugged at both ends. Sealant shall be removable. Ductseal is not acceptable.
- G. PVC conduit shall be solvent welded to prevent the entrance of moisture.
- H. Below grade telecommunications, low voltage control and instrumentation conduits shall be separated a minimum of 12" horizontally from below grade power conduits.

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- I. Verify location, mounting heights, etc. of cable trays, surface metal raceways from the Owner and Engineer prior to installation. In general, surface raceways shall be mounted as unobtrusively as possible, tight against whiteboard trim, chair rails, in room corners, against chases, etc. & other breaks in the in the wall or ceiling.
- J. Junction boxes mounted above accessible ceilings shall be within 42 inches of the ceiling and shall have a minimum 12 inch clearance in front of the box.
- K. Raceways shall be located to not interfere with the removal of pipes or equipment for maintenance or repair. All raceways shall be kept a minimum of 6 inches away from items producing heat.
- L. Only elevator related raceways may be accessed or routed in or through the elevator shaft or equipment room.
- M. Above grade raceways, fittings, etc. shall be securely supported from permanent structural members of building, either directly or indirectly. Raceways shall be fastened at intervals of 8 feet, nominally, and within 36 inches of each outlet, fitting, panel, etc. Caddy clips or wire ties using not less than No. 14 wire and "ladder-ties" which will prevent displacement, may be used only for concealed runs of EMT or GRS to 1¹/₂ inch. Single runs of exposed conduit shall be supported with steel pipe straps.
- N. Support cable trays with trapeze style hangers/systems, minimum 8 foot on center, securely supported from permanent structural members of building.
- O. Raceways, cable trays, etc. shall not be supported from ducts, plumbing or other piping or from other raceways. Support raceways, cable trays, etc. only from building structural elements.
- P. Bends in raceways shall be made without flattening, kinking or reducing the cross-sectional area of the raceway. Bends in parallel or banked runs shall be made from the same center line so that the bends are parallel.
- Q. Bends or intersections in telecommunications cable tray shall be full radius style, made without flattening, kinking or reducing the cross-sectional area of the cable tray.
- R. All raceway cuts shall be made square with a proper cutting tool. The inside and outside of all raceway ends shall be reamed after cutting and/or threading to eliminate burrs and rough edges, then wiped clean. Joints shall be cut square and shall butt solidly into couplings. Running threads will not be permitted.
- S. Surface metal raceways shall be cut with a factory manufactured and/or approved cutting tool designed/made specifically for the purpose.
- T. Raceways shall be closely and tightly fitted in couplings, connectors, boxes, etc. to provide an electrically continuous low resistance ground fault return path. Threaded joints shall be made up with at least 5 threads fully engaged.

- U. The raceway systems shall be complete (including the installation of bushings, grommets, etc.), snaked and cleaned, and approval of the installation is obtained from the Owner and Engineer, before installation of any wallboard where the raceway is concealed in walls and above ceilings.
- V. The raceway systems shall be complete (including the installation of bushings, grommets, etc.), snaked and cleaned, and approval of the installation is obtained from the Owner and Engineer, before or pulling any cable.
- W. Exposed raceways shall be painted.
- X. Below grade telecommunications, spare, c.o., etc. conduits shall have their location properly marked.

3.02. EQUIPMENT PADS AND VAULTS

- A. Equipment pads, vaults, handholes, etc. shall be installed plumb and true and shall be square with the adjacent buildings, property lines and roadway. The location of similar equipment shall be consistent.
- B. Prior to excavation, the Contractor shall mark or otherwise show the location of all equipment, vaults, handholes, etc. and obtain specific approval from the Owner and Engineer for the location of each.
- C. Bedding material shall consist of a minimum of 6 inches compacted gravel, graded level. Backfill shall be good compactable material without large rocks, chunks or sticks. Backfill shall be progressively compacted from the bottom to the top surface to 95% of maximum density, and shall be without voids.
- D. Lids, conduit and cable entrances, etc. shall be suitably sealed and/or grouted to prevent the entrance of moisture.
- E. Conduit into vaults and handholes shall extend no more than 5 inches and no less than 3 inches from the bottom of the box surface. Care shall be taken to assure a neat and convenient arrangement.
- F. Core and/or saw cut vaults for conduit entrances.
- G. Provide vault drains, sump, etc. as indicated (see civil drawings).
- H. Vaults shall be drained from at, or near, its bottom to the nearest point in a storm drainage ditch below the level of the vault base. Provide suitable rodent screen on the end of each drain.

3.03. EXCAVATION AND BACKFILLING

- A. Excavate to depths noted, and as required for proper completion of all below grade work and cut to sufficient size to provide ample room for construction of forms, shoring and bulkheads as required.
- B. Cut existing asphalt, concrete, etc. as required. Push under existing curbs, sidewalks, etc. where possible.

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- C. Underground utilities (electrical, water, sewer, cable television, etc.) are known to exist in the area of construction. The location of existing utilities shown on the drawings is approximate only and is not guaranteed to be an indication of all utilities in the area. The contractor is responsible for contacting the Owner and all utility companies and for field location of all utilities prior to construction. The one-call number for underground utility location services is 811 (1-800-424-5555). The Contractor shall promptly notify the Engineer of any conflicts between the contract documents and field location of existing utilities. The Contractor is responsible for maintaining the integrity of all existing utilities during construction.
- D. Damaged electrical and telecommunications (telephone, computer/data, television, fiber, copper, etc.) cables shall be replaced in their entirety. Splicing will not be allowed.
- E. Provide a spotter at all times when excavation occurs by use of a backhoe, excavator or other mechanical equipment.
- F. Shore and brace excavations where necessary to prevent cave-ins and in accordance with all safety laws and codes.
- G. During excavations and backfilling, extreme care shall be taken to keep rocks and other rough material away from conduits and cables. Pack a minimum of 6 inches of soft fill material (free from stones, rocks and other rough material that might be forced against the conduits and cables during backfilling, or when settling or frost-heaving disturbs the surrounding earth) around conduits and cables. Wash in to avoid air gaps.
- H. Backfill shall be good compactable material without large rocks, chunks or sticks. Backfill in all excavations shall be progressively compacted in maximum 12 inch lifts to 95% of maximum density, and shall be without voids.
- I. Prior to excavation, the Contractor shall mark or otherwise show the location of all equipment and vaults, and obtain specific approval from the Owner and Engineer for the location of each prior to installing equipment, boxes, raceways, etc.
- J. Maintain all bench marks, control monuments and stakes, whether newly established by Surveyor or previously existing. Protect from damage and dislocation. If necessary to disturb existing benchmark, re-establish in a safe place.
- K. The clearance between the underground conduit systems and other underground items, such as water and sewer lines shall be as large as necessary to permit maintenance of any of the systems without damage to the other items.
- L. Keep all excavations, pits, trenches, etc., entirely free from water. Protect excavations from rain or water from any source during construction. Use suitable pumping equipment or other means as required by conditions. Continue pumping as necessary until completion of work.

- M. When operations are interrupted by unfavorable weather conditions, prepare areas by grading and compaction to avoid ponding and erosion.
- N. Dirt shall not be permitted to accumulate on roads or adjacent green belts, nor to be washed into drainage ditches.
- O. Appropriate steps, such as the application of water, shall be taken to prevent airborne dust due to the work, particularly during excavation and moving of materials.
- P. Trenches, excavations and any damage to adjoining areas shall be repaired/restored to existing or better condition to the approval of the Owner, Architect and Engineer.

3.04. WARNING TAPES

- A. Direct bury warning tape 12 inches above topmost conduits. For multi-use excavations and trenches, provide multiple tapes. Tapes shall extend into vaults and be stubbed up with and secured to conduits as required for access when testing.

3.05. LABELING & IDENTIFICATION

- A. Junction boxes concealed in ceiling spaces and exposed in electrical, mechanical, utility rooms, and the like shall be marked with the panel and circuit numbers contained within. Marking shall be legibly handwritten with black indelible ink marker.
- B. In each junction and pull box, neutral conductors shall be grouped with associated phase conductors by taping the conductors together.
- C. Spare, C.O., etc. conduits shall be labeled with their destination.
- D. Color coding for power cable shall be as follows:
 - 1. 208Y/120 volt, 3 phase, 4 wire:
Phase A = black, B = red, C = blue, N = white;
 - 2. 120/240 volt, 1 phase, 3 wire:
Phase A = black, B = red, N = white;
 - 3. 120/240 volt, 3 phase, 4 wire:
Phase A = black, B = orange, C = blue, N = white;
 - 4. Equipment ground cables shall be green.
 - 5. Switch legs shall be the same color as the phase conductors. Switch travelers shall be purple.

3.06. BOXES

- A. Boxes shall be installed plumb and true and be firmly supported either directly or indirectly by a sound and safe structural member of the building with approved anchors and fasteners, and shall be readily accessible for maintenance.
- B. Pull boxes or fittings shall be provided in conduit runs as required to prevent excessive stress on the cables during pulling and to allow the minimum required bending radius.
- C. Where an accessible ceiling space exists, locate above the ceiling; otherwise locate in an unobtrusive location to the approval of the Architect, Engineer and Owner.
- D. Pull boxes shall be provided at the transition between the surface metal raceway system and conduit or "open" cabling system. Where an accessible ceiling space exists, locate above the ceiling; otherwise locate in an unobtrusive location against the ceiling.
- E. Flush mounted switch, outlet, etc. boxes in common non-fire rated walls and facing into different rooms shall be offset a minimum of 6 inches to minimize sound transmission between rooms. Flush mounted switch, outlet, etc. boxes in common rated fire resistive walls and facing into different rooms shall be offset a minimum of 24 inches. Boxes mounted back-to-back will not be allowed. Raceways between boxes in adjoining rooms shall be filled as required to maintain the fire rating (where required) and minimize sound and dust transmission between rooms.
- F. Low voltage cut-in type mounts in a common wall and facing into different rooms shall be offset a minimum of 12 inches and shall be separated by a stud. Area between low voltage cut-in type mounts without boxes shall be filled with insulation or other suitable material to minimize sound and dust transmission between rooms.

3.07. WIRE AND CABLE

- A. All wire and cable shall be enclosed within the raceway system; except:
 - 1. "Open cable wiring" approved for the purpose shall be permitted for Class 2 signal and control circuits, fire alarm system cable, telecommunications cable, etc. when run concealed in an accessible location above the ceilings.
 - 2. Class 2 signal and control circuits, fire alarm system cable, telecommunications cable, etc. may be (or shall be where indicated) "fished" inside existing frame walls not being replaced or re-finished. Fished cables shall be provided with a suitable pull string, accessible at both ends.
 - 3. Type MC Cable may be substituted for EMT for branch circuits concealed inside walls and ceilings from junction boxes to devices, luminaires, etc. and between devices. Type MC cable shall not be

used for any runs between junction boxes, for homeruns, or be exposed.

- B. Floor and ceiling penetrations by "open" cables will not be allowed. Provide conduit sleeves, minimum 2" EMT, as required plus a spare (with fire and dust stopping and sealing) where "open" cable passes through floors, walls, partitions, etc.
- C. Inspect cable prior to installation to verify that it is identified properly on the reel or box identification label, that it is of proper gauge, containing correct number of pairs, etc. Note any buckling of the jacket which would indicate possible problems. Damaged cable or any other components failing to meet specification shall not be used in the installation.
- D. Conductors of different voltages, systems, functions, etc. shall not be combined in the same raceway or cable unless specifically noted otherwise.
- E. Wire and cable shall not be exposed to weather or mechanical damage longer than necessary. Cut ends of the cable shall be immediately sealed to protect from moisture. Duct tape is not an acceptable means of sealing.
- F. The contractor shall not receive cable from the supplier if it arrives onsite with the cable ends unsealed.
- G. Cable shall be unrolled from reels, or removed from cartons, and installed so as to not damage the insulation or cable sheath and in a manner which will prevent kinking, crushing or excessive tension on conductors and insulation. Use only guides, rollers, sheaves, etc. that are free-turning and clean. Cable shall not be dragged on the ground or over sharp edges or abrasive surfaces. Slack wire shall be provided at all pull points.
- H. All cables to be installed in a raceway shall be pulled together. The pulling means (fish tape, cable, rope, etc.) shall be of a type that will not damage the raceway.
- I. Telecommunications cables shall be installed without sharp bends (less than 2 inch radius) or pulling tension in excess of 20 pounds.
- J. Cable shall be installed or drawn into the raceway system only after all work of any nature that might cause injury to the cable is completed. The raceway system shall be complete, snaked and cleaned before pulling any cable.
- K. "Open" telecommunications cables, ancillary systems cables, low voltage control cables, etc. shall be bundled and be supported from permanent structural members of the building, either directly or indirectly, with suitable rings or hooks. Support spacing shall not exceed 5 feet. Cables shall not interfere with the removal of pipes or equipment for maintenance or repair. Support "open" cables a minimum of 6 inches above T-bar ceilings. All "open" cable shall be kept a minimum of 6 inches from pipes, ducts, and other items producing heat. Tape and cable ties are not approved methods of fastening cables.

- L. Type MC cable shall be supported and secured by staples, straps, hangars or similar fittings designed and installed so as to not damage the cable. Type MC cables shall be supported at intervals not exceeding 5 feet and within 12 inches of every box, cabinet or fitting.
- M. All cables shall terminate in an approved enclosure or fitting. Type MC cable shall be terminated at boxes, enclosures, etc. with a non-metallic anti-short bushing and an approved connector, and insure a proper bond by firmly tightening connectors to both the box or enclosure and the cable. The continuity of circuits, grounding, etc. shall not be dependent device connections (e.g. receptacles), where the removal of such devices would interrupt the continuity.
- N. Type MC cable shall be cut with an armored cable type rotary cutter. Cable shall be cut square, without sharp edges which could damage the cable insulation.
- O. Cord drops from ceilings or similar shall have suitable stainless steel basket weave support/strain relief grips, Kellems or approved equal. Cord connectors shall liquidtight type.
- P. Provide conduits, boxes, etc. for all "open" cable wiring where penetrating from one floor to the next and through rated fire walls.
- Q. Provide conduits, boxes, etc. for telecommunications and other ancillary systems (where required by the ancillary system provider) "open" cable wiring within walls up to an accessible location above the ceiling.
- R. Protect "open" cables during installation. Provide suitable covers on supports, structural members, etc. with sharp edges. Remove all added coverings, protection, etc. after installation of the cable.
- S. All cables shall terminate in an approved enclosure or fitting. Type MC cable shall be terminated at boxes, enclosures, etc. with a non-metallic anti-short bushing and an approved connector, and insure a proper bond by firmly tightening connectors to both the box or enclosure and the cable. The continuity of circuits, grounding, etc. shall not be dependant device connections (e.g. receptacles), where the removal of such devices would interrupt the continuity.
- T. Provide wire/cable markers (Brady type or equivalent/better) identifying its circuit number and/or final destination on all cables/conductors (power, telephone/computer, and other ancillary systems) at panels, devices, junction points, etc.
- U. Cable pulling lubricants shall be used to minimize pulling stresses on cable pulled into raceways.
- V. All cable is subject to subtle damage that may degrade future performance, if abused during installation. In all cable installation, set reels and use sufficient pulleys and manpower so that cables are not pulled around corners or against material that might cause chafing.

OBSERVATION OF IMPROPER CABLING HANDLING TECHNIQUES MAY CAUSE THE CONSULTANT/ENGINEER AND/OR OWNER TO REQUIRE THE CONTRACTOR TO DISCARD AFFECTED CABLES, INCLUDING ANY OTHERS ALREADY INSTALLED BY THE PERSONNEL FOUND USING INCORRECT PROCEDURE.

- W. Conductor connections shall be made with connectors of the proper size and type. Compression connections shall be made with the correct die and number of crimps, or the correct tightening torque in the case of mechanical connectors, according to manufacturer's instructions and recommendations. Use suitable oxide inhibiting joint compound on all aluminum terminations. Termination of insulated conductors shall be made so that the stripped length of bare conductor is not longer than required for the terminal or connector. Care shall be taken to not nick conductors during insulation removal.
- X. At pulling points, the cables shall be neatly bundled by circuit.
- Y. Taps and splices shall be kept to a minimum; and are not allowed in cables larger than #8 AWG, control cable, ancillary systems cable, etc. and below grade without prior approval from the Engineer.
- Z. Field wiring shall not contact live parts.
- AA. Cables shall not be supported by their terminations. Suitable cable ties and/or supports shall be utilized in switchboards, panelboards, terminal boxes, junction boxes, vaults, etc. to group and support conductors. All cable shall be fanned-out to terminals and identified by labels; or, if terminated on circuit breakers or control devices, by typewritten indexes or nameplates.
- BB. Insulated cable supports shall be provided to relieve any strain imposed by cable weight or movement, and to secure cable as required to withstand the effects of fault currents.

3.08. CABLE TESTING

- A. Service and feeder cables, including panels with branch circuit breakers open, shall have the insulation resistance to ground measured with other phases grounded after all splices and terminations are made; except, before connection to utilization equipment, fixtures, etc. Test cables phase to phase and phase to ground, with the other phase(s) grounded. Insulation resistance shall be measured using a 500 volt megger. Measure insulation resistance at one minute following the application of the test voltage. The minimum reading shall be 1.0 megohms. Ground each phase at the completion of the test.
- B. Branch lighting and general purpose receptacle circuits do not require an insulation test, functional tests only are required; except, all receptacles shall be tested for correct connection using a suitable receptacle tester.
- C. See specification section 27 05 00 Common Work Results for Communications for cable testing.

3.09. PENETRATIONS

- A. Wall, ceiling and floor penetrations by raceways (both inside and outside the raceway), cables, etc. shall be sealed to maintain the original moisture, dust and fire resistance to the approval of the Architect.
- B. Do not cut, notch or drill structural framing members for the installation of raceways without the Architect's approval in each case. Holes and penetrations where allowed in studs, joists and other structural members for raceways and cables shall be of a size to allow for a tight fit.
- C. Provide conduit sleeves as required, plus a spare of the same size, where "open" cable passes through floors, walls, partitions, etc.
- D. Provide sleeves connecting surface metal raceways on opposite sides of walls.
- E. Cut existing surface metal raceway covers on each side of new walls.
- F. Provide conduit sleeves where cable trays pass through fire-resistive walls, partitions, etc. Sleeves size and quantity shall provide the same capacity as the cable tray.
- G. Cable trays shall extend through non-rated partitions. Frame around opening as directed.
- H. Floor and ceiling penetrations by "open" cables and/or cable trays will not be allowed.
- I. Contractor shall x-ray or otherwise determine the exact location of existing structural components, conduits, piping, wiring, ducts and the like prior to making any new penetrations or openings (or expanding existing openings) in any floor, wall or ceiling.
- J. Flash and counter-flash all roof penetrations.

3.10. PULL STRINGS AND ROPES

- A. Provide pull ropes in all below grade telecommunications (with and without cables), spare, etc. conduits.
- B. Provide pull strings in all above grade telecommunications (with and without cables), spare, etc. conduits.
- C. Provide pull rope in all cable trays (with and without cables).
- D. Provide pull string with all cables fished inside existing walls.

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3.11. ANCILLARY SYSTEMS

- A. The Contractor shall coordinate with ancillary systems suppliers and provide conduit, boxes, cables, etc. in accordance with their requirements; except, minimum as indicated and/or specified.

End of Section 26 05 00

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the grounding work.
- B. Coordinate grounding work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

PART 2 - PRODUCTS

2.01. GROUNDING

- A. Ground rods shall be copper clad steel, $\frac{5}{8}$ inch diameter by 10 feet long minimum.
- B. Ground clamps, nuts, washers, etc. shall be corrosion resistant high copper alloy or silicon bronze.
- C. Branch circuits, control circuits, etc. shall include a separate equipment ground cable (sized the same as the largest circuit conductor, unless otherwise noted) run in the same raceway with the circuit conductors or bundled with the circuit conductors if run "open". Equipment ground conductors for branch circuits, control circuits, etc. installed in metallic raceways shall be redundant, consisting of both an electrically continuous metal raceway system and the separate equipment ground cable run in the same raceway with the circuit conductors.

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- D. Telecom Grounding Busbar (TGB) shall be a prefabricated assembly, solid copper, minimum $\frac{1}{4}$ inch thick x 4 inches high x 12 inches long, complete with insulators, mounting brackets and hardware. Ground bars shall be pre-drilled with both $\frac{1}{4}$ inch diameter holes spaced on $\frac{5}{8}$ inch centers and $\frac{3}{8}$ inch diameter holes spaced on 1 inch centers for two-hole lugs in compliance with the ANSI/TIA/EIA 607 recommendations. TGB shall be B-line model SB476, Chatsworth Products model 40153-020, Eritech model TMGB-A20L27PT, Harger model GBI14420TMGB, or approved equal.
- E. If required, the contractor shall drill additional $\frac{1}{2}$ inch diameter holes spaced on $1\frac{3}{4}$ inch centers for two-hole lugs on large cables. The Contractor may not elect to fabricate the ground bars.

2.02. PANELS

- A. Provide both ground and neutral bars in panels (new and existing). All connectors and lugs shall be solderless, pressure type suitable for copper or aluminum wire.

2.03. WIRE AND CABLE

- A. Ground wire and cable sizes indicated and/or specified are minimums only and shall be increased as required due to NEC, system, load, voltage drop, etc. requirements.
- B. Equipment ground cable shall be single conductor stranded copper with 600 volt type XHHW or THWN/THHN insulation. Conductor size shall match branch circuit, etc. conductor size unless noted otherwise.
- C. Telecommunications ground cable shall be single conductor stranded copper with 600 volt type XHHW or THWN/THHN insulation. Conductor size shall be minimum # 6 AWG unless noted otherwise. Conductor insulation for # 2 AWG and smaller cables shall be green color; insulation for # 1 and larger cables may be black with green marking tape applied in telecommunications rooms.

PART 3 - EXECUTION**3.01. GROUNDING**

- A. All electrical equipment, enclosures, boxes, devices, etc. shall be provided with a ground fault return path by means of an insulated grounding conductor installed with the circuit conductors, and the integrity of the raceway system if applicable. Bond raceway system as required.
- B. Ground terminals of all equipment, devices, etc. shall be grounded by the equipment ground conductor.
- C. Raceways shall be closely and tightly fitted in couplings, connectors, boxes, etc. to provide an electrically continuous low resistance ground fault return path. Threaded joints shall be made up with at least 5 threads fully engaged.

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- D. Building steel and interior metal piping systems shall be suitably bonded.
- E. Each telecommunications grounding busbars in the IDF rooms shall be bonded to the telecommunications main grounding busbar with a telecommunications bonding backbone as indicated.
- F. Grounding conductors exposed to mechanical damage shall be protected with PVC conduit sleeves with bushings.
- G. Before grounding connections are made, contact surfaces shall be thoroughly cleaned and anti-oxidant solution applied.
- H. Connections shall be both mechanically and electrically secure. Torque connecting hardware in accordance with the manufacturer's instructions and recommendations.
- I. Torque connecting bolts at telecommunications grounding busbars to 35 ft/lbs.
- J. Tests shall be made to verify the continuity of the ground system and all ground fault return paths.

End of Section 26 05 26

PART 1 – GENERAL**1.01. APPLICABLE PROVISIONS**

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the moisture, fire and dust stopping and sealing work.
- B. Coordinate moisture, fire and dust stopping and sealing work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the Work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

PART 2 - PRODUCTS**2.01. GENERAL**

- A. Coordinate the features of materials and equipment so they form an integrated system.

2.02. MOISTURE PROOFING

- A. Moisture proofing systems shall be designed and installed to allow the passage of cable, conduit or pipe through exterior walls, floors, etc. They shall provide a barrier seal to prevent the penetration of water and gases into the structure to be penetrated.

2.03. FIRE STOPPING AND SEALING MATERIALS

- A. Fire-stop systems shall be designed and installed to allow the passage of cable, conduit or pipe through fire rated walls or floors. They shall provide a barrier seal to prevent the penetration of fire, smoke, water, and gases, with a fire rating to match the rating of the architectural assembly or structure to be penetrated.
- B. Fire-stop systems shall consist of one or more of the following materials:
 - 1. Ablative (typical of silicone-based technology);
 - 2. Cementitious (Can be troweled like grout or mortar, but is specifically designed for the purpose. Grout shall not be permitted);
 - 3. Elastomeric (Flexible substance which resembles rubber);
 - 4. Endothermic (Absorbing heat energy.);
 - 5. Intumescent (Swelling under the influence of heat, pillows, etc.)
 - 6. Mechanical (Assemblies that allow additions or deletions)
- C. Fire-stop systems shall be qualified for the intended use.
- D. Fire-stop material within wall and floor sleeves and the like shall be intumescent bags. Fire-stop material around cable penetrations, within raceways (except wall and floor sleeves), etc. shall be intumescent bags or soft, pliable, non-hardening intumescent putty, with high dielectric strength (insulator). Material shall allow removal of the material(s)/system(s) for future cable additions and/or removals.
- E. Fire-stop products shall be as manufactured by "Nelson", "Dow Corning" or approved equal.

2.04. DUST SEALING MATERIALS

- A. Dust seal systems shall be designed and installed to allow the passage of cable, conduit or pipe through non-rated ceilings, walls, partitions or floors.
- B. Dust sealant around raceways and the like shall be top grade paintable silicone based or poly-sulfite caulk, or expanding foam type sealant.
- C. Dust sealant around cable penetrations, within raceways, etc. shall allow removal of the material for future cable additions and/or removals.

PART 3 - EXECUTION

3.01. INSTALLATION

- A. Provide all fire-stop sealing for all penetrations through fire-resistance-rated floors, walls and partition construction; including empty openings and openings containing cables, raceways, supports and other penetrating items as required, both new and existing where new cables, raceways and the like have been installed. Contractor is responsible for verifying the fire rating of the barrier to be penetrated.
 - 1. Provide all fire-stop sealing for all penetrations through fire-resistance-rated floors, walls and partition construction; including empty openings and openings containing cables, raceways, supports and other penetrating items as required, both new and existing where new cables, raceways and the like have been installed. Contractor is responsible for verifying the fire rating of the barrier to be penetrated.
 - 2. Install fire-stop systems in accordance with manufacturer-tested methods and to manufacturer's instructions. If required, extend fire-stop system through the full thickness of the wall or floor and through the full length of the sleeve.
 - 3. Seal openings with a removable fire-stop material after each shift. Do not leave unattended openings in building fire-resistance-rated walls, partitions and floors at any time during construction.
- B. Where sleeves or penetrations are installed through non-rated partitions, provide a dust seal to prevent dust from migrating between the spaces separated by the partition. Also, where fire stop material does not completely fill an opening (e.g. intumescent pillows), provide suitable dust sealant as required.
- C. Where existing sleeves or penetrations are re-entered for installation of new cables, Contractor shall modify/re-install or provide new fire stop material as required to maintain the original fire rating of the barrier.

3.02. MOISTURE PROOFING

- A. Conduit terminations at equipment, etc. shall be suitably sealed and/or plugged at both ends to prevent the entrance of moisture.

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- B. Conduit penetrations through building exterior walls shall be suitably sealed and/or grouted to prevent the entrance of moisture.

End of Section 26 07 00

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the electrical work.
- B. Coordinate electrical work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. SUBMITTALS

- A. Provide submittals for the following:
 - 1. CT Enclosures.
 - 2. Meter Bases.
 - 3. Panelboards.
 - 4. Disconnect switches.
 - 5. Surge arrestor.
 - 6. Time clock.
 - 7. Wiring devices & wallplates.
 - 8. Electric Vehicle (EV) Chargers.

PART 2 - PRODUCTS**2.01. ELECTRIC POWER SERVICE**

- A. Utility meter base shall be surface mounted, NEMA 3R, in accordance with the requirements of Puget Sound Energy Co. for the service size and type indicated.
- B. Utility meter base shall be provided with a phenolic nameplate to indicate the address that the meter serves, per PSE requirements.
- C. Current transformer enclosure shall be surface mounted, horizontal hinged door, NEMA 3R, with CT mounting base brackets, in accordance with the requirements of Puget Sound Energy Co. for the service size and type indicated.

2.02. PANELS

- A. Panels shall be dead-front, circuit breaker type panelboards, suitable for use as service entrance equipment where required. Branch circuits shall be arranged using double row construction. Interiors shall be rigid and so designed that circuit breakers can be replaced, changed or added without disturbing adjacent units and without machining, drilling, or tapping.
- B. Busses shall be copper or tinned aluminum. Ground and neutral bars shall be provided. All connectors and lugs shall be solderless, pressure type suitable for copper or aluminum wire.
- C. Circuit breakers shall be plug-on in loadcenters and bolt-on in panelboards, molded-case, thermal magnetic, quick make-quick break type with trip indicating handles. Branch circuit breakers for motor loads shall be HACR type. Branch circuit breakers for lighting loads shall be SWD type. Multi-pole breakers shall be single-handle, internal common trip. Tandem breakers shall not be used.
- D. Provide padlocking devices on circuit breakers where required.
- E. Provide approved handle ties between single pole circuit breakers for all multiwire branch circuits as required.
- F. Main and/or feeder breakers and branch circuit panels and breakers shall be series short circuit rated.
- G. Circuit breakers for installation in the existing panelboard(s) shall be of the same manufacturer, and be of a type manufactured specifically for that type, vintage and short circuit rating of the panelboard.
- H. Spaces shall be bussed for the maximum device that can be fitted into them, and shall be equipped with mounting and connecting accessories for future installation of circuit breakers.
- I. Panels shall be suitable for top and bottom entry of feeder and branch circuit conduits, cables, etc.

- J. Panels shall be industrial/commercial type panelboards with hinged door, catch and lock (all keyed alike). Residential type loadcenters will not be allowed.
- K. Panels and each feeder breaker in each (clearly and accurately identifying the function and location) shall have laminated plastic master nameplates.
- L. Panels shall be provided with laminated plastic nameplates to identify the system color coding scheme for phase and neutral conductors as required.
- M. Panels shall be provided with warning nameplates to warn personnel of potential arc flash and shock hazards in compliance with the NFPA 70E standard. Nameplates shall include the voltage system, arc flash boundary limits and PPE category specific to the location.
- N. Panels shall have a circuit directory frame and card with a transparent cover furnished on the door. Directory cards shall have a typewritten index clearly and accurately identifying the function and location (using the room name and numbering system shown on the Architectural plans) of the circuit. Provide new typewritten circuit directory cards for all existing panels that are modified in any way.
- O. Circuit directory cards shall be arranged to match the physical arrangement of the breakers, with odd numbered circuits on the left side of the card and even numbered circuits on the right side of the card. Where required due to the size of the directory frame, the odd numbered circuits may be on a separate card from the even numbered circuits. Odd and even numbered circuits shall not be intermingled together.

2.03. SURGE ARRESTORS

- A. Surge arrestors shall be a heavy-duty secondary surge protective devices, UL 1449, third edition listed. Surge arrestors shall be bi-polar and bi-directional, providing all mode protection (L-L, L-N, L-G and N-G) and EMI/RFI filtering. Surge arrestors shall be Category C suitable for service entrance protection at the main service switchboard and Category C for panelboard protection at the downstream panels. The suppression system shall incorporate metal-oxide varistors (MOVs) as the core surge suppression component. Each unit shall include a high-performance EMI/RFI noise rejection filter. All components and diagnostics shall be contained within one discrete assembly. Enclosures shall be metal, weatherproof, with hinged cover and status indication.
 - 1. Surge arrestors shall be rated for minimum 160,000 amps peak surge current capacity per phase and 80,000 amps per mode at the main service.
 - 2. Surge arrestors shall be rated for minimum 80,000 amps total surge current capacity per phase and 40,000 amps per mode at the downstream panels.
- B. Surge arrestors shall be Advanced Protection Technologies, Inc. (TE/2XGA/04/W2), Innovative Technology (Protector Series), Total Protection Solutions (ServiceTrack ST series) with a 20 year warranty, or approved equal.

- C. Surge arrestors mounted in panelboards or switchboard are not allowed.

2.04. DISCONNECT SWITCHES

- A. Disconnect switches shall be heavy-duty, horsepower rated, safety switches, suitable for use as service entrance equipment where required. The switches shall have a handle whose position is easily recognizable, lockable in the OFF position, operable from the front and in control of the disconnecting means with the cover open or closed. The switch position shall be non-teasible, positive, quick make-quick break. Line, load, neutral and ground lugs shall be provided as required. Cable terminals shall be suitable for copper and aluminum wire.
- B. Disconnect switches shall be identified with laminated nameplates, black face, white core, engraved with minimum $\frac{1}{8}$ inch letters describing its function. Nameplates shall identify the equipment that is fed by the disconnect and the source panelboard and circuit number that supplies the disconnect.

2.05. FUSES

- A. Fuses shall be dual-element, current limiting, rejection type, Class RK-5.
- B. Fuses shall be dual-element, current limiting, rejection type, Class RK-5; except, fuses in the handhole at each light pole shall be Class CC.
- C. Provide 10%, except minimum 3 fuses, of each type and rating in a suitable wall mounted spare fuse cabinet.

2.06. TIME CLOCKS

- A. Time clocks shall be 7 day digital astronomic type, multi-channel (as required, except minimum 8 channels), each separately programmable and capable of minimum 99 operations (1 minute minimum setting), seasonal adjustments, holiday schedules, manual override, automatic daylight saving time and leap year compensation, with LCD display, SPDT, 20 amp rated contacts (as required, except minimum 4 contacts) and battery backup. Intermatic ET8215C or approved equal.
- B. Time clocks shall be capable of retaining programming and the time setting during loss of power for a period of 10 hours, minimum. (per NREC)

2.07. WIRING DEVICES

- A. Wiring devices shall be specification grade, all of the same manufacturer, white colored.

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- B. Wiring devices shall be specification grade, all of the same manufacturer, white colored; except:
- C. Lighting switches shall be toggle, AC quiet type rated 20 amps, 120-277 volt. Pilot light switches shall be lit when on. Key switches shall be lock type with black nylon key guide and 1 key per switch.
- D. Equipment disconnect type switches shall be toggle, heavy duty manual motor controllers, horsepower rated, with the number of poles and ampere rating indicated and/or required.
- E. Timer switches shall be mechanical type, spring wound, 30 minute timing range with single pole, single throw contact (breaks circuit at end of timing cycle) rated 20 amps and 1 H.P. at 125 volts AC.
- F. Motion sensor switches shall be ultrasonic or passive infrared type, wall mounted, white colored, 120-277 volt, rated minimum 1200 watt, with switch for manual control and vandal resistant hard lens.
- G. Motion sensor switches shall be ultrasonic or passive infrared type, wall mounted, white colored, 120-277 volt, rated minimum 1200 watt, with built-in light level sensor, adjustable sensitivity, adjustable time delay, switch (2 switches if dual control) for manual control and vandal resistant hard lens. Motion sensor switches shall be Watt-Stopper type WI-200 for single switch/level applications and WI-300 for dual level/switch applications, or approved equal.
- H. Dimmer switches shall be of the rating required (except 1500 watt minimum), slide-to-off type, solid state, voltage compensated, with finned heat sink and radio and TV noise filtering. Dimmers shall be Lutron "Nova" type or approved equal. Dimmers shall be derated as required by the manufacturer where multiple stations are ganged together.
- I. Fan variable speed switches will be furnished by the Mechanical Contractor, and shall be installed by the Electrical Contractor.
- J. General purpose receptacles shall be tamper resistant, 15 amp, 125 volt, AC, straight blade, 3-wire grounding type; except:
 - 1. Receptacles within the telecommunications rooms shall be rated 20 amps.
 - 2. Special purpose receptacles as noted for specific equipment.
 - 3. Single receptacles on an individual 20 amp branch circuit shall be rated 20 amps.
- K. Tamper resistant receptacles shall be provided with a mechanism to prevent penetration of small objects into either outlet slot.
- L. Controlled receptacles shall be same as general purpose receptacles, except shall be gray color and shall be permanently engraved with the controlled receptacle icon on the face of the device.
- M. Ground fault interrupter (GFI) type receptacles shall be duplex, Class A, 15 amp, 125 volt with end of life protection (either by rendering itself incapable of delivery power or by visual indication) and reverse line-

load miswire protection. Provide individual ground fault interrupter type receptacles at each location indicated or as required. Feed-through type protection of multiple outlets will not be allowed.

- N. Surge protected receptacles shall provide normal and common mode transient voltage surge suppression at point of use with multiple MOVs providing minimum 200 joules of surge protection in each mode.
- O. Special purpose receptacles shall be of the type, ratings and design for the use intended, NEMA configuration. Provide matching plugs where indicated.
- P. Flush mounted devices shall have smooth specification grade stainless steel wallplates.
- Q. Surface mounted devices shall have raised surface type covers, galvanized steel.
- R. Weather-proof devices (other than receptacles) shall be equipped with stainless steel or cast metal covers and spring-loaded gasketed doors.
- S. Weather-proof receptacles shall be equipped with heavy duty die cast while-in-use covers. Covers shall maintain a weatherproof rating whether or not an attachment plug is inserted. Intermatic WP1000MC series, or approved equal.
- T. Definite purpose devices shall be labeled with a description of the device's function, rating and circuit identification.
- U. Receptacles (or their wallplates) supplied from the emergency system(s) shall have a distinctive marking so as to be readily identifiable.
- V. All outlets shall be labeled with the panel and circuit number(s) from which the device is fed. Labels shall be heavy duty adhesive type, clear with black letters on light colored devices and clear with white letters on dark colored devices. Lettering shall be appropriately sized for the application, except minimum $\frac{1}{8}$ inch. Labels on ceiling mounted devices shall be large enough to read from the floor. Labels shall be as manufactured by Kroy, Brothers, or approved equal. Self-adhesive circuit numbers, masking tape, plastic punch type "Dymo" labels, etc. are not acceptable.

2.08. PLUGS & CONNECTORS

- A. Plugs (cord ends) shall be of the type, ratings and design for the use intended, NEMA configuration.
- B. Plugs (cord ends) shall be black and white nylon constructed, with separately molded face, single piece ribbed housing and screw connected strain relief cord holder. Plugs shall be suitable for use with the associated cord, and shall have the NEMA configuration and manufacturer model number durably molded into the plug housing.

2.09. ELECTRIC VEHICLE CHARGING STATIONS**A. Quality Assurance**

1. Contractor and contractor's personnel shall be experienced, thoroughly trained and completely familiar with electric vehicle charging station infrastructure, systems, equipment, devices, materials, etc., and the required methods of installation, testing, etc.
2. Confirm location and orientation of all charging stations and guard posts with owner prior to installation.

B. Dual port, pedestal mount electric vehicle charging stations shall be rated for exterior use, UL listed, SAE J1772 compliant, level II, 19.2KW, 80A, 240V, supplied with one 100A (power share) circuit, 2 single vehicle charging stations mounted to one 6'-0" pedestal (both on the same circuit), LED indicators, 18 foot cables, Omni port (enables J1772 and/or NACS vehicle charging), cord holders, overhead cable management, 2 cable retractors, cellular pay by phone feature. Charging stations shall be Charge Point CT6621B-80A-L5.5, or approved equal.**C. Charging stations shall have a charge circuit interruption device with ground fault protection with fully automated self-test feature.****D. Charging stations shall be U.L. listed (or other listing acceptable in Washington State)****E. Charging stations shall have a service ground monitor, constantly checking for the presence of proper safety ground.****F. Contractor shall provide concrete base, anchor bolts, hardware, etc. per manufacturer's instructions.****G. Provide one year software subscription service.****2.10. EQUIPMENT IDENTIFICATION****A. Provide nameplates for all equipment and other devices used for the control of circuits, equipment, etc. Include the panel and circuit number(s) from which it is fed.**

1. Emergency Power Systems per NEC and WAC.
2. Switchboards and each feeder circuit breaker within each.
3. Panelboards and each feeder circuit breaker within each.
4. Generator and transfer switch.
5. Motor starters, contactors, etc.

6. Separately mounted circuit breakers.
 7. Disconnect switches.
 8. Control and contactor panels, and each device within each.
 9. Control stations and their devices.
-
- B. All distribution equipment (switchboard, panelboards, motor control centers, etc.) shall be provided with laminated plastic nameplates to identify the system color coding scheme for phase and neutral conductors as required.
 - C. All distribution equipment (switchboard, panelboards, motor control centers, etc.) shall be provided with warning labels to warn personnel of potential arc-fault hazards.
 - D. Definite purpose devices shall be labeled with a description of the device's function, rating and include the panel and circuit number(s) from which it is fed.
 - E. All equipment and outlets shall be labeled with the panel and circuit number(s) from which it is fed.
 - F. Labels shall be heavy duty adhesive type, clear with black letters on light colored devices and clear with white letters on dark colored devices. Lettering shall be appropriately sized for the application, except minimum $\frac{1}{4}$ inch. Labels on ceiling mounted devices shall be large enough to read from the floor. Labels shall be as manufactured by Kroy, Brothers, or approved equal. Self-adhesive circuit numbers, masking tape, plastic punch type "Dymo" labels, etc. are not acceptable.
 - G. Nameplates shall adequately describe the function or operation of the identified equipment, devices, etc. and, where applicable, include the panel and circuit number(s) from which it is fed. Nameplate designations shall be consistent with the project documents. Submit proposed inscriptions for approval.

PART 3 - EXECUTION**3.01. UTILITY SERVICES**

- A. Electric power service shall be in accordance with the requirements of Puget Sound Energy.
- B. The Contractor shall do all necessary coordination with the utilities/service providers, and do all excavating, trenching and backfilling (in accordance with their requirements) required by the utilities to bring service to the facility.
- C. The Owner will pay utility service charges.

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3.02. TEMPORARY POWER

- A. The Contractor shall provide all temporary power services, facilities, equipment, devices, material, etc. required for the construction; including adequate lighting, outlets, balancing, testing, etc. as may be necessary for the proper performance and inspection of the work.
- B. During power interruptions, and if Contractor's equipment will not operate on the available power, the contractor shall supply all equipment needed, such as transformer(s), generator(s), etc. and pay all costs involved.
- C. The temporary power system shall be provided in a neat and safe manner, in compliance with governing codes and good working practice.
- D. The temporary power system shall be removed when no longer required.

3.03. LOCATIONS

- A. The mounting heights and location of similar equipment and devices shall be consistent, in accordance with the requirements of the ADA where applicable. Special purpose items shall be located conveniently for the purpose intended.
- B. Devices shall be located to not interfere with the removal of pipes or equipment for maintenance or repair. All devices shall be kept a minimum of 6 inches away from items producing heat.
- C. Disconnect switches, circuit breakers, etc. shall, in no case, be installed so that the grip of the operating handle, when in its highest position, is more than 6¹/₂ feet above the floor or working platform.
- D. Outlets (power, telecommunications, etc.) shall be mounted 18 inches to centerline above finished floor unless noted otherwise; except, outlets above counters, etc. shall be mounted 6 inches to centerline above the counter or 3 inches to centerline above the splashboard, whichever is higher.
- E. Locate light switches, etc. 6 inches from door casings (except on center in spaces less than 12 inches), 42 inches to centerline above finished floor. Where light switches are adjacent to countertops, install the switches at the same height as adjacent devices above the countertop.
- F. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices, and obtain specific approval from the Owner and Architect for the location of each prior to installing enclosures, boxes, raceways, etc.

3.04. EQUIPMENT AND DEVICES

- A. Equipment, devices, enclosures, etc. shall be installed plumb and true and shall be square with the adjacent walls, ceilings and structural members.
- B. Equipment, cabinets, boxes, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.
- C. The correct lifting, jacking and/or moving gear which will prevent damage to the equipment shall be used.
- D. Bolts, nuts, screws and other fastenings shall be tightened and all covers replaced on equipment and boxes. Electrical connections, particularly those on bus work in panelboards, etc. shall be checked to ensure tightness and electrical conductivity. Gaskets, seals, etc. shall be checked for proper fit.
- E. To minimize transformer noise, provide rubber sound isolation pads between the transformer enclosure and the floor. Back off nuts as directed at sound isolation pads, both internal and external, to float transformer on the isolation pads.
- F. Follow manufacturer's installation details wherever available. Provide boxes, mountings, wiring or fittings required, standard or special.
- G. The Contractor shall touch-up paint all scratched, marred or damaged factory finish on equipment, devices, enclosures, etc.

3.05. DEVICES

- A. Flush mounted switch, outlet, etc. boxes in common non-fire rated walls and facing into different rooms shall be offset a minimum of 6 inches to minimize sound transmission between rooms. Flush mounted switch, outlet, etc. boxes in common rated fire resistive walls and facing into different rooms shall be offset a minimum of 24 inches. Boxes mounted back-to-back will not be allowed. Raceways between boxes in adjoining rooms shall be filled as required to maintain the fire rating (where required) and minimize sound and dust transmission between rooms.
- B. Low voltage cut-in type mounts in a common wall and facing into different rooms shall be offset a minimum of 12 inches and shall be separated by a stud. Area between low voltage cut-in type mounts without boxes shall be filled with insulation or other suitable material to minimize sound and dust transmission between rooms.

3.06. TESTING

- A. Before energization verify proper phasing of conductors.
- B. Before testing, visually inspect equipment thoroughly, and perform mechanical operation and key interlock tests in accordance with manufacturer's instructions.
- C. Before energization, test all equipment in accordance with manufacturer's recommendations; except minimum as described below.
- D. Switchgear and Switchboards:
 - 1. Perform contact resistance test across each switch blade. Minimum acceptable resistance is 50 micro-ohms.
 - 2. Insulation resistance shall be tested. Disconnect all accessories and electronic devices that may be subjected to the test voltage. Test from phase-to-ground and from phase-to-phase with all switches and circuit breakers in both the open and closed positions, all instrumentation and control fuses removed, and no loads connected. The minimum acceptable insulation resistance to ground is 8 times the kv rating of the equipment under test.
 - 3. Perform phasing check on double-ended switchgear and switchboards to ensure correct bus phasing from each source.
 - 4. Equipment ground fault protection systems shall be tested to verify proper installation and operation. Include all protected feeders. The tests shall be performed by a firm that has qualified personnel and proper equipment to perform the tests. A copy of the tests, trip settings and measurements shall be included in the operation and maintenance manual.
- E. Motors:
 - 1. Insulation resistance of motor windings shall be tested from the motor starter terminals after connection of the motor circuit cables. Test from phase-to-ground and from phase-to-phase. The minimum acceptable insulation resistance to ground is 8 times the KV rating of the winding under test.
- F. Insulation Resistance Tests:
 - 1. Test using a 500 VDC or 1000 VDC megohmmeter.
 - 2. Ground all phases not being tested.
 - 3. Measure insulation resistance at one minute following the application of the test voltage.
 - 4. Ground each phase at the completion of the test.

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- G. Compare test results with factory-obtained results and results on similar equipment. Investigate variations. Consult manufacturer for recommendations.
- H. Upon completion, all equipment and systems shall be tested for functional operation, including all intended modes and sequences of operation.
- I. Record the values of each test, along with the description of the instrument, voltage level, temperature, time, and date of the test on the form included in the contract documents. Sign the results.

End of Section 26 20 00

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- B. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the lighting and lighting control work.
- C. Coordinate lighting and lighting control work with related work shown and specified elsewhere.
- D. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- E. Lighting control system work shall include all necessary set-up, programming, testing, commissioning, etc. for a complete and operational system, adjusted, tested and ready for operation.
- F. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. QUALITY ASSURANCE

- G. The lighting systems and all controls shall be in accordance with the Washington State Non-Residential Energy Code (NREC) and ASHRAE 90.1.

1.04. SUBMITTALS

- H. Provide submittals for the following:
 - 1. Lighting poles, bases.
 - 2. Lighting fixtures.
 - 3. Lighting control devices.

PART 2 - PRODUCTS

2.02. GENERAL

- A. Fixtures, luminaires, etc. shall include all necessary mounting and connecting accessories.
- B. Contractor & lighting fixture supplier shall verify description & catalog numbers in Lighting Fixture Schedule on the drawings match and mounting requirements are correct. Advise engineer of any conflicts or discrepancies.

2.03. LIGHTING

- A. Light Emitting Diode (LED) luminaires shall have a luminous efficacy of at least 90 lumens/W, a color temperature of 3500 K, a CRI of at least 80, an estimated life of at least 50,000 hours at 70% lumen maintenance, and shall include a minimum 5-year warranty on the entire luminaire including the driver. The luminaire and LEDs shall have been tested in accordance with LM-79 and LM-80."
- B. Enclosures surrounding recessed luminaires in rated ceilings shall be as required to ensure the integrity of the fire rated assembly. Enclosures shall be "hand-built" or, at the option of the Contractor, a pre-manufactured fire rated barrier, EZ Barrier Fire Box or Tenmat FF series or approved equal. Maintain code and manufacturer required clearances around luminaires. Coordinate with general contractor and ceiling provider.

2.04. LIGHT POLES

- A. Light poles shall be base mounted, straight square extruded aluminum with handhole, baseplate, base cover, galvanized anchor bolts and luminaire mounting accessories as required. Corners shall be radiused. Pole shall be natural anodized to match luminaire. The poles shall be designed with the luminaire loadings required and in accordance with the 50 year mean recurrent interval wind (except minimum 100 miles per hour) and ice loading, height coefficients, shape coefficients and factors of safety specified by the American Association of State Highway and Transportation Officials.
- B. Pole Bases shall be precast concrete or cast-in-place, of the size and shape as recommended by the pole manufacturer for the soil conditions at the site (except minimum as indicated). Concrete shall conform to the Standard Specifications.
- C. Anchor bolts shall be L-type, of the size as recommended by the pole manufacturer. Anchor bolts shall be hot dipped galvanized after fabrication.
- D. Fixtures, luminaires, poles, etc. shall include all necessary mounting and connecting accessories.
- E. Contractor & lighting pole/fixture supplier shall verify description & catalog numbers match and mounting requirements are correct. Advise engineer of any conflicts or discrepancies.

2.05. EMERGENCY LIGHTING

- A. Emergency lighting power units shall be self contained, designed to provide power to fixtures automatically upon interruption of normal electric power for a minimum of 90 minutes. Emergency power source shall be a rechargeable, maintenance free, sealed, spillproof pure lead or lead-calcium battery system. The units shall incorporate a regulated solid-state charger with filtered output and low voltage disconnect.
- B. Controls shall include circuitry to provide continuous self-diagnostic monitoring of the units operation, programmed discharge cycles, charger mode indicator light, unit malfunction indicator lights, and a test switch.

2.06. LIGHTING CONTROLS

- A. Occupancy sensors shall be combination passive infrared and ultrasonic type, 360° transmission, 2000 square feet coverage rated, with adjustable time delay, adjustable sensitivity, and an LED indicator. The sensors shall be able to detect the difference between a human body and the background space.
 - 1. Low voltage ceiling mounted occupancy sensors for ceilings up to 15 feet shall be Watt Stopper DT-300, or approved equal.
 - 2. Ceiling mounted occupancy sensors for ceilings higher than 15 feet shall be high bay type, or approved equal.
 - 3. Low voltage wall mounted occupancy sensors shall be Watt Stopper DT-200, sensors, or approved equal.
 - 4. Low voltage occupancy sensors and/or power packs shall have 2 additional contacts for connection to building HVAC system (provide additional slave packs for HVAC system if 2 additional contacts are not factory provided on devices).
- B. Low voltage wall switches shall be of the same manufacturer and specifically designed for use with the low voltage sensors and relay/power packs.
 - 1. Wall switches for on-off applications (manual-on applications) shall be momentary contact type, shall have similar appearance as adjacent line voltage toggle type switches, shall be Pass & Seymour 1250, or approved equal.
 - 2. Wall switches for 0-10 volt dimming applications shall be Watt Stopper DCLV2, or approved equal.
 - 3. Color and faceplates shall match other wall devices, switches, and outlets as specified.

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- C. Occupancy relays/power packs shall be manual-on type (except corridors and bathrooms shall be automatic-on type), remote mounted, 120 or 277 volt AC input (as required), 24 volt DC output, with contacts rated minimum 20 amps. Relays/ power packs shall be capable of controlling and/or being controlled by up to minimum 3 sensors.
 - 1. Occupancy sensor relays/power packs shall be of the same manufacturer and specifically designed for use with the occupancy sensors. Relays/power packs shall be Watt Stopper BZ-150, or approved equal.
 - 2. Provide additional power packs and/or auxiliary relay packs for areas requiring more than 3 sensors.
 - 3. Provide additional power packs (slave packs) to switch plug loads from the same occupancy sensor located in the room that controls the lighting loads, WattStopper.
 - 4. Contractor shall provide label on ceiling grid where power pack is located. Typical for all power packs located above accessible ceilings.
- D. Line voltage ceiling mounted occupancy sensors shall have the same performance characteristics as low voltage, manual-on type, except with integral 120/277 relay. Line voltage occupancy sensors shall be Watt Stopper DT-355, or approved equal.
- E. Motion sensor wall switches shall be ultrasonic or passive infrared type, wall mounted, ivory colored, 120-277 volt, rated minimum 1200 watt, with built-in light level sensor, adjustable sensitivity, adjustable time delay, switch (2 switches if dual control) for manual control and vandal resistant hard lens. Buttons on the face of the switches shall operate in toggle mode to manually turn on/off connected lighting loads. Motion sensor switches shall be Watt-Stopper type DSW-301 for single switch/level applications.
- F. Daylighting photosensors shall be ceiling mounted, low voltage, 0-10V output for LED fixtures, accurate to +/- 5% over the footcandle range, and shall have a linear response. The light level control module shall be capable of dimming lights on or off (via a low voltage power pack), shall have adjustable setpoints, adjustable deadband to prevent cycling, and adjustable time delays. Lighting level controls shall be low voltage and operate with the same power pack as the occupancy sensors in the same room. Photosensors shall be Watt-Stopper LS-301, or approved equal.
- G. Photo-electric controls (120V and greater) shall be minimum 1500 watt with adjustable ON/OFF range. Locate/shield as required. Photoelectric controls for pole mounted luminaires shall be pole-top mounted, turn-lock type with receptacle.
- H. Remote control stations shall be pushbutton type, flush mounted, with individually programmable preset buttons, using analog signals to communicate between control stations and between control stations and dimmers. Face plates shall be stainless steel with ivory legends and buttons.

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- A. Contactors shall be of the full voltage type, NEMA standard (IEC standard will not be allowed), 600 volt, multi-pole with fused and grounded control circuit, 110 volt holding coil, "On" pilot light, "Hand-Off-Auto" selector switch, and additional accessories as required. Contactors shall be of the gravity dropout type with double-break contacts. The contacts and coil shall be replaceable without removing the starter from its enclosure.
- B. Control relays shall be minimum 300 volt rated, industrial type, electrically operated, NEMA standard, horsepower rated, with 110 volt holding coil and the number of contacts required.
- C. Pushbuttons, selector switches, indicating lights, etc. shall be heavy-duty oil-tight type, with minimum 10 amp and 120 volt continuous rated contacts. Indicating lights shall be transformer type with the lens color indicated. Each device shall have a suitable legend plate.
- D. Contactor, control and relay panels, terminal boxes, etc. shall be fabricated from code gauge (or heavier) galvanized steel with hinged doors or covers.
- E. Terminal blocks, clamp or screw type, shall be provided for all external wires entering terminal boxes, control stations, etc. where suitable terminals are not available on the devices. Control wires shall not be spliced or tapped using wire nuts without approval from the Engineer.
- F. Contactors, control devices, etc. shall be identified with laminated plastic nameplates, black face, white core, engraved with minimum $\frac{1}{8}$ inch letters describing its function.

2.08. WIRE AND CABLE

- A. Fixture whips provided as an assembly by the fixture manufacturer with the fixtures shall be #14 AWG.
- B. Fixture cable, where supplied by the Contractor, shall be stranded copper with 600 volt type PF insulation.

2.09. NAMEPLATES AND LABELS

- A. Provide nameplates for all lighting switches in classrooms as indicated on the drawings.
- B. Nameplates shall adequately describe the function or operation of the identified equipment, devices, etc. Nameplate designations shall be consistent with the project documents. Submit a sample of nameplates for approval.

PART 3 - EXECUTION

3.01. LOCATIONS

- A. The mounting heights and location of similar equipment and devices shall be consistent, in accordance with the requirements of the ADA where applicable. Special purpose items shall be located conveniently for the purpose intended.
- B. Disconnect switches, circuit breakers, etc. shall, in no case, be installed so that the grip of the operating handle, when in its highest position, is more than 6¹/₂ feet above the floor or working platform.
- C. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices locations, and obtain specific approval from the Owner and Architect for the location of each prior to installing enclosures, boxes, raceways, etc.
- D. Outlets shall be mounted 18 inches to centerline above finished floor unless noted otherwise.
- E. Locate light switches, lighting control stations, etc. 6 inches from door casings (except on center in spaces less than 12 inches), 42 inches to centerline above finished floor.

3.02. EQUIPMENT, LUMINAIRES AND DEVICES

- A. Equipment, luminaires, devices, etc. shall be installed plumb and true and shall be square with the adjacent walls, ceilings and structural members.
- B. Unless noted or indicated otherwise, orientation of luminaires within a space shall be consistent.
- C. Recessed luminaires:
 - 1. Maintain code and manufacturer required clearances from combustible materials around luminaires.
 - 2. Maintain code and manufacturer required clearances from insulation around luminaires.
 - 3. Recessed luminaires in rated ceilings shall be enclosed or otherwise provided with an approved pre-manufactured fire rated barrier as required to ensure the integrity of the fire rated assembly. Maintain code and manufacturer required clearances around luminaires.
 - 4. Coordinate with general and insulation contractors, ceiling provider, etc.
- D. Equipment, cabinets, boxes, luminaires, devices, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.

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- E. Ceiling mounted lights above markerboards shall be mounted and adjusted to provide for the optimal light level and uniformity on the markerboard surface (with shadow line located above whiteboard).
- F. Occupancy sensors shall be mounted and aimed in accordance with manufacturer's recommendations. All necessary adjustments and settings shall be made in order to ensure the lights will operate when the room is occupied.
- G. Photoelectric controls shall be mounted and aimed in accordance with manufacturer's recommendations. All necessary adjustments and settings shall be made in order to ensure the controls will operate properly.
- H. The correct lifting, jacking and/or moving gear which will prevent damage to the equipment shall be used.
- I. All bolts, nuts, screws and other fastenings shall be tightened and all covers replaced on equipment and boxes. All electrical connections shall be checked to ensure tightness and electrical conductivity. All gaskets, seals, etc. shall be checked for proper fit.
- J. Follow manufacturer's installation details wherever available. Provide any special mountings, wiring or fittings required.
- K. Provide complete manufacturer's schematic drawings for each system. Any deviations between schematic drawings and contract documents shall be outlined in a separate cover letter. Said deviations will be subject to approval by the Engineer.
- L. Provide gaskets, seals, etc. as required to prevent the entrance of moisture, debris, insects, etc. Check for proper fit.
- M. Repair damaged corrosion protection and touch-up paint all scratched, marred or damaged factory finish on equipment, devices, fixtures, enclosures, etc.

3.03. SUPPORTS

- A. Provide all necessary supports and backing for all fixtures, boxes, enclosures, etc. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts. Use size and number of attachments as required to support equipment, fixtures, etc. weight with a safety factor of at least four.
- B. Powder actuated fasteners, plastic expansion type anchors, nails and toggle bolts are not permitted.
- C. Brace all equipment, etc. as required to meet the requirements of seismic zone 3.

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- D. Fixtures, luminaires, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.
- E. Ceiling mounted recessed light fixtures, etc. shall be connected both to the ceiling system with proper "earthquake" clips and to the building structural system with a minimum of 2 suitable earthquake chains or "tie wires" at diagonally opposite corners.
- F. Forms shall not be used while placing light standard (pole) bases. Concrete shall bear against undisturbed earth.
- G. Follow manufacturer's installation details wherever available. Provide all supports, mountings, etc. required, standard or special.

3.04. WIRES AND CABLES

- A. Inspect cable prior to installation to verify that it is identified properly on the reel or box identification label and that it is of proper gauge, containing correct number of pairs, etc. Note any buckling of the jacket which would indicate possible problems. Damaged cable or any other components failing to meet specification shall not be used in the installation.
- B. Line voltage cable within poles shall be routed in electrical nonmetallic tubing as required to maintain separation of line and low voltage cabling.
- C. All exposed cable shall be run in the raceway system, except where specifically approved otherwise. "Open" wiring will not be allowed.
- D. All concealed power limited systems cable may be run "open" in accessible ceilings; except, where indicated otherwise and where penetrating through ceilings, floors, walls, draft-stops, etc.
- E. "Open" cables shall be bundled and supported from permanent structural members of the building, either directly or indirectly, with suitable hooks. Support spacing shall not exceed 5 feet. Protect "open" cables during installation in ceiling spaces. Cables shall not interfere with the removal of pipes or equipment for maintenance or repair. All "open" cable shall be kept a minimum of 6 inches from pipes, ducts, and other items producing heat. Support "open" cables a minimum of 6 inches above T-bar ceilings. Tape and cable ties are not approved methods of fastening cables.
- F. Floor and ceiling penetrations by "open" cables will not be allowed. Provide conduit sleeves, as required plus a spare (with fire and dust stopping and sealing) where "open" cable passes through floors, walls, partitions, etc.
- G. Cable shall be unrolled from reels, or removed from cartons, and installed in a manner which will prevent kinking, crushing or excessive tension on conductors and insulation. Slack wire shall be provided at all pull points.

- H. Cable shall be installed or drawn into the raceway system only after all work of any nature that might cause injury to the cable is completed. The raceway systems shall be complete (including the installation of bushings, grommets, etc.), snaked and cleaned, and approval of the installation is obtained from the Owner and Engineer, before pulling any cable.
- I. Cable pulling lubricants shall be used to minimize pulling stresses on cable pulled into raceways.
- J. All cable is subject to subtle damage that may degrade future performance, if abused during installation. In all cable installation, set reels and use sufficient pulleys and manpower so that cables are not pulled around corners or against material that might cause chafing.

OBSERVATION OF IMPROPER CABLING HANDLING TECHNIQUES MAY CAUSE THE CONSULTANT/ENGINEER AND/OR OWNER TO REQUIRE THE CONTRACTOR TO DISCARD AFFECTED CABLES, INCLUDING ANY OTHERS ALREADY INSTALLED BY THE PERSONNEL FOUND USING INCORRECT PROCEDURE.

- K. In general, communications cable cannot tolerate sharp bends or excessive pull tension during installation. Adhere to manufacturers recommended minimum bend radius and maximum pull tension for cables; except, not less than 2 inch bending radius and pulling tension in excess of 20 pounds.
- L. Replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, and over tightened bindings.
- M. Lighting Control Devices:
 - 1. Each individual room shall be configured in either a manual-on/auto-off or auto-on/auto-off configuration, as required by Washington State Energy Code.
 - 2. Stand-alone occupancy sensors shall be individually tested and the test results documented. Verify that the occupancy sensors detect motion in the controlled space immediately when the room is entered. Record the amount of time that the lights stay on after the room is vacated. Delay times shall be programmed as follows:
 - a. Offices: 30 minutes.
 - b. Classrooms: 30 minutes.
 - c. Restrooms: 30 minutes.
 - d. Corridors: 15 minutes.
 - e. Work Rooms: 15 minutes.
 - f. Conference Rooms: 15 minutes.
 - g. Storage Rooms: 5 minutes.
 - h. Utility Rooms: 5 minutes.

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3. Wall switch occupancy sensors shall be configured for the optimal setting for the space in which they are installed. Factory default settings are typically not acceptable. Verify settings with the Engineer prior to installation.
4. Daylight harvesting photosensors shall be individually tested and the test results documented. Verify that the photosensor controls light fixtures in a continuous dimming configuration with rising and falling ambient light levels. Record the foot-candle level on the work surface and the corresponding footcandle measurement of the photosensor. Maintained foot-candles at the work surface shall be as follows:
 - a. Offices: 50 foot-candles.
 - b. Classrooms: 50 foot-candles.
 - c. Conference Rooms: 50 foot-candles.
 - d. Restrooms: 20 foot-candles.
 - e. Corridors: 20 foot-candles.
 - f. Storage Rooms: 20 foot-candles.
 - g. Utility Rooms: 20 foot-candles.
5. Comply with energy code lighting control system "Acceptance Requirements". Acceptance tests are used to verify that lighting controls were installed and calibrated correctly. These tests may require that a responsible party certify that controls are installed and calibrated properly.

3.05. EQUIPMENT TESTING

- A. Before testing, visually inspect equipment thoroughly, and perform mechanical operation tests in accordance with manufacturer's instructions.

3.06. DEMONSTRATION & TRAINING

- A. Lighting Control Systems and Devices:
 1. Before Substantial Completion, arrange and provide an Owner instruction period to designated Owner personnel. Set-up, commissioning of the lighting control system, and Owner instruction includes:
 - a. Instruction in and confirmation of entire system operation and communication to each device.
 - b. Confirmation of operation of individual relays, switches, occupancy sensors, daylight sensors, etc.
 - c. Confirmation of system programming, photocell settings, override settings, etc.

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- d. Provide training to cover installation, maintenance, troubleshooting, programming, and repair and operation of the lighting control system.
- B. The person(s) who conduct these instructions and demonstrations shall be a qualified with substantial training and operating experience on this equipment and project, and shall be versed in the operating theory as well as practical operation and maintenance work. Instructor(s) shall have the necessary educational and interpersonal skills, as well as proven ability to effectively perform the training.
- C. Include a preliminary discussion and presentation of information using the actual Operation & Maintenance Manuals required for this project. Contractor shall notify Architect at least 14 days in advance of readiness to conduct the instruction period. The actual time and date of instruction period shall be acceptable to the Owner and Engineer.
- D. All training material shall be furnished and supplied by the Contractor.

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PART 1 – GENERAL**1.01. APPLICABLE PROVISIONS**

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to the telecommunications systems work.
- B. Coordinate telecommunications systems work with related work shown and specified elsewhere.
- C. The existing campus system shall be maintained and modified for demolition, temporary and new work until the schedule calls for its removal and the new system is installed, tested and fully operational.
- D. See Division 01 specifications for project schedule and work sequence.
- E. The Contractor shall perform all the work required (including the furnishing of all supervision, labor, services, tools, materials and equipment and the performance of all operations and incidentals necessary) for a complete, safe and reliable telecommunications system installation, adjusted, tested and ready for operation. The work is generally described as follows:
 - 1. Scheduling and coordination of all phases/sequences of the project.
 - 2. Maintaining, modifying, and temporary work to accommodate all phases/sequences of the project.
 - 3. Demolition.
 - 4. Removal of the existing telecommunications systems equipment, devices, cables, raceways, boxes, etc.
 - 5. Telephone, data, and surveillance horizontal cabling infrastructure.
 - 6. Data cabling infrastructure to point of connection at patch panels.
 - 7. Supports and racks.
 - 8. Equipment backboards.
 - 9. Cable trays, supports and racks.

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10. Equipment racks, complete with:
 - a. Vertical wire management.
 - b. Horizontal wire management.
 - c. Patch panels.
 - d. Space for Owner provided electronic data system.
 11. Grounding.
 12. Individual and/or combination voice and data stations/outlets and associated cables, etc.
 13. Terminating all cables on both ends - voice, data, grounding, backbone, station, copper, etc.
 14. Moisture, fire and dust stopping and sealing.
 15. Nameplates and labeling.
 16. Equipment, device, cabling, etc. identification and records.
 17. Configuration and testing of all components.
 18. Testing and completing.
 19. As-built drawings.
 20. Obtaining, and paying for all required licenses, permits, inspections, plan review and other fees, etc.
- F. Work not included: The following electrical system related work will be provided by the Owner, General Contractor, other Subcontractors, or Systems Contractors working directly with the Owner:
1. Owner: Telephone & data patch cables, cross-connects & line cords.
 2. Owner: telephone electronic equipment (answering system) and telephone handsets.
 3. Owner: provide data network equipment: LAN switches, network switches, network controller, uninterruptible power supply (UPS) & battery cabinet.
 4. Owner: access point devices (except, contractor shall provide the outlets).

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1.03. ALTERNATES

- A. Include work associated with each alternate in the alternate bid price.

1.04. DEFINITIONS

- A. The word "Telecommunications" refers to all forms of information transport and processing, such as voice (telephone), data (computer network), etc.
- B. The word(s) "Station" or "Station Outlet" refers to all combination telecommunications outlets.
- C. The word(s) "Station" or "Station Cables" refers to all CAT6A horizontal cables.
- D. The word "Backbone" refers to the cabling, connections, etc. between telecommunications rooms.
- E. The term "Contractor" used throughout this section of these specifications and on the telecommunications drawings shall be understood to mean the Telecommunications Contractor. All other work shall be called out by name.
- F. "Approved" means approved by the Architect. "For approval" means for the Architect's approval.
- G. "Furnish" means to supply and deliver to the Project, ready for installation and in operable condition.
- H. "Install" means to incorporate in the work in final position, complete, anchored, connected, and in operable condition.
- I. "Provide" means furnish and install.
- J. "As directed" means as directed by the Architect.
- K. "Concealed" means hidden from sight in trenches, walls, chases, ceilings, etc.
- L. "Exposed" means within sight; that is, not concealed as defined above, and installed on the surface of walls, ceilings, etc.
- M. "C.O." means conduit only; that is, without cable (except, provide pull string).
- N. "F.O.I.C." means Furnished by Others (e.g. general contractor, other subcontractors, equipment suppliers, Owner, systems contractors working directly with the Owner, etc.), Installed by Contractor.

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- O. Definitions of all other terms, etc. are in accordance with AIA, ANSI, IEEE, IES, NEMA, etc. standard definitions.

1.05. DRAWINGS AND SPECIFICATIONS

- A. The telecommunications plan drawings are general in form and do not attempt to show complete details or list every item of the telecommunications systems, the building construction or the various equipment; however, the routing of raceways and circuits, and the locations of equipment, devices, fixtures, etc. represent the desired finished arrangement; except, as governed by structural or mechanical conditions or obstructions.
- B. Specifications are, in some cases, written in an abbreviated form. Words such as shall, shall be, the Contractor shall, and similar mandatory phrases are supplied by inference.
- C. Investigate the structural and finish conditions affecting the work. Refer to the architectural, structural and mechanical drawings, supplier shop drawings and submittals, etc. for additional details, equipment ratings, dimensions, location and swing of doors, location and size of partitions, cabinets, etc. and similar features. Verify all dimensions, equipment ratings, etc. with the actual before installation. Arrange the work accordingly.
- D. The intent of the drawings and specifications is to include all items necessary for the proper execution and completion of the Work; however, any item or detail not specifically mentioned in the specifications or shown on the drawings, but which is necessary to produce the intended results shall be included.
- E. The Contractor shall bring to the Architect's and Engineer's attention any discrepancies within the Contract Documents, between the Contract Documents and field conditions, and any design and layout changes required due to specific equipment selection, etc. prior to equipment and material purchasing and installation. Corrective work necessitated by discrepancies after purchasing and installation shall be at the Contractor's expense.
- F. Verify all equipment and device locations with the Owner and Architect prior to rough-in

1.06. SPECIAL AREAS

- A. Telecommunications rooms shall be treated as clean room type environments. Final cleaning shall include thorough cleaning of the room to a dust-free condition. After termination of cables and final cleaning, food, drink, dirt, dust, metal shavings and the like shall not be permitted in telecommunications rooms.

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1.07. SUBMITTALS

- A. Provide product submittals for the following:
 - 1. Station cable.
 - 2. Workstation termination hardware.
 - 3. Patch panels.
 - 4. Telecommunications room termination hardware.
 - 5. Backbone cable.
 - 6. Backbone cable termination hardware.
 - 7. Equipment racks and cabinets.
 - 8. Cable supports.
 - 9. Grounding busbars & ground lugs.
 - 10. Labels.
- B. The Contractor shall submit proposed procedures and equipment to be used in testing voice and data and fiber optic cabling along with samples of the reporting format from a past similar project.
- C. Provide qualification information for persons installing and testing the components (equipment, devices, materials, etc.) of each system, indicating their capabilities and experience. Include evidence of applicable registration or certification.

1.08. RECORD DOCUMENTS

- A. Submit "as-built" record drawings and operation and maintenance manuals at completion of the project in accordance with the specific submittal requirements listed elsewhere in these Specifications.
- B. Provide as-built documentation consistent with the contract documents as required, in AutoCAD 2010 .dwg files with as-built notations for all sheets. (Consultant/Engineer will provide construction drawings AutoCAD files to contractor.)
- C. Provide cable test results in both paper copy and software form (where available) on a CD-ROM; except, for station cables and intra-building voice backbone cables provide only a summary in paper copy and complete test results for individual station cables in software form. The CD-ROM shall include the necessary viewing software for all test reports.

1.09. "AS BUILT" DRAWINGS

- A. "As-built" drawings shall include cable ID codes for each outlet/receptacle and changes to cable routing, raceway system, telecom room layout, riser diagram, etc.

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- B. Include any detailed equipment, raceway, wiring, etc. diagrams and layouts prepared by Contractor or his subcontractors, suppliers, etc.

1.10. WARRANTY

- A. The complete installation shall be guaranteed for a period of one (1) year after date of project completion. For warranty purposes, the date of project completion shall be considered the date of final acceptance of the installation by the Owner certified in writing, and after Owner has received all project close-out requirements. All corrective work, if needed and requested by the Owner, shall be provided without cost to the Owner during the guarantee period.
- B. The contractor shall provide the manufacturer 20-year Extended Product Warranty on the completed voice and data cable infrastructure end-to-end solution.
- C. The contractor shall provide any available third party or manufacturer warranties on the installation.

1.11. QUALITY ASSURANCE

- A. Contractor and Contractor's personnel shall be experienced, thoroughly trained and completely familiar with telecommunications infrastructure, systems, equipment, devices, materials, etc. and the required methods of installation.
- B. Contractor Qualifications:
 - 1. The Contractor shall be a "specialist", who is regularly engaged in the type of work specified herein. Award will be made only to a bidder who can provide satisfactory evidence that he has the technical ability, experience, tools, personnel and financial resources to successfully complete the project as specified herein. The Contractor shall have an experience base of at least five (5) years for installation of equipment and related wiring/cabling similar to those proposed on this project.
 - 2. The Contractor shall be registered and certified with the manufacturer of the voice and data end-to-end solution, and shall be capable of providing the required warranty.
 - 3. It is desirable, although not required, for the installer to employ on this project one or more certified technicians as follows:
 - a. Registered Communications Distribution Designer (RCDD), certified by the Building Industry Consulting Service International (BICSI).
 - 4. The Contractor shall engage experienced testing technicians for the purpose of testing the cabling systems. If requested by the Owner, the Contractor shall submit qualifications of the cable testing technician(s) for Owner review and acceptance.

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5. The Contractor shall be licensed and bonded in the State of Washington.
- C. Manufacturer Qualifications: Engage firms experienced in manufacturing components and materials listed and labeled under the applicable TIA/EIA standards (accepted, proposed or draft).
- D. Installation, equipment and materials shall be in accordance with all applicable codes, standards and regulations; including the latest editions and addenda of the following:
 1. National Electrical Code (NEC), ANSI/NFPA 70, adopted and amended by RCW 19.28, WAC 296-4 and WAC 296-401: Laws, rules and regulations for installing network cabling and related components and equipment.
 2. ANSI/NECA/BICSI 568-2006 – Installing Commercial Building Telecommunications Cabling.
 3. ANSI/TIA/EIA 526-7-98 – Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 4. ANSI/TIA/EIA 526-14-A-98 – Optical Power Loss Measurements of Installed MultiMode Fiber Cable Plant
 5. TIA/EIA TSB-125 – Guidelines for Maintaining Optical Fiber Polarity Through Reverse-Pair Positioning.
 6. TIA/EIA TSB-140 – Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
 7. ANSI/TIA/EIA 568-C.0 – Generic Telecommunications Cabling for Customer Premises.
 8. ANSI/TIA/EIA 568-C.1 - Commercial Building Telecommunications Cabling Standard.
 9. ANSI/TIA/EIA 568-C.2 - Commercial Building Communications Cabling Standard, Balanced Twisted Pair Cabling Components.
 10. ANSI/TIA/EIA 568-C.3 – Optical Fiber Cabling Components Standard.
 11. ANSI/TIA/EIA 569-B - Commercial Building Standard for Telecommunication Pathways and Spaces.
 12. ANSI/TIA/EIA 598-B – Optical Fiber Cable Color Coding.
 13. ANSI/TIA/EIA 606-A – Administration Standard for Commercial Telecommunications Infrastructure.

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14. ANSI/TIA/EIA 607-A - Commercial Building Grounding and Bonding Requirements for Telecommunications.
15. ANSI/TIA/EIA 758 – Customer-Owned Outside Plant Telecommunications Cabling Standard.
16. IEEE 802.3-2002 – IEEE Standard for Information Technology, Part 3: CSMA/CD.

PART 2 – PRODUCTS**2.01. GENERAL**

- A. Coordinate the features of materials and equipment so they form an integrated system. Match components for optimum performance and appearance.
- B. Horizontal cabling infrastructure shall be selected and constructed as a complete end-to-end solution by Amp, Hubbell, or OCC.
- C. Unless sizes and/or quantities are specifically indicated, provide at least 20% spare wiring capacity in all cabinets, panels, cable trays and raceways.
- D. All telecommunications equipment, devices, materials, etc. shall be new and installed only if in first class condition.
- E. All wire and cable installed in below grade raceways shall be suitable for wet locations.

2.02. VOICE (TELEPHONE) AND DATA (COMPUTER NETWORK) STATION CABLES & BACK BONE CABLE

- A. Voice and data station cable shall be 4 pairs, twisted, #23 AWG solid copper, nominal 100 ohm, Category 6A UTP (unshielded twisted pair) cable, 300 volt rated. Cable shall be tested and certified by the manufacturer at up to 500 MHz and shall provide positive ACR beyond 250 MHz. Cable shall support ANSI X3.263 (100 Mbps), ATM (155 and 622 Mbs), IEEE 802.3 1000Base-T (Gigabit Ethernet) and ANSI/TIA/EIA 854 1000Base-TX (Gigabit Ethernet). Cable shall conform to or exceed ANSI/TIA/EIA568-B.2-1 Category 6A Cabling requirements and ISO/IEC Class E_A cabling requirements. Additionally, the cable shall meet or exceed all the following performance criteria:

	@250 MHz	@500 MHz
1. Maximum Attenuation (dB/100M):	32.8	49.2
2. Minimum NEXT (dB):	41	37
3. Minimum PSNEXT (dB):	39	35
4. Minimum ELFEXT (dB):	20	14
5. Minimum PSELFEXT (dB):	17	11
6. Minimum RL (dB):	17.3	15.2

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7. Minimum ACR (dB):	8.2	--
8. Minimum PSACR (dB):	6.2	--

- B. Cable shall consist of 4 unshielded insulated conductor pairs and drain wire. Cable shall not utilize bonded pairs. Cable shall be of a standard round design, with an overall jacket. Jacket shall be blue.
- C. Cable shall be riser rated, be listed as being resistant to the spread of fire and bear flammability testing ratings as communications cable type CMR.
- D. Cables installed in exterior or below grade conduits shall not be required to be UL listed and shall have a water-blocking gel, be suitable for wet locations and have a black jacket. Cables shall be allowed to be CAT6 rated, with an overall foil shield.
- E. All cables shall be of the same manufacturer, Amp 6A UTP, Berk-Tek LANmark-10G UTP, Hitachi Supra 10G, Hubbell NextSpeed Ascent FTP, Superior/Essex Category 6A Sctp or approved equal.

2.03. COPPER CABLE TERMINATION HARDWARE

- A. Voice & data station cable patch panels shall be standard foot print (strait), 24 port, 1 rack units in height, with modular jack openings, supplied with un-loaded modular jacks and transparent label holders. Modular jacks shall be type RJ-45, 8-position, non-keyed conforming to T568B specification in ANSI/TIA/EIA-568-C.2 standard for shielded Category 6A. Patch panels shall provide a continuous ground path for each module. Panels shall be Amp, Hubbell, Leviton, OCC, Systimax or approved equal. Provide the number of patch panels/ports required plus 30% spare, except minimum as indicated on the drawings.
- B. Voice backbone patch panels shall be 24 or 48 port as indicated, rack mounted, category 3, modular to 110 type with 6 port modules and transparent label holders. Module jacks shall be 1 pair, 8 position, non-keyed conforming to TIA and ISO category 3 performance requirements. Patch panels shall be 1 or 2 rack units in height as indicated.
- C. Horizontal cable management panels shall be 1 or 2 rack units in height as indicated, mounted to the front of a standard 19 inch equipment rack.
- D. All patch panels, 110 blocks, clips, cable management, etc. shall be of the same manufacturer, Amp, Hubbell, Leviton, OCC, or Systimax, and specifically designed for use together.

2.04. STATION HARDWARE

- A. Telecommunications outlets and station hardware shall consist of boxes, faceplates (wallplates), voice receptacles (jacks), data receptacles (jacks), blank inserts, labels, etc. as indicated. Faceplates, receptacles, connectors, etc. shall be heavy duty modular type, of the same manufacturer, Amp, Hubbell, or OCC, and designed for use together.
- B. Voice and data receptacles shall be RJ45 jacks, die-cast metal body, non-keyed with gold plated spring wire contacts and 110 style wire terminations. Jacks shall meet ANSI/TIA/EIA-568-C.2 Standard for shielded Category 6A connecting hardware and be configured in accordance with designation T568B eight position jack pin/pair assignment.
- C. Voice and data receptacles for use in floor boxes shall be keystone standard compatible.
- D. Faceplates (wallplates) shall be commercial grade, single or double gang, as required, high impact flame retardant thermoplastic, white colored, 4 port, with transparent label windows on top and bottom. Faceplates shall be labeled as directed. Provide blank inserts in all unused ports.
- E. Wall mount type telephone faceplates shall be 8 conductor, wired to TIA-568B, with 110 style wire terminations, stainless steel faceplate and telephone mounting posts.
- F. Surface mount type telephone boxes for use in Fire Alarm and Security Panels shall be 2 port, high impact flame retardant thermoplastic, white colored, with 110 style wire terminations and RJ-31X style jacks.
- G. Individual telecommunications outlets shall be mounted in flush wall mounted boxes or combination floor boxes, as indicated.
- H. Individual telecommunications outlets in new walls and partitions and in existing fire rated walls shall be mounted in boxes. Surface mounted boxes shall be surface metal raceway style to match the surface metal raceways. Flush mounted boxes shall be cut-in style where required.

2.05. WALL MOUNTED EQUIPMENT RACKS

- A. Wall mounted equipment racks shall be heavy-duty fixed type, 41.4 inches high x 19 inches wide x 18 inches deep, wall mounted, 3" channel with universal hole pattern, self-supporting, minimum 200 pound loading capacity, with ground terminal block, Chatsworth 11961-718, or approved equal.
- B. Equipment racks and vertical wire management shall be of one manufacturer.
- C. Provide all necessary mounting brackets, plates, pans, shelves, hardware, wire management, etc.

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2.06. CABLE RACKS

- A. Cable racks (including the supports, brackets, radius dropouts and other miscellaneous hardware) shall be of one manufacturer, Chatsworth Products, Inc., UL Classified Cable Runway, B-Line Saunders Cable Runway, or approved equal.
- B. Cable racks shall be universal type tubular steel cable, with $1\frac{1}{2}$ " x $\frac{3}{8}$ " side rails, minimum 12 inches wide with 9 inch rung spacing and all necessary mounting, grounding, splicing, etc. accessories.
- C. Cable racks shall be mounted to the top of the equipment racks with 4" standoff brackets.
- D. Pipe stands shall be provided where required to support the cable rack from the floor where the span exceeds the rating of the rack. Supports from the ceiling shall not be allowed.
- E. Radius Drops shall be provided at each location where cables transition from the cable rack down to equipment racks, cabinets, wall mounted hardware, etc. so that bending radius standards are maintained for all cables.
- F. Cable rack and all fittings, connectors, supports, etc. shall be UL Classified as an Equipment Grounding Conductor.

2.07. CABLE SUPPORTS

- A. Supports for cables run "open" above ceilings and the like shall be wide base type J-hook assemblies. Supports shall be made of galvanized steel and have minimum 2" diameter.
- B. Supports for large bundles of cables (more than 50 cables) run open above ceilings, in crawlspaces and the like shall be wide base fabric loop, re-enterable assemblies, Erico Caddy CAT425, or approved equal.
- C. Supports for attachment to drop wires shall be capable of minimum 25 lb load capacity.
- D. Supports for attachment to T-bar grid will not be allowed.
- E. Bundle cables with double sided Velcro straps. Tie-wraps shall not be allowed.
- F. Support spacing shall not exceed 5 feet.

2.08. PULL STRING AND ROPE

- A. Pull string shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, etc.

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- B. Pull rope shall be twisted polypropylene treated with ultraviolet stabilizers, minimum $\frac{1}{4}$ inch diameter. Rope shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, etc.

2.09. GROUNDING

- A. Telecom Main Grounding Busbar (TMGB) shall be a prefabricated assembly, solid copper, minimum $\frac{1}{4}$ inch thick x 4 inches high x 20 inches long, complete with insulators, mounting brackets and hardware. Ground bars shall be pre-drilled with both $\frac{1}{4}$ inch diameter holes spaced on $\frac{5}{8}$ inch centers and $\frac{3}{8}$ inch diameter holes spaced on 1 inch centers for two-hole lugs in compliance with the ANSI/TIA/EIA 607-B recommendations. TMGB shall be B-line model SB476, Chatsworth Products model 40153-020, Eritech model TMGB-A20L27PT, Harger model GB14420TMGB, or approved equal.
- B. Telecom Grounding Busbars (TGB) shall be same as TMGB, except minimum 12 inches long
- C. If required, the contractor shall drill additional $\frac{1}{2}$ inch diameter holes spaced on $1\frac{3}{4}$ inch centers for two-hole lugs on large cables. The Contractor may not elect to fabricate the ground bars.
- D. Ground cable shall be single conductor stranded copper with 600 volt type XHHW or THWN/THHN insulation. Conductor size shall be minimum # 6 AWG unless noted otherwise. Conductor insulation for # 2 AWG and smaller cables shall be green color; insulation for # 1 and larger cables may be black with green marking tape applied in telecommunications rooms.
- E. Ground lugs, clamps, nuts, washers, etc. shall be corrosion resistant high copper alloy or silicon bronze. Cable-to-cable connectors shall be copper, compression type.
- F. Cable lugs at ground bars, equipment, racks, etc. shall two-hole bolt-on compression type, long barrel, $\frac{5}{8}$ inch hole spacing for # 6 AWG and smaller cables, 1 inch hole spacing for # 4 AWG through # 1/0 AWG cable and $1\frac{3}{4}$ inch hole spacing for # 2/0 AWG and larger cable. Mounting bolts shall be $\frac{1}{4}$ inch, $\frac{3}{8}$ inch or $\frac{1}{2}$ inch diameter (as required), with hex head bolts, beveled or spring type washers, lock washers and hex head nuts; Thomas & Betts 548 series or Burndy YA series (no exceptions).

2.10. NAMEPLATES AND LABELS

- A. Provide identification tags with labels for the following:
 - 1. Backbone cables, on both ends and at each pathway junction point (e.g. entrance/exit of conduits or raceways), and at 100 foot intervals in open cable tray systems. Labels shall identify the cable type, function, origin and destination.
 - 2. Telecom Main Grounding Busbars and Telecom Grounding Busbars.
 - 3. Primary Protector Panels.

B. Provide labels for the following:

1. Backbone cables, on both ends and at each pathway junction point (e.g. entrance/exit of conduits or raceways), and at 100 ft. intervals in open cable tray systems. Labels shall identify the cable type, function, origin and destination.
2. Voice and data station cables, at both ends, with the cable ID code.
3. Ground cables, with cable origin and destination.
4. Telecommunications faceplates, with the voice and data cable ID codes.
5. Voice and data cable termination hardware, with the cable ID codes.
6. Fiber optic termination housings.

C. Nameplates, labels, identification tags, etc. shall utilize identifier formats consistent with the ANSI/TIA/EIA 606-A standard. Submit proposed inscriptions to Owner for approval prior to construction.**D. Font size, color and contrast for all labels shall be in accordance with the ANSI/TIA/EIA 606-A standard.****E. All labels shall be neatly typed or generated with a mechanical labeling device.****F. All labels shall be long lasting and durable, resistant to heat, moisture, solvents, oil, etc.****G. Cable ID code, labeling scheme, etc. will be provided to the Contractor by the Owner and Engineer. Submit a sample of the proposed labels to Owner for approval prior to installation.****2.11. ANCHORS AND FASTENERS**

- A. Anchors and fasteners used shall be of a type designed for use in the base material to which the item is to be attached. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts.
- B. Pad and floor mounted equipment shall be secured with suitable hot dipped galvanized steel anchor bolts, washers, hex nuts, etc.
- C. Powder actuated fasteners, plastic expansion type anchors, nails and toggle bolts are not permitted.

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- D. Anchors shall be non-corrosive or have suitable corrosion resistant coatings or treatment.
- E. Bolts, nuts, screws and other threaded devices shall have standard threads and heads, unless required for tamper-proof installation.

PART 3 - EXECUTION**3.01. DEMOLITION**

- A. Telecommunications cables indicated as to be removed shall be removed from their point of origin to destination, except, modern CAT6 and RG6 cables shall be pulled back to the nearest cable tray, coiled out of sight and labeled for future use.
- B. TELECOMMUNICATIONS CABLES INDICATED AS TO BE REMOVED AND RE-INSTALLED OR RELOCATED, SHALL BE PULLED BACK AND COILED IN A NEAT AND SAFE MANNER, BY QUALIFIED COMMUNICATIONS PERSONNEL, PRIOR TO ANY DEMOLITION WORK. CARE SHALL BE TAKEN TO PROHIBIT DAMAGE TO THE CABLES DURING CONSTRUCTION WORK. DEMOLITION OF TELECOMMUNICATIONS CABLES SHALL NOT BE PERFORMED BY DEMOLITION CONTRACTOR, GENERAL CONTRACTOR OR ELECTRICAL CONTRACTOR PERSONNEL.
- C. Where demolition work effects the building tenants and operations, coordinate work with the owner, tenants and respective service providers.

3.02. LOCATIONS

- A. Outlets shall be mounted 18 inches to centerline above finished floor unless noted otherwise; except, outlets above counters, etc. shall be mounted 6 inches to centerline above the counter or 3 inches to centerline above the splashboard, whichever is higher.
- B. Wall mounted and emergency telephones shall be mounted 54 inches to highest operable component above finished floor unless noted otherwise.

3.03. COORDINATION OF THE WORK

- A. Where work may affect owner's standards or operations, coordinate the work of this Section with Owner's Telecommunications Department.
 - 1. Meet jointly with the Owner's representative and representatives of the Telecommunications Department to exchange information and agree on schedules, and details of equipment arrangements and installation interfaces.

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2. Record the agreements reached in these meetings and distribute the records to all participants.
3. Schedule the work to avoid unreasonable disturbance or interruption of University operations.
4. Adjust the arrangements and locations of equipment and cabling supports in affected rooms and spaces to accommodate and optimize the room or space arrangements.

- B. Schedule the work to avoid disturbance or interruption of Owner's operations in adjacent spaces and access pathways.
- C. Coordinate work schedule to facilitate installation of active electronic equipment and cut-over of services.

3.04. INTERRUPTIONS

- A. Telecommunications interruptions, whether to individual equipment or to the entire system, shall not be done without prior approval and scheduling with the Owner. Telecommunications interruptions that affect operation of the existing facility shall not be done during normal working hours. Some working of non-standard hours will be required, without increase in Contract Sum.
- B. Telecommunications services may be interrupted during the construction process provided that the facility is not occupied and services are returned prior to return of the building occupants.
- C. Reconnection of individual items shall be done 1 at a time.
- D. As much as possible, cables and equipment shall be pre-assembled, systems prefabricated and cable pre-installed to minimize the change-over down time.

3.05. WIRES AND CABLES

- A. Inspect cable prior to installation to verify that it is identified properly on the reel or box identification label, is of proper gauge, containing correct number of pairs, etc. Note any buckling of the jacket which would indicate possible problems. Damaged cable or any other components failing to meet specification shall not be used in the installation.
- B. Telephone/voice and computer/data cables shall be homerun to the Communications Room without splices or taps and terminated in patch panels in an equipment rack.
- C. All exposed power limited telecommunications cable shall be run in metal raceways, except where specifically approved otherwise.

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- D. All concealed power limited telecommunications systems cable may be run "open" in accessible ceilings; except, where indicated otherwise and where penetrating through ceilings, floors, walls, draft-stops, etc.
- E. "Open" cables shall be bundled and supported from permanent structural members of the building, either directly or indirectly, with suitable hooks. Support spacing shall not exceed 5 feet. Protect "open" cables during installation in ceiling spaces. Cables shall not interfere with the removal of pipes or equipment for maintenance or repair. All "open" cable shall be kept a minimum of 6 inches from pipes, ducts, and other items producing heat. Support "open" cables a minimum of 6 inches above T-bar ceilings. Cables shall be bundled using double sided Velcro straps. Tape and tie-wraps are not approved methods of bundling or supporting cables.
- F. Floor and ceiling penetrations by "open" cables will not be allowed. Provide conduit sleeves, minimum 2" EMT, as required plus a spare (with fire and dust stopping and sealing) where "open" cable passes through floors, walls, partitions, etc.
- G. Cable shall be unrolled from reels, or removed from cartons, and installed in a manner which will prevent kinking, crushing or excessive tension on conductors and insulation.
- H. Slack cable shall be provided at both ends of the cable and at all major pull points to accommodate future changes to the cabling system. A minimum 10 feet shall be provided in the telecommunications room, coiled above the cable rack. A minimum 12 inches shall be provided at the outlet locations, coiled in the accessible ceiling space, where available, or in the surface mounted raceway system.
- I. Cable shall be installed or drawn into the raceway system only after all work of any nature that might cause injury to the cable is completed. The raceway systems shall be complete (including the installation of bushings, grommets, etc.), snaked and cleaned, and approval of the installation is obtained from the Owner and Engineer, before pulling any cable.
- J. Telecommunications cable shall be installed without sharp bends (less than 2 inch radius) or pulling tension in excess of 20 pounds.
- K. Cable pulling lubricants shall be used to minimize pulling stresses on cable pulled into raceways.
- L. All cable is subject to subtle damage that may degrade future performance, if abused during installation. In all cable installation, set reels and use sufficient pulleys and manpower so that cables are not pulled around corners or against material that might cause chafing.

OBSERVATION OF IMPROPER CABLING HANDLING TECHNIQUES MAY CAUSE THE CONSULTANT/ENGINEER AND/OR OWNER TO REQUIRE THE CONTRACTOR TO DISCARD AFFECTED CABLES, INCLUDING ANY OTHERS ALREADY INSTALLED BY THE PERSONNEL FOUND USING INCORRECT PROCEDURE.

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- M. In general, communications cable cannot tolerate sharp bends or excessive pull tension during installation. Adhere to manufacturers recommended minimum bend radius and maximum pull tension for cables; except, not less than 2 inch bending radius and pulling tension in excess of 20 pounds.
- N. Cable lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit. After installation, exposed cable and other surfaces must be cleaned free of lubricant residue. (Ideal Yellow 77 is not approved.) Recommended Products:
 - 1. Twisted-pair cable: Dyna-Blue, American Polywater
 - 2. Optical fiber cable: Optic-Lube, Ideal
- O. Replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, and over tightened bindings.
- P. Replace or rework UTP cables with loosely twisted and over twisted pairs at terminals, and re-terminate UTP cables with sheath removed more than $\frac{1}{2}$ inch.

3.06. PULL STRINGS AND ROPES

- A. Provide pull ropes in all below grade telecommunications conduit and duct (with or without cables) and in all cable tray.
- B. Provide pull string in all above grade telecommunications conduits (with or without cables), except pull strings shall not be permitted in plenum ceiling spaces.

3.07. CABLING CONFIGURATION

- A. Cable installation in the telecommunications closets shall conform to the requirements of the TIA/EIA Standards and the project documents. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, ventilation mixing boxes, network equipment, access hatches to air filters, switches, electrical outlets, electrical panels and lighting fixtures. Avoid crossing areas horizontally just above or below any riser conduit. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings.
- B. Cable shall be routed as close as possible to the ceiling, floor, or corners to insure that adequate wall or backboard space is available for current and future equipment and for cable terminations. Cables shall not be supported from existing electrical conduit or other equipment. Minimum bend radius shall be observed.

- C. Bundle all similarly routed cables together, and attach by means of support saddles screwed to the backboard, then routed vertically and/or horizontally via "square" corners over a path that will offer minimum obstruction to future installations of equipment, backboards, or other cables. Observe cable bend radius.
- D. Cables shall be bundled together by means of Velcro straps. Do not over tighten Velcro straps on station cables. Tie-wraps shall not be used as a means of support or bundling.

3.08. VOICE AND DATA STATION CABLE TERMINATION

- A. Terminate all voice and data station cables on patch panels and at stations in accordance with ANSI/TIA/EIA Standards and accepted industry practice. Bundle together and support cables at the equipment rack in a neat and workmanlike manner. Reduce untwisting of copper pairs by stripping back only as much cable jacket as is required to perform connecting hardware terminations, except maximum $\frac{1}{2}$ inch.

3.09. VOICE BACKBONE CABLE TERMINATION

- A. Voice backbone cables in telecommunications rooms shall be terminated on 110 hardware or primary protectors, as indicated, in accordance with ANSI/TIA/EIA Standards and accepted industry practice. Provide appropriate ground lugs for shielded cables and ground to the TMGB as indicated.
- B. Voice backbone cables in new or existing splice cases shall be spliced to new and/or existing cable pairs, as indicated, with 25 pair in-line splice modules in accordance with ANSI/TIA/EIA Standards and accepted industry practice. Provided appropriate ground lugs for shielded cables and bond to the shields of all other cables in the splice case. Bonding shall provide both electrical continuity and physical stability for the cable.
- C. Where existing splice cases are modified, the contractor shall provide new or modify existing end caps to ensure the physical integrity of the splice case.

3.10. EQUIPMENT RACKS AND CABLE RACKS

- A. All equipment racks and cable racks shall be anchored to the floor and bolted to the walls in accordance with manufacturer recommendations and industry standards.
- B. Concrete anchors used to mount equipment racks to concrete floors shall be $\frac{1}{2}$ " diameter and shall be buried a minimum $3\frac{1}{2}$ " deep in the concrete floor.
- C. Lag bolts used to mount equipment racks to wood structure shall be $\frac{1}{2}$ " diameter and shall be bolted through the depth of the wood structure, except, minimum 3" depth.

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- D. All equipment racks shall be securely attached to the cable rack above with manufacturer's standard hardware.
- E. Cable racks shall be supported from the wall with steel triangular support brackets in the middle and L-brackets on the end. Do not support from ceilings.
- F. Brace all equipment, equipment racks, cable racks, etc. as required to meet the requirements of Seismic Design Category D.

3.11. GROUNDING

- A. Ground/bond the Telecom Grounding Busbars to the Telecom Main Grounding Busbar with minimum #1/0 AWG cable.
- B. Ground/bond all sections of the telecommunications raceway system to the Telecom Grounding Busbars with a minimum # 12 AWG cable. The ground wire shall be run alongside the telecommunications cables and bonded to physically isolated raceway system components throughout the facility (i.e., conduit sleeves, consolidation panels, telecommunications cable tray, access point enclosures, etc.), except 1" conduit stubs less than 10 feet in length from outlet locations up to ceiling spaces are not required to be grounded.
- C. Ground/bond the telecom cable trays and conduits entering the Telecom Rooms to the with minimum # 6 AWG cable.
- D. Ground/bond all equipment racks, cable rack, etc. in the Telecom Rooms to the Telecom Grounding Busbars with minimum #6 AWG cable.
- E. Ground/bond the primary protector(s) in the Telecom Rooms to the Telecom Grounding Busbars with minimum #6 AWG cable.
- F. Ground/bond sections of cable racks together with manufacturer recommended hardware, except, bonding jumpers are not required between sections of cable rack which are UL Listed as equipment grounding conductors.
- G. Before grounding connections are made, contact surfaces shall be thoroughly cleaned and anti-oxidant solution applied.
- H. Connections shall be both mechanically and electrically secure. Torque connecting hardware in accordance with the manufacturer's instructions and recommendations.
- I. Torque connecting bolts at telecommunications grounding busbars to 35 ft/lbs.

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- J. Tests shall be made to verify the continuity of the ground system and all ground fault return paths.

3.12. OUTLETS

- A. Outlet boxes shall be securely attached to walls or structural/framing members with approved anchors and fasteners. Use of adhesive tape for this purpose shall not be permitted.

3.13. TESTING

- A. All testing shall be performed by personnel that are trained and certified in the specific task. The Contractor shall perform end-to-end installation performance tests of the cabling plant. The Contractor shall submit for approval a proposal describing the test procedures, test result forms, and timetable for fiber optic, and all copper wiring.
- B. The Owner and Engineer shall be notified one week prior to any testing so that the initial testing may be witnessed.
- C. For phased projects, the contractor shall submit one (1) copy of the test result documentation at the completion of each phase to the Engineer for review. Preliminary test reports shall be provided in electronic format – paper copies shall not be required.
- D. The Contractor shall submit three (3) final copies of the test result documentation for all required tests (including fiber optic OTDR tracing printouts and distance test results), and provide verification that all cable tests have been completed. Test reports shall be submitted on a CD-ROM and shall include viewing software for viewing the test report files. Documentation shall identify each cable with the designated identification description. Cables that do not meet the minimum standards as specified, at any of the required tests, shall be replaced at the Contractors expense.
- E. Provide cable test results in both paper copy and software form (where available) on a CD-ROM; except, for station cables and intra-building voice backbone cables provide only a summary in paper copy and complete test results for individual station cables in software form. The CD-ROM shall include the necessary viewing software for all test reports.
- F. Copper Voice/Data Cable Testing:
 - 1. All voice station drop cables shall be tested in accordance with the “permanent link” configuration as defined in ANSI/TIA/EIA 568-C.1. The entire link (termination hardware, jacks, cables, etc.) shall pass all tests to ANSI/TIA/EIA Category 6A specifications and ISO/IEC Class E_A parameters, at up to 90 meters in length.
 - 2. Each wire/pair shall be tested for, minimum:

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- a. Wiremap (polarity, pair reversals, continuity, shorts and grounds);
 - b. Cable length (record all lengths);
 - c. Insertion Loss;
 - d. NEXT (near end cross talk);
 - e. PSNEXT (power sum NEXT);
 - f. ACRN (attenuation/cross-talk ratio – near end);
 - g. PSACR-N (power sum ACR – near end);
 - h. FEXT (far end crosstalk);
 - i. ACRF (attenuation to crosstalk ratio – far end);
 - j. PSACRF (power sum ACR – far end);
 - k. PSANEXT (power sum alien NEXT);
 - l. PSAACRF (power sum alien ACRF);
 - m. Propagation delay;
 - n. Delay skew;
 - o. Return Loss.
3. Test procedures shall be based on ANSI/TIA/EIA 568-C.1 and ANSI/TIA/EIA 568-C.2 utilizing a commercial UTP cable tester that meets or exceeds the specified accuracy requirements defined as Level III for use with Category 6A and Class E_A cabling systems. Each tester shall be certified as calibrated within three (3) months of testing.
4. Test results which pass within the margin of error of the tester shall not be acceptable. In the event that a cable passes the test within the margin of error, the Contractor shall determine problem(s) and make corrections as required (including replacement of the cable and/or other components if necessary) at Contractor's expense without increase in Contract Sum. After correction(s), Contractor shall repeat tests.

G. Voice Backbone Cable Testing:

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1. Conduct CAT 3 tests on all voice backbone cables from origin to destination. Each 4 pair group within the multi-pair cable shall be tested for faults, continuity, length, attenuation and NEXT.
 2. Tests shall be performed utilizing a commercial UTP cable tester that meets or exceeds the specified accuracy requirements defined with Category 3 cabling systems. The tester shall be certified as calibrated within three (3) months of testing.
 3. Test results shall be recorded and reported in software form.
- H. After all testing has been completed, the Contractor shall verify functional operation of each receptacle (e.g. each voice receptacle has dial tone, each active data receptacle connects to the data equipment, etc.).
- I. For all tests not meeting criteria as determined by the Owner and Engineer, Contractor shall determine problem(s) and make corrections as required (including replacement of the cable and/or other components if necessary) at Contractor's expense without increase in Contract Sum. After correction(s), Contractor shall repeat tests.

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PART 1 – GENERAL**1.01. APPLICABLE PROVISIONS**

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the fire detection and alarm system work.
- B. Coordinate fire detection & alarm system work with related work shown and specified elsewhere:
 - 1. Building Automation and Control System.
 - 2. Fire Suppression Systems.
 - 3. Doors and door hardware systems.
 - 4. Mechanical HVAC systems.
 - 5. Fire Sprinkler system.
- C. Provide equipment, devices and all necessary accessories for a complete fire detection and alarm system. Provide all materials necessary for the proper execution and completion of the Work. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. The Fire Alarm System Supplier and contractor shall review the fire sprinkler drawings and include all flow, tamper, PIV monitor and temperature monitor modules as required.
- E. In the event that any item is not available exactly as specified, the Contractor shall so notify the Owner in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. ALTERNATES

- A. Include fire detection and alarm work associated with each alternate in the alternate bid price.

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1.04. PLAN REVIEW AND PERMITS

- A. The Contractor shall submit complete sets of fire alarm system submittals as required to the Whatcom County Fire Marshal for approval and pay the plan review fees.
- B. The Contractor shall arrange for inspections and pay for all required licenses, permits, inspections, plan review fees and any other fees.
- C. All necessary permits and approvals shall be obtained prior to the start of construction.

1.05. APPROVED EQUIPMENT SUPPLIER

- A. The Engineered System Distributor shall be an authorized factory representative of the specified equipment to ensure proper specification adherence for system programming, operation, final connection, test, turnover, warranty compliance, and after-market service.
- B. System and all appurtenances shall be manufactured, tested, and shipped by a single supplier, who is a local (not more than 50 miles from site and within the United States) authorized distributor that can provide 24 hour service with factory trained personnel, a required stock of replacement parts, and technical assistance.
- C. In addition to the single supplier providing the system, a competitive second supplier, minimum, shall also meet the same criteria for the system being submitted. A proprietary system with only 1 supplier meeting the criteria above is not approved.
- D. Fire detection and alarm system shall be Silent Knight or Potter. Silent Knight Farenhyt series is not approved.

1.06. QUALITY ASSURANCE

- A. Fire alarm system shall be installed by, or under the direct supervision of, a qualified representative of the manufacturer. Contractor and Contractor's personnel shall be experienced, thoroughly trained and completely familiar with fire alarm systems and the required methods of installation.
- B. The Distributor shall have a minimum of 5 years experience installing fire alarm systems as specified herein.
- C. Programming/re-programming, testing, etc. shall be by a qualified representative of the manufacturer.
- D. System shall comply with all requirements of NFPA #72 (National Fire Alarm Code), International Fire Code, International Building Code and ADA.

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- E. Fire alarm system shall be in accordance with all applicable codes and standards and all requirements of the City of Sumas, State of Washington and Whatcom County.

1.07. SUBMITTALS

- A. Submit complete documentation for the fire alarm system equipment, devices, materials, etc. showing the model number, type, rating, size, style, manufacturer's names, and manufacturer's catalog data sheets for all items. Include data on features, rating, and performance.
- B. Provide calculations to support the size of stand-by batteries submitted.
- C. Provide voltage drop calculations for all alarm (horn, strobe) circuits. Increase cable sizes if required.
- D. Submittals shall include complete fire alarm system riser and wiring diagrams, plan drawings, etc. (Engineer will provide construction drawings AutoCAD files to contractor, if desired.) Include dimensioned plan and elevation views, diagrams, and other details of components as appropriate.
- E. If requested by the Owner, provide samples of materials for evaluation.

1.08. RECORD DOCUMENTS

- A. Submit "as-built" record drawings and operation and maintenance manuals at completion of the project in accordance with the specific submittal requirements listed elsewhere in these Specifications.
- B. Provide as-built documentation consistent with the contract documents as required, in AutoCAD Version .dwg files with as-built notations for all sheets. (Consultant/Engineer will provide construction drawings AutoCAD files to contractor.)
- C. As-built drawings shall include the identification numbers for each device on the plans.

PART 2 - PRODUCTS**2.01 GENERAL**

- A. Coordinate the features of materials and equipment so they match the system seamlessly.
- B. Contractor shall make certain that all materials selected by him, his subcontractors or by his suppliers, conform exactly to requirements of the drawings and specifications. Transmittal of such specifications and drawing information to subcontractors, person manufacturing and/or supplying materials to the project, and rigid adherence thereto, is the Contractor's responsibility.

- C. All equipment, devices, fixtures, materials, etc. shall be UL (Underwriter's Laboratories, Inc.) and FM (Factory Mutual) listed, labeled and approved for the service intended where UL standards have been established.
- D. All equipment, devices, fixtures, materials, etc. shall be new and installed only if in first class condition, unless specifically designated as existing.

2.02 SYSTEM DESCRIPTION

- A. Fire detection and alarm system shall be automatic, microprocessor based, addressable technology, zoned, fully supervised, Class B; complete with all necessary hardware, software and memory specifically tailored for this installation.
- B. The system shall provide audio/visual signal appliances for the safe and orderly evacuation of the building. System shall include the required number of alarm zones plus space for the addition of minimum 6 future alarm zones).
- C. Fire alarm System shall employ a one-way private radio alarm system utilizing a single radio alarm transmitter (RAT) located on the premises with the following requirements. It shall:
 - 1. Transmit fire alarm, supervisory, and trouble signals from the protected premises to at least two radio alarm repeater station receivers (RARSRs)
 - 2. Monitor integrity of the transmission and communications channel by testing the signal from every transmitter once every 24 hours.
 - 3. Monitor the quality of the signal received and annunciate at the supervising station if the signal falls below minimum signal quality specified in NFPA 72.
 - 4. Provide redundant communication path with minimum of two independent RF paths that must be simultaneously employed.
 - 5. Monitor the interconnection of the premises unit and indicate a failure at the premises or transmit a trouble signal to the supervising station.
 - 6. Be compatible with the owner's current monitoring company.
- D. Fire alarm panel shall have a Communicator that is integral with the panel that monitors the radio system.
- E. Upon approval from the Fire Marshal, in lieu of the radio system described, the fire alarm system shall supervise 2 telephone lines, be capable of seizing the lines and notifying a local 24 hour monitoring service on either or both lines, upon actuation of any initiating device (alarm or tamper) or trouble on any zone. Provide programming, etc. as required for connection to the monitoring company of the Owner's choice.
- F. Fire alarm panels shall be fully automatic, surface mounted, dead front, modular construction type for ease of expansion and servicing. Panels shall be complete with all necessary controllers, displays, interface and signalling circuit cards, power supplies, batteries, inputs, outputs, user operation switches, relays, contacts, supervisory detection of all faults (including shorts, grounds, low battery, etc.), alarm

and trouble lights for the panel plus each zone, silence pushbutton, etc. Control panel shall indicate sequentially zones in alarm, zones in trouble and system functions. LEDs shall augment the display to make clear the system status. Integral keypad shall operate, set up and interrogate the system.

- G. Provide a remote annunciator at the building entrance for control and monitoring of the system.
- H. Provide a graphic panel adjacent to the fire alarm panel and at annunciator locations for indication where in the building the alarm has occurred in accordance with applicable codes and standards.
- I. Provide devices (smoke detectors, heat detectors, pull stations, etc.), addressable type where available. Non-addressable type devices shall be provided with addressable modules.
- J. System shall supervise the sprinkler systems. Connect to flow, tamper, etc. switches accordance with NFPA requirements. Provide temperature monitoring in sprinkler riser rooms where required.
- K. System shall supervise the dry-pipe sprinkler system in accordance with NFPA requirements.
- L. System shall supervise the kitchen hood fire suppression system (if provided). Connect to flow, tamper, etc. switches accordance with NFPA requirements.
- M. System shall supervise the radio signal amplification system in accordance with NFPA requirements.
- N. Outputs, relays, contacts, etc. shall be provided for automatic alarm operations as required.
- O. System shall be capable of adding future sub-panels, detectors, stations and alarms throughout the facility and in future additions and/or portable classrooms.
- P. Fire detection and alarm panels shall be Silent Knight, to match the district's existing systems. Silent Knight Farenhyt series is not approved.
- Q. Alarm mode shall mute Gym AV system and Clock Intercom System.

2.03 PROGRAMMING

- D. Alarm operations and user operations shall be programmed into the Fire Alarm Panel based on applicable codes and Owner requirements.
- B. Automatic Alarm Operations
 - 1. Operation of any initiating device shall display a supplier programmed message on the display, and light the zone LED. Supplier shall submit proposed message to Owner and Engineer for approval prior to programming.

2. Operation of any initiating device shall flash the alarm queue LED, sound a momentary audible signal, and annunciate on the alphanumeric LCD display. It shall display the type, condition, and a location message for the first alarm immediately without the need for operator response.
3. Operation of initiating devices (smoke detectors) in elevator lobbies, elevator hoistway or elevator machine room shall cause the elevator to be re-called to the designated level or alternate level as required by NFPA 72. Programmable control modules shall be provided at the elevator control cabinet as required by the elevator supplier. A distinct message shall be displayed at the control panel and the remote annunciator to indicate that the elevator is no longer safe for use.
4. Operation of heat detectors in the elevator hoistway or machine room shall initiate the shunt trip of the elevator circuit breaker via a programmable control module to shut down the elevator prior to sprinkler operation.
5. Operation of heat detectors in the elevator hoistway or machine room shall initiate the shunt trip of the elevator circuit breaker via hardwired 120V contacts to shut down the elevator prior to sprinkler operation
6. Sort all events by type and log into type queues for display by emergency user selection. Sound a momentary audible signal for each event occurrence. Flash a queue LED when an unseen event exists in a queue. Update the display to annunciate the total by type and the chronological number of the event on display.
7. Display the operational status of each signal circuit to inform the emergency user of the system signal programming.
8. All alarms shall sound evacuation signals throughout the building.
9. HVAC fan and air handling unit shutdown:
 - a. Large units (greater than 2000 cfm) shall be stopped.
 - b. Where smoke/fire dampers are installed on the connected ductwork, the unit shall be stopped, regardless of cfm rating.
 - c. Provide override capability to restart units before alarm is cleared.
 - d. Unit shutdown shall be a hardwired connection to the motor controller for each individual unit and shall not rely on the building HVAC control system.
 - e. Building HVAC control system shall be notified that the fire alarm system has initiated shutdown of the HVAC fans and air handling units.

10. Large rooftop HVAC air handling units shall be provided with shut-down capability and shall be monitored by the fire detection and alarm system. Operation of a duct smoke detector shall report as a trouble signal.
11. Magnetic door holders shall be released.
12. Smoke/Fire dampers shall be closed. Relays shall be programmed with a 30 second delay to allow the associated air handling units to come to a complete stop prior to closing the dampers.
13. Notify monitoring service.

C. Emergency User Controlled Operations

1. Operation of the "Alarm Silence" switch shall silence all alarm signals (except strobes shall continue flashing) and turn on an "Alarm Silenced" LED. Should a new alarm occur after signal silence the alarm devices shall re-sound.
2. Operation of the "Sound Total Evacuation" switch shall turn on the "Evacuation" LED and sound all alarms.
3. Operation of the "Silence Operator Alert Signal" switch shall turn off the operator alert signal. An amber status LED shall follow the signal operation.
4. Operation of the "Next Message" switch shall display the next event logged in a queue. Operation of the "Next Message" switch when the last event is on display shall scroll the display back to the first event.

D. Non-Emergency User Operations

1. Log a trouble and turn on a related LED for all user features which modify, bypass, or inhibit the normal operations of the fire alarm system.
2. Trouble signals shall be suppressed during delivery of alarm signalling.
3. Operation of the "Test All Lamps" switch shall start the lamp test sequence. The lamp test sequence shall test all display modules and remote annunciator LEDs.
4. Operation of the "Menu" switch shall activate a program to guide the user through programming operations. Restrict the use of this program by password.
5. Operation of the "Reset System" switch shall return the system to normal after all initiating devices have been returned to normal.

2.02. CONTROL PANELS

- A. Fire alarm panels shall be modular construction type for ease of expansion and servicing.
- B. The Main Fire Alarm Panel shall include the following, minimum:
 - 1. Addressable device controllers, modules, etc. as required.
 - 2. Traditional initiating device interface cards as required.
 - 3. LCD display Module.
 - 4. Control display modules as required.
 - 5. Remote microphone interface.
 - 6. Computer command port.
 - 7. Modem communicator card
 - 8. RS-232 output (RJ45 form factor).
 - 9. Digital Alarm Communicator Transmitter (DACT).
 - 10. Annunciator output.
 - 11. Two "form C" common alarm contacts.
 - 12. One "form C" common trouble contact.
 - 13. 24 volts DC power supply and batteries.
 - 14. Remote trouble output.
 - 15. User controlled operations (emergency and non-emergency) switches and LEDs.
 - 16. Terminal blocks as required for all field wiring.
- C. Fire Alarm Sub-Panels shall include, as required:
 - 1. Controllers, modules, etc. as required.

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2. Analog device interface cards as required.
 3. LCD display module.
 4. Control display modules as required.
 5. Programmable signalling circuit cards (3 amps each).
 6. Two "form C" common alarm contacts.
 7. One "form C" common trouble contact.
 8. 24 volts DC power supply and batteries.
 9. Remote trouble output.
 10. Terminal blocks as required for all field wiring.
- D. Control panel cabinets shall be wall mounted, NEMA 1. Cabinets shall have inner and outer doors with viewing windows. All indicators, controls and instructions shall be clearly visible through the viewing windows.
- E. Control panel cabinets shall be wall mounted, NEMA 1, Cabinets shall have inner and outer doors with viewing windows. All indicators, controls and instructions shall be clearly visible through the viewing windows.
- F. Provide a minimum 2 line by 40 characters Liquid Crystal Display (LCD) to annunciate each addressable input device or conventional input zone, alarm or trouble operation.
- G. All notification appliance circuits shall be powered from modules internal to the fire alarm cabinet. Booster power supplies adjacent to the fire alarm panel will not be allowed.
- H. Panels shall have the following additional features, without requiring any changes in hardware or firmware:
1. Logic Statements.
 2. Time Controls.
 3. Sequences.
 4. Actions.
 5. Weekday/Holiday schedules.

6. Reporting of all sensors and zones.
7. Sensitivity setting by sensor (within UL Limits).
8. Sensitivity setting changed by time (day/night mode).
9. Alarm verification by point or zone.
10. Enabling and disabling of any system device or function.
11. Ground fault detection on all system devices and inputs.
12. Normal and silent walk tests.

2.03. REMOTE BOOSTER POWER SUPPLY

- A. Remote booster power supply panels shall include, as required:
 1. Controllers, modules, etc.
 2. Analog device interface cards.
 3. Programmable signalling circuit cards (3 amps each).
 4. Two "form C" common alarm contacts.
 5. One "form C" common trouble contact.
 6. 24 volts DC power supply and batteries.
 7. Remote trouble output.
 8. Terminal blocks as required for all field wiring.
- B. Panels shall be wall mounted, NEMA 1. All indicators, controls and instructions shall be clearly visible through the viewing windows.

2.04. ANNUNCIATOR

- A. Annunciator shall be supervised, flush mounted, keypad type with English language back-lit liquid crystal display. Annunciator shall indicate sequentially zones in alarm, zones in trouble and system functions.

LEDs shall augment the display to make clear the system status. Integral keypad shall operate, set up and interrogate the system. Integral microphone shall operate the system emergency voice communication capability.

- B. Annunciators shall be sized as required to allow for all control display modules to be installed.
- C. Annunciators shall be provided with remote microphones, unless specifically noted otherwise.

2.05. GRAPHIC MAP

- A. Graphic map shall be a floor plan representation of the facility and shall include the following:
 - 1. Clearly legible room names and numbers for all floors of the building.
 - 2. Location of the Annunciator indicated with "You are Here" notation.
 - 3. Location of the Fire Alarm Panel.
 - 4. Location of Sprinkler Valve Riser Room.
 - 5. Location of the Mechanical Room.
 - 6. Location of Electrical Room.
 - 7. Locations and zone numbers of Areas of Evacuation Assistance.
- B. Graphic Map shall be minimum 18 inches by 24 inches or larger if required to accurately represent the facility, white with black lines and lettering behind a $\frac{1}{8}$ inch anti-glare acrylic pane. Frame shall be anodized aluminum with concealed hanging system.
- C. Install the graphic map on the wall adjacent to the remote annunciator and the fire alarm panel.

2.06. ADDRESSABLE LOOPS AND CIRCUITS

- A. Each device shall have a unique address. The Supplier shall program each address to a system input zone and correlate to output operations, as directed by the Owner. Non-functioning, non-addressed and non-programmed devices shall report trouble. The system shall be capable of field modification to the addressable programming, and for future addition or removal of devices, without the necessity of re-addressing any other devices. Provide installation flexibility by insuring that the physical sequence of the devices on the loop need not determine the device address.

- B. Each and every address shall include the following, except final addressing scheme shall be coordinated with the Owner prior to construction and shall be uniform:
1. The initiating device type (e.g. SMOKE, HEAT, DOOR, etc.)
 2. The area description (e.g. CORRIDOR, CLASSROOM, MECHANICAL ROOM, etc.)
 3. The room or space number.
 4. The floor (e.g. FIRST, SECOND, etc.)
 5. The area (e.g. NORTH, SOUTH, EAST, WEST, CENTER, etc.)
 6. (Example: SMOKE – CORRIDOR 110 FIRST FLOOR EAST.)

2.07. DEVICES & DETECTORS

- A. Remote devices and detectors shall have a microprocessor with non-volatile memory to support its functionality and serviceability. Each shall store as required the device serial number, device address, device type, number of alarms and troubles, time and date of last alarm, amount of environmental compensation left/used, last maintenance date, current detector sensitivity values, diagnostic information (trouble codes) and algorithms required to process sensor data and perform communications with the loop controller.
- B. Each device shall be capable of electronic addressing, either automatically or application programmed assigned, to support physical/electrical mapping and supervision by location.
- C. Devices and detectors shall be capable of full digital operation. Maximum total response time for devices and detectors changing state shall be 0.5 seconds.
- D. Each detector shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head and be capable of performing independent fire detection algorithms to measure sensor signal dimensions, time patterns and combine different fire parameters. Signal patterns that are not typical of fires shall be eliminated by digital filters.
- E. Detectors shall be capable of being functionally tested with a test magnet. The test magnet shall electronically simulate smoke in the sensing chamber, testing the sensor electronics and connections to the control panel.
- F. Each device and detector shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the analog loop controller. A red LED shall flash to display alarm status.

- G. Devices, modules, etc. shall be capable of identifying up to 24 diagnostic codes. Detectors shall be capable of identifying up to 32 diagnostic codes. Diagnostic codes shall be stored at the device or detector and be available for system maintenance.
- H. Pull stations shall be intelligent, addressable, manual, metal, single action, enclosed manual reset type, red.
- I. Exterior pull stations shall be weatherproof, non-coded, manual, metal, single action, enclosed manual reset type, red. With each exterior pull station, provide a separately mounted monitor module located in a nearby heated space.
- J. Heat Detectors
 - 1. Heat detectors shall be intelligent type, surface mounted, with an integral microprocessor. Detectors shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data.
 - 2. Fixed temperature type heat detectors shall have a heat sensor and operate at a fixed temperature nominal alarm point rating of 135°F.
 - 3. Elevator shutdown related heat detectors shall be specifically coordinated with the sprinkler system components in compliance with the applicable codes.
 - 4. Rate-of-rise type heat detectors shall have a heat sensor and operate at a fixed temperature alarm point rating of 135°F and a rate-of-rise alarm point of 15°F per minute.
 - 5. Detectors shall be 2 piece, consisting of a base and separate plug-in head.
 - 6. Provide skirts around surface mounted detector boxes.
- K. Smoke Detectors
 - 1. Smoke detectors shall be intelligent type, photoelectric, utilizing light scattering to sense changes in air samples from its surroundings with an integral factory assembled microprocessor. The microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. The percent smoke obscuration alarm set point shall be field selectable.
 - 2. Smoke detectors shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. The detectors shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature, aging and humidity with an environmental compensation algorithm which identifies and sets ambient "Environmental Thresholds"

approximately six times an hour. The process shall employ digital compensation to adapt the detector to both 24 hour long term and 4 hour short term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the "learned" base line sensitivity. The base line sensitivity information shall be updated and permanently stored at the detector approximately once every hour. The information shall be stored in the microprocessor and be transferred to the analog loop controller for retrieval using a portable program analyzer.

3. Duct type smoke detectors shall be the same as above; except, with a suitable housing/air chamber for sampling the air in a return air duct stream. The housing shall be high impact plastic, with a clear cover for easy viewing of the polling and alarm LEDs. Include an interposing relay with a dry contact for an interlock to the HVAC Unit control system.
4. Smoke detectors shall be sealed against contamination by dirt, bugs, etc.
5. Detectors shall be 2 piece, consisting of a base and separate plug-in head.
6. Provide skirts around surface mounted detector boxes.

L. Room Temperature Switches

1. Room temperature switches shall be non-intelligent type, surface mounted, moisture and vapor resistant, contain a completely sealed sensor that is highly sensitive to temperature changes, resistant to vibration and corrosion and constructed in a small compact design.
2. Room temperature switches shall continually monitor the temperature of the air in its surroundings, contain normally open contacts that close when the temperature drops below 40 degrees Fahrenheit and will automatically reset to the normal state when the temperature rises above 40 degrees Fahrenheit. 40 degree Fahrenheit setting shall be factory set, non-adjustable.
3. Separately installed intelligent type monitor module shall be provided, mounted nearby and connected each room temperature switch provided.
4. Room temperature switches shall be manufactured by Potter Electric Signal Company, type RTS-O.

M. Input/Output Modules

1. The personality of modules shall be multifunction, programmable at the site to suit conditions and be capable of being changed at any time using a personality code downloaded from the controller.

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2. Signal modules shall be addressable type devices used to control and supervise zones of indicating devices that require an external power supply (e.g. strobes, horns, relays, etc.) through a 2 wire analog circuit.
3. Control relay modules shall be addressable type devices used to control electrical or mechanical equipment connections (e.g. door holders, smoke/fire dampers, motorized dampers, relays, etc.) through a form C dry contact.
4. Monitor modules shall be addressable type devices used to connect and supervise zones of dry device contacts (e.g. tamper switches, pull stations, etc.) or the integrity of field wiring (e.g. 24VDC, 70VAC, 120VAC, Telephone lines, etc.) through a 2 wire analog circuit.
5. Modules shall be standard mount where installed individually or plug-in mount to motherboards where grouped in enclosures.

N. Exterior detectors, devices and associated backboxes, etc. shall be weatherproof.

2.08. RELAYS

- A. Relays shall be SPDT type, 10 Amp rated, line voltage relays with 115V input voltage. Relays shall be provided in conjuncture with addressable control relays in order to control electrical and mechanical loads.

2.09. SIGNALING DEVICES

- A. Fire alarm horns shall be 24 volt DC, multi-tap and set as required to provide the minimum acceptable or code required sound level.
- B. Fire alarm strobes shall be 24 volt DC, candela intensity as indicated (or as required by ADA or the authority having jurisdiction to provide the minimum required intensity level throughout the buildings) with clear polycarbonate lens and FIRE lettering.
- C. Fire alarm horn/strobes shall be as above; except, combined into a single assembly.
- D. Fire alarm strobe devices shall be synchronized throughout the facility.
- E. Exterior devices and associated backboxes, etc. shall be weatherproof.
- F. Finish shall be white.
- E. Sprinkler system alarm bell shall be vibrating type, 120 volt, semi-flush mounted, weatherproof, of sufficient loudness, and shall have a distinctly different sound than the fire alarm system alarms.

2.10. DOOR HOLDERS

- A. Door holders shall be 2 piece with 24 volt DC electromagnet providing approximately 35 lb. holding force. In a fire situation, the voltage to the door holder shall be interrupted automatically; thereby releasing the door. The electromagnet shall be flush or semi-flush mounted as directed by the Architect.
- B. Power supply shall be provided as required for door holders.
- C. Coordinate with door and door hardware suppliers.

2.11. BATTERIES

- A. Batteries shall be gel electrolyte, no maintenance type, sized as required to operate the entire system, or portions of the system which are powered by the batteries for a minimum of 24 hours and then be capable of operating alarm devices for a minimum of 10 minutes, plus have a minimum of 50% spare capacity.

2.12. WIRE AND CABLE

- A. All wire and cable installed in below grade raceways shall be suitable for wet locations.
- B. All wire and cable shall be color coded as required or as indicated. Color coding shall be consistent throughout the building.
- C. Detection circuits cable:
 - 1. Detection circuit cable run in raceways shall be single conductor solid copper with 600 volt type TFFN insulation.
 - 2. Detection circuit cable shall be two conductor copper, shielded if required by the system, type FPLR, listed as being resistant to the spread of fire, with 300 volt insulation and an overall jacket; except in air handling plenums, cable shall be plenum rated, be listed as being resistant to the spread of fire and bear flammability testing ratings as cable type FPLP.
 - 3. The minimum conductor size shall be #18 AWG.

D. Alarm circuits cable:

1. Alarm circuit cable run in raceways shall be single conductor stranded copper with 600 volt type THHN/THWN insulation.
2. Alarm circuit cable shall be two conductor copper, type FPLR, listed as being resistant to the spread of fire, with 300 volt insulation and an overall jacket; except in air handling plenums, cable shall be plenum rated, be listed as being resistant to the spread of fire and bear flammability testing ratings as cable type FPLP.
3. The minimum conductor size shall be #14 AWG.

E. Alarm circuits cable:

1. Alarm circuit cable run in raceways shall be single conductor stranded copper with 600 volt type THHN/THWN insulation.
2. Alarm circuit cable shall be two conductor copper, type FPLR, listed as being resistant to the spread of fire, with 300 volt insulation and an overall jacket; except in air handling plenums, cable shall be plenum rated, be listed as being resistant to the spread of fire and bear flammability testing ratings as cable type FPLP.
3. The minimum conductor size shall be #14 AWG.

F. Power supply circuits cable:

1. Detection circuit cable run in raceways shall be single conductor solid copper with 600 volt type TFFN insulation.
2. Power supply circuit cable shall be two conductor copper, type FPLR, listed as being resistant to the spread of fire, with 300 volt insulation and an overall jacket; except in air handling plenums, cable shall be plenum rated, be listed as being resistant to the spread of fire and bear flammability testing ratings as cable type FPLP.
3. The minimum conductor size shall be #18 AWG.

G. Cable jacket color shall be red.**H. Increase cable sizes as required to compensate for voltage drop.**

- I. All concealed power limited systems cable may be run "open" in accessible ceilings; except, where indicated otherwise and where penetrating through ceilings, floors, walls, draft-stops, etc.

2.13. BOXES

- A. Device, junction, etc. boxes for fire alarm systems other than the surface raceway type shall be substantially red in color, both inside and outside.

2.14. CONNECTIONS AND TERMINATIONS

- A. Wiring shall be installed from device to device without splices or taps in fire alarm circuit cable. "T" taps will not be allowed without specific approval from the Engineer.
- B. Pull wiring through junction, pull, etc. boxes and conduit fittings to devices where possible. Multiple splices, connections, etc. from a single location shall be done in terminal boxes with suitable terminal blocks. Multiple splices, connections, etc. at a single location will not be allowed with "wire nuts".
- C. Cable ties shall be utilized in panels, etc. to group and support conductors. All cable shall be fanned-out to terminals and identified by labels.
- D. Red electrical tape shall be utilized to identify the incoming wire pair for each device loop at each device. Outgoing wire pairs shall not be marked.

2.15. SIGNS AND LABELS

- A. Provide adhesive type labels on all fire alarm components with their zone/identification number, clear with black letters on light colored devices and clear with white letters on dark colored devices. Lettering shall be large enough to read from the floor, except minimum $\frac{1}{8}$ inch. Labels shall be as manufactured by Kroy, Brothers, or approved equal. Self-adhesive circuit numbers, masking tape, plastic punch type "Dymo" labels, etc. are not acceptable.
- B. Provide approved signs at the fire alarm control panel with instructions on how to reset the system after an alarm or trouble condition, and that describes the location of the panel circuit breakers.
- C. Provide a laminated plastic nameplate, red face, white core, with 1 inch high letters on the door of the room with the fire alarm control panel that reads "FIRE ALARM CONTROL PANEL INSIDE".
- D. Provide a laminated plastic nameplate, white face, red core, with 1 inch high letters adjacent to the waterflow gong bell that reads "SPRINKLER FIRE ALARM CALL 9-1-1".
- E. Provide a laminated plastic nameplate, red face, white core, with minimum $\frac{1}{8}$ inch high letters on cover of all equipment, boxes and other devices used for the control of circuits, equipment, etc. (e.g. communications cabinets, control and alarm module boxes, etc.).

PART 3 - EXECUTION**3.01. INSTALLATION**

- A. Installation of the fire alarm system and its components shall be done by, or under the direct supervision of, a factory trained authorized representative of the manufacturer.
- B. Install, connect and test smoke detector bases and initiating circuits prior to installation of smoke detector heads. Unless required by the authority having jurisdiction for protection during construction, do not install smoke detector heads until after construction clean-up by all trades has been completed. Detectors that have been installed prior to final clean-up shall be cleaned and/or replaced as required after final clean-up.
- C. Attach surface mounted magnetic door holders directly to framing members concealed in the walls. Surface mounted brackets or blocks on the outside of the walls shall not be acceptable. If framing members are not found in the necessary locations, provide blocking, concealed in the wall, to span between framing members as required. Patch and paint the wall surface to maintain the original finished conditions.

3.02. LOCATIONS

- A. Locations and mounting heights of equipment, devices, etc. shall be consistent, and in accordance with the requirements of NFPA, ADA and the authority having jurisdiction.
- B. Locate fire alarm pull stations 46 inches to centerline above finished floor, 6 inches from door casings; except, on center in spaces narrower than 12 inches. Offset pull stations a minimum of 2 inches from light switches, etc. (farther away from door casing). Center assembly in spaces narrower than 12 inches.
- C. Locate fire alarm devices (horn, strobes, etc.) 80 inches to bottom above finished floor or 6 inches below ceiling, whichever is lower, 6 inches from door casings, corners, etc.; except, on center in spaces narrower than 12 inches.
- D. Locate magnetic door holder devices as required by the door hardware supplier. Coordinate exact placement with Owner and General contractor on site prior to installation.
- E. Field locate Booster Power Supplies with Owner and Architect prior to installation.
- F. Unless noted or indicated otherwise, smoke and heat detectors shall be ceiling mounted. In sloped ceiling areas, detectors shall be located within 3 feet of the peak, measured horizontally.
- G. Locate addressable smoke detectors a minimum of 36" from electronic fluorescent ballasts.
- H. Locate addressable smoke detectors a minimum of 36" from air supply grills.

- I. Wall mounted smoke and heat detectors shall be located between 4 inches and 12 inches down from the ceiling to the top of the detector.
- J. Elevator shaft and equipment room heat detectors shall be located within 24 inches of sprinkler heads.
- K. Locate fire alarm annunciators 48 inches to centerline above finished floor, 6 inches from door casings; except, on center in spaces narrower than 12 inches.
- L. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices, and the proposed routing of raceways. Obtain specific approval for the location of each from the Owner, Architect and Engineer before rough-in.

3.03. WIRES AND CABLES

- A. Inspect cable prior to installation to verify that it is identified properly on the reel or box identification label and that it is of proper gauge, containing correct number of pairs, etc. Note any buckling of the jacket which would indicate possible problems. Damaged cable or any other components failing to meet specification shall not be used in the installation.
- B. All exposed cable shall be run in the raceway system, except where specifically approved otherwise. "Open" wiring will not be allowed.
- C. All concealed power limited systems cable may be run "open" in accessible ceilings; except, where indicated otherwise and where penetrating through ceilings, floors, walls, draft-stops, etc.
- D. "Open" cables shall be bundled and supported from permanent structural members of the building, either directly or indirectly, with suitable hooks. Support spacing shall not exceed 5 feet. Protect "open" cables during installation in ceiling spaces. Cables shall not interfere with the removal of pipes or equipment for maintenance or repair. All "open" cable shall be kept a minimum of 6 inches from pipes, ducts, and other items producing heat. Support "open" cables a minimum of 6 inches above T-bar ceilings. Tape and cable ties are not approved methods of fastening cables.
- E. Floor and ceiling penetrations by "open" cables will not be allowed. Provide conduit sleeves, minimum 2" EMT, as required plus a spare (with fire and dust stopping and sealing) where "open" cable passes through floors, walls, partitions, etc.
- F. Cable shall be unrolled from reels, or removed from cartons, and installed in a manner which will prevent kinking, crushing or excessive tension on conductors and insulation. Slack wire shall be provided at all pull points.
- G. Cable shall be installed or drawn into the raceway system only after all work of any nature that might cause injury to the cable is completed. The raceway systems shall be complete (including the installation of bushings, grommets, etc.), snaked and cleaned, and approval of the installation is obtained from the Owner and Engineer, before pulling any cable.

- H. Cable pulling lubricants shall be used to minimize pulling stresses on cable pulled into raceways.
- I. All cable is subject to subtle damage that may degrade future performance, if abused during installation. In all cable installation, set reels and use sufficient pulleys and manpower so that cables are not pulled around corners or against material that might cause chafing.

OBSERVATION OF IMPROPER CABLING HANDLING TECHNIQUES MAY CAUSE THE CONSULTANT/ENGINEER AND/OR OWNER TO REQUIRE THE CONTRACTOR TO DISCARD AFFECTED CABLES, INCLUDING ANY OTHERS ALREADY INSTALLED BY THE PERSONNEL FOUND USING INCORRECT PROCEDURE.

- J. In general, cable cannot tolerate sharp bends or excessive pull tension during installation. Adhere to manufacturers recommended minimum bend radius and maximum pull tension for cables; except, not less than 2 inch bending radius and pulling tension in excess of 20 pounds.
- K. Cable lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit. After installation, exposed cable and other surfaces must be cleaned free of lubricant residue.
- L. Replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, and over tightened bindings.

3.04. TESTING

- A. Testing of the fire detection and alarm system shall be done by a qualified representative of the manufacturer; who, after completion, shall submit a letter that he has tested the system and found it acceptable in all respects.
- B. Testing of the systems and all components shall be in accordance with the requirements of NFPA 72 and/or the authority having jurisdiction.
- C. Contractor shall notify Owner at least 48 hours in advance of readiness to conduct any tests. The actual time and date of tests shall be acceptable to the Owner and the Contractor.
- D. For all tests not meeting criteria as determined by the Owner and Engineer, Contractor shall determine problem(s) and make corrections as required (including replacement of the cable and/or other components if necessary) at Contractor's expense without increase in Contract Sum. After correction(s), Contractor shall repeat tests.
- E. All interfaced systems shall be tested at the same time as the fire alarm system. This includes the fan control, elevator recall, and suppression systems, lockdown, automatic unlocking of doors and other fire safety functions.

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3.05. TRAINING, INSTRUCTION AND ASSISTANCE

- A. After the installation is complete and operating, and prior to acceptance of the work, conduct instruction period(s) at the site, to point out locations of service and maintenance, and instruct the Owner's representatives in the operation of all systems and equipment.
- B. The person(s) who conduct these instructions and demonstrations shall be a qualified representative of the manufacturer with substantial training and operating experience on this equipment and project. Their qualifications shall be submitted to the Owner before conducting the instruction period.
- C. Each period shall include preliminary discussion and presentation of information using the actual maintenance manuals required for this project. Contractor shall notify Owner at least 48 hours in advance of readiness to conduct the instruction period. The actual time and date of instruction period shall be acceptable to the Owner and the Contractor.

End of Section 28 31 00

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavating unsuitable material.
- B. Excavating, backfilling, and compacting for structures, pavements, and landscape areas.
- C. Cutting, grading, and filling (earthwork).
- D. Aggregate and soil materials.
- E. Protecting and conditioning materials.
- F. Exporting and disposing of unsuitable and excess soil material.

1.02 RELATED REQUIREMENTS

- A. Section 017419 - Construction Waste Management and Disposal

1.03 REFERENCES

- A. ADA - Americans with Disabilities Act.
- B. WSDOT Standard Specifications - Washington State Department of Transportation 2026 Standard Specifications for Road, Bridge, and Municipal Construction.
- C. Whatcom County Development Standards.
- D. ASTM D422 - Method for Particle Size Analysis of Soils.
- E. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-pound Rammer and 18-inch Drop.
- F. AASHTO T176 - Plastic Fines in Graded Aggregates and Soils by use of the Sand Equivalent Test.
- G. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods - (Shallow Depth).
- H. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.04 DEFINITIONS

- A. Unsuitable Material: Soil, organics, waste, or other material not complying with these specifications, not capable of supporting foundations, or not capable of compaction to specified density. Old fill soils and buried topsoil are unsuitable.
- B. Pothole: Exploratory excavation to uncover buried utility, structure, or other feature to determine location, elevation, size, and type of material.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Test Reports: Sieve analysis for each material.
- C. Certificates: WSDOT pit certification for each pit.

1.06 QUALITY ASSURANCE

- A. Qualifications: Crew Foreman: Minimum six years' working experience and four years' experience as foreman performing similar work.

- B. Work and material shall comply with WSDOT Standard Specifications.
- C. Comply with Whatcom County standards.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Stockpiling
 - 1. Stockpile materials on site within construction limits at locations approved by Owner's Representative.
 - 2. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
 - 3. Remove stockpile and leave area in clean and neat condition. Grade site surface to prevent freestanding surface water.
 - 4. Maintain toe of material at least 6 feet from edges of trenches and excavations. Pile so surface water is prevented from flowing into excavations. Provide free access to fire hydrants, water valves, meters; private driveways; and leave clearance to enable free flow of storm water in gutters, conduits, and natural watercourses.
 - 5. Stockpiles not used or disposed of within seven calendar days shall be covered with polyethylene sheet.

1.08 PROJECT/SITE CONDITIONS

- A. Existing Conditions: Existing on-site soils are moisture sensitive.
- B. Existing Soils: Existing soils that may be reused on-site outside of building footprint, as approved by the Geotechnical Engineer, will require moisture conditioning (drying or wetting of soil) prior to being placed and compacted. Contractor shall include in Work moisture conditioning of all soil to be reused on site to meet compaction requirements.

1.09 SEQUENCING AND SCHEDULING

- A. Maintain access to roadways and sidewalks adjacent to site.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Structural Fill (Imported): Crushed, partially crushed, or naturally occurring granular material. Free from wood waste, organics, and other extraneous or unsuitable material, in accordance with WSDOT Standard Specifications Section 9 03.14(1), Gravel Borrow. Restrict fines content to no more than 5 percent passing Number 200 sieve.
- B. Structural Fill (On-site Material): On-site soil material is not suitable for reuse as structural fill during wet weather. On-site soil shall not be reused under pavement surfaces. On-site soils in landscape areas approved by the Geotechnical Engineer and reused by the Contractor shall be properly moisture conditioned to meet compaction requirements.
- C. Drain Rock: Gravel backfill for drains in accordance with WSDOT Standard Specifications Section 9-03.12(4).
- D. Foundation Material: In accordance with WSDOT Standard Specifications Section 9-03.17, Class A.
- E. Bedding Material for Pipe: In accordance with WSDOT Standard Specifications Section 9-03.12(3), Gravel Backfill for Pipe Zone Bedding.

- F. Stabilization Rock: 2-inch to 4-inch spalls. Less than 3 percent fines. Crushed or partially crushed rock material.
- G. Control Density Fill (CDF): CDF used to support building foundations designed for bearing pressures exceeding 3,000 pounds per square foot (psf) shall be in accordance with WSDOT Standard Specification Section 2-09.3(1)E and shall have a minimum compressive strength of 200 pounds per square inch (psi). The mix design should be adjusted to obtain this minimum compressive strength.
- H. Working Pad: WSDOT Standard Specifications Section 9 03.1(4)C, grading No. 57.

2.02 SOURCE QUALITY CONTROL

- A. Tests and Inspection: Provide sieve analysis in accordance with ASTM D422 for each material type. Perform tests and analyses of aggregate material in accordance with WSDOT Standard Specifications. If tests indicate materials do not meet specified requirements, change material and retest.
- B. Contractor shall provide soil disposal at an off-site location.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Site Verification of Conditions
 - 1. Verify survey benchmarks, property corners, horizontal control, and intended elevations for Work are as indicated.
 - 2. Verify vegetation to remain is protected and prominently marked.
 - 3. Verify erosion control is in place and operating as specified.
 - 4. Verify removal of abandoned utilities is complete.
 - 5. Verify demolition is complete.

3.02 PREPARATION

- A. Protection
 - 1. Locate existing utilities; avoid damage or disturbance. For aid in utility location call "Dial Dig 1 800 424 5555," 48 hours (two working days) prior to beginning construction. There are utilities on site that Dial Dig will not locate. Employ and pay for locator service to locate and mark utilities in addition to "DIAL DIG" service.
 - 2. Protect and maintain existing utilities that are to remain.
 - 3. Identify existing and proposed structural foundations near excavations. Verify excavation will not undermine footings or supports and cause damage to structures. Excavation shall not extend into foundation influence zone projected down at 45 degrees from edges of footings.
 - 4. Protect plant life, lawns, and other features remaining as portion of final landscaping or interim erosion control.
 - 5. Protect benchmarks, property corners, horizontal control, existing structures, sidewalks, railings, paving, and curbs.
 - 6. Protect pavement or paved areas intended to remain from damage.
 - 7. Use means necessary to prevent erosion of freshly graded areas during construction or until such time that permanent drainage and erosion control measures are fully operational.

B. Preparation

1. Survey and stake limits of clearing. Slope stake toe of fills.
2. Identify required lines, levels, contours, and datum. Should indicated figures conflict with actual conditions, notify Owner's Representative, and await direction before proceeding.
3. Identify on-site trees to be removed within limits of clearing.
4. Identify existing improvements to be salvaged for Owner.
5. Verify existing grade elevations to be matched. Notify Owner's Representative where existing grades to be matched creates an adverse effect, such as blocking grading, abrupt change in grade, slopes steeper than allowed, and grades not conforming with ADA.

C. Subgrade Preparation

1. Comply with WSDOT Standard Specifications Section 2-06.
2. Excavate and dispose of buried topsoil, buried organic soils, and utilities to be removed within building footprint, landscaping, paved areas, and utility trenches.
3. Following stripping and site excavation and prior to placing backfill, proof roll exposed subgrade of proposed paved areas with appropriate construction equipment approved by Owner's Representative. Make at least three passes of equipment over exposed subgrade. In areas where pumping or excessive subgrade movement occurs, scarify, aerate, and recompact existing material as directed by Owner's Representative.
4. Where subgrade soils are loose, remove to solid bearing, and replace material in compacted lifts.
5. Minimize traffic over prepared subgrade.

D. Over Excavation

1. When Owner's Geotechnical Engineer determines unsuitable material exists below subgrade or foundation excavation elevations indicated on Drawings, it shall be excavated and replaced with compacted structural fill. Geotechnical Engineer shall have sole responsibility to determine depth and extent required for over excavation.

E. Grading

1. Shape subgrades to lines, grades, and cross sections indicated on Drawings. Remove and replace soft or otherwise unsatisfactory material. Bring low areas up to required elevations with structural fill.
2. Grade areas adjacent to building and structures in manner that provides positive drainage away from structures and prevents ponding of water at building or structure.

F. Cutting and Filling

1. Fill areas to contours and elevations with structural fill. Use specific materials where indicated on Drawings.
2. Place and compact fill materials in continuous layers not exceeding 6 inches loose depth when using hand compaction equipment or 12 inches loose depth when using heavy compaction equipment.
3. Moisture condition all fill to within 2 percent of optimum moisture content to attain required compaction density.
4. Do not fill over ponded surface water or existing subgrade surfaces that are yielding, disturbed, or softened.

5. Suspend placing fill when climatic conditions will not allow specified placement and fill compaction.
 6. Make grade changes gradually. Blend slope into level areas. Construct uniform grades between spot elevations or contours shown.
 7. Remove excavated on-site soil material and surplus fill materials from site to an approved contractor-provided off site waste site.
- G. Compacting
1. Compact backfill material using hoepacs, towed, or self-propelled compactors or hand operated compactors. Compact backfill within 6 feet horizontal of existing or new structures with hand operated vibratory or impact-type compactors. Do not operate heavy equipment or compactors adjacent to structure walls.
 2. Compact to dense, unyielding state, in accordance with geotechnical report.
 3. Fills under buildings and to a point 10 feet horizontal beyond building perimeter to a minimum of 95 percent in accordance with ASTM D1557.
 4. Structural fill placed behind below-grade walls shall be compacted to 90 to 92 percent in accordance with ASTM D1557.
 5. Fills under Pavement and Walks:
 - a. Within 2 feet vertical of finish grade, compact to a minimum of 95 percent in accordance with ASTM D1557.
 - b. Below 2 feet vertical of finish grade, compact to a minimum of 90 percent in accordance with ASTM D1557.
 6. Fills in landscaped areas: Minimum of 90 percent in accordance with ASTM D1557.

3.03 SITE TOLERANCES

- A. Variation from true elevation: 1/2 inch.
- B. No change in drainage pattern allowed.

3.04 FIELD QUALITY CONTROL

- A. Comply with Section 014000 - Work Restrictions.
- B. Comply with Whatcom County requirements.
- C. Site Tests:
 1. Owner will perform compaction testing. Owner's testing does not alleviate Contractor from performing earthwork in accordance with the contract documents. Contractor may self-perform compaction testing as needed to verify Work complies with contract documents.
 2. If tests indicate Work does not meet specified requirements, recompact and retest, or remove and replace and retest.
- D. Inspection: Owner's Representative will observe Work at following milestones:
 1. Subgrade: Prior to placing fill.
 2. Mass Grading and Utility Trench Backfilling: During fill placement.
 3. Surface: After completion of cuts and fills and prior to placing topsoil, bases, or pavements.

3.05 PROTECTION

- A. Protect exposed site material and subgrade from damage due to excess moisture and trafficking.
- B. Take necessary precautions to protect soils from excess moisture by such means necessary, which may include:
 - 1. Grading, rolling, and sealing surfaces prior to forecasted or anticipated storms, at end of workday, or completion of Work during day.
 - 2. Covering stockpiled material.
 - 3. Covering exposed surfaces.
 - 4. Not exposing or stripping more area than can be worked, sealed, and protected.

3.06 CLEANING

- A. Dispose of surplus or unsuitable material.
- B. Dispose of waste, surplus, and unsuitable materials according to laws, regulations, and ordinances off site at site obtained by Contractor.
- C. Dispose of all waste material in accordance with project's Waste Management Plan in accordance with Section 017419 - Construction Waste Management and Disposal.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pavement removal.
- B. Pavement patching.
- C. Soil sterilization.
- D. Asphalt concrete paving.

1.02 REFERENCE STANDARDS

- A. WSDOT Standard Specifications - Washington State Department of Transportation 2026 Standard Specifications for Road, Bridge, and Municipal Construction.
- B. ANSI/ASTM D 1557-91 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
- C. ASTM D2922-91 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods - (Shallow Depth).
- D. ASTM D3017-88 - Test Method for Moisture Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
- E. ASTM D1556-90 - Test Method for Density and Unit Weight of Soil in Place by Sand Cone Method.
- F. ASTM D2950 - Density of Bituminous Concrete in Place by Nuclear Method.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Soil residual herbicide, including hazardous waste data sheet.
- C. Quality Assurance/Control Submittals: Certificates - tack coat, asphalt concrete mix. Certificate stating material complies with specifications and documentation material is approved by WSDOT.

1.04 QUALITY ASSURANCE

- A. Qualifications: Paving contractor and crew foreman shall have minimum three years' experience with paving projects of this type. Submit list of projects for 3 years' experience. Note date, owner, type, and size of overlay and location.
- B. Pre-Installation Meeting:
 - 1. Coordinate and attend meeting prior to paving and preparation.
 - 2. Attendees to include paving contractor, Owner, and Architect.
 - 3. Agenda to include sequencing of Work, schedule, and responsibilities.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Comply with Section 5-04.3 of WSDOT Standard Specifications.
- B. Minimum air temperature for placing asphalt paving 55 degrees F and rising.
- C. Do not perform paving in rain.

1.06 SEQUENCING AND SCHEDULE

- A. Coordinate closure of sidewalks with Owner. Minimize closure of sidewalks.

- B. Maintain fire truck and emergency vehicle accesses.

PART 2 PRODUCTS

2.01 SOIL RESIDUAL HERBICIDE

- A. Comply with WSDOT Standard Specifications Section 5-04.3(5) D.
- B. Use only products approved by Owner.

2.02 ASPHALT CONCRETE PAVEMENT

- A. Driveways and Parking Lots: Hot Mix Asphalt (HMA): HMA Cl. 1/2-inch PG 64 S28 as specified in Section 5-04 of WSDOT Standard Specifications and Amendments. Meet requirements for Asphalt Concrete Pavement (ACP). Class B modified asphalt pavement will be considered as a substitution.

2.03 CRUSHED SURFACING TOP COURSE (CSTC)

- A. Conform to WSDOT Standard Specifications Section 9 03.9(3).

2.04 CRUSHED SURFACING BASE COURSE (CSBC)

- A. Conform to WSDOT Standard Specifications Section 9 03.9(3).

2.05 TACK COAT

- A. Cationic emulsified asphalt per WSDOT Standard Specifications Section 9-02.1(6).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify base gradients and elevations are correct.
- C. Verify subsurface Work is completed and no further excavation will be required within limits of Work.
- D. Verify demolition Work within or adjacent to Work is complete.
- E. Verify heavy construction traffic is as complete as possible and traffic remaining will not damage or degrade Work.
- F. Verify fire department has been advised of restrictions to site access during Work.
- G. Verify weather forecast during planned time of placement is within weather limitations.
- H. Verify door locations and required clearances for swing out over walkways.

3.02 PREPARATION

- A. Prepare and compact subgrade in accordance with Section 2-06 of WSDOT Standard Specifications.
- B. Water and thoroughly mix subgrade until optimum moisture content is obtained when deficiency of moisture content exists. When excess moisture exists, rework and aerate subgrade until optimum moisture content is obtained.
- C. Condition existing surface per WSDOT Standard Specifications Section 5-04.3(5).
- D. Adjust top of structures, manhole covers, valve boxes, grates, cleanout covers to grade. Comply with WSDOT Standards for structures.

- E. Areas receiving new paving section: Excavate, remove, and dispose of excess material. Fine grade to maintain drainage and prepare subgrade.
- F. Apply herbicide to subgrade in new pavement and patching areas.

3.03 CONSTRUCTION

- A. Base Courses:
 - 1. Place per WSDOT Standard Specifications Section 4-04.3.
 - 2. Spread aggregate over prepared substrate to a total compacted thickness as indicated on Drawings.
 - 3. Place aggregate in maximum 6-inch layers and compact to 95 percent per ASTM D1557.
 - 4. Level and contour surfaces to elevations and gradients indicated.
 - 5. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
 - 6. Add water as necessary to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
 - 7. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- B. Soil Sterilization:
 - 1. Apply Soil Residual Herbicide per WSDOT Standard Specifications Section 5 04.3(5)D.
 - 2. Protect surrounding area from effects of soil sterilization.
 - 3. Do not allow toxic material to run off onto adjacent vegetation or to storm system.
- C. Spreading and Finishing:
 - 1. Comply with WSDOT Standard Specification Section 5-04.3(9).
 - 2. Maximum nominal compacted depth of any layer of any course: HMA Class 1/2-inch: 0.30 feet.
- D. Joints: Comply with WSDOT Standard Specification Section 5-04.3(12). Provide full depth thickness at joint with adjacent paving. Sawcut exposed butt joint. Paint edge of joints with asphalt for tack coat.
- E. Asphalt concrete pavement:
 - 1. Construct according to requirements of WSDOT Standard Specifications Section 5 04. Where thickness of finished asphalt pavement will be 3 inches or less, place in one lift.
 - 2. Apply tack to contact surfaces of curbs, catch basins, gutters, and cold pavement joints.
 - 3. Perform hand tamping in areas not accessible to rolling equipment.
 - 4. Ensure joints made during paving operations are straight, clean, vertical, and free of broken or loose material.
 - 5. Seal all contact joints between asphalt pavement joints, curbs, walls, and drains with CSS-1.
 - 6. Back tamp exposed edges to 45 degrees.
 - 7. Establish smooth grades with minor cuts or fills. Maintain proper drainage and correct low spots.
- F. Asphalt Concrete Pavement Patching:
 - 1. Before patch is constructed, trim pavement cuts so marginal patch lines will form straight edges and vertical faces.
 - 2. Prepare subgrade according to requirements of WSDOT Standard Specifications Section 2-06.

3. When roadway is needed for vehicular traffic and permanent pavement cannot be promptly placed or when weather and availability of materials does not allow for prompt pavement repair, place and maintain a 2-inch-thick CSBC and a 2-inch-thick MC 250 cold patch. Remove temporary base and asphalt when permanent pavement repair can be completed.
4. Adjust utility structures and castings to grade.
5. Place bases and asphalt pavement per this section.

3.04 TOLERANCES

- A. At Abutting Existing Surfaces to be Matched: Within 1/8 inch.
- B. Pavement Areas: Generally smooth, free of depressions exceeding 3/8 inch in 10 feet. Minor deviations may be allowed if approved by Owner.

3.05 PROTECTION

- A. Do not allow vehicular traffic on newly paved areas until surface has cooled to atmospheric temperature.
- B. Protect surrounding area from effects of soil sterilization. Do not allow toxic material to run off onto adjacent vegetation or to storm system.

3.06 FIELD QUALITY CONTROL

- A. Site Tests: Following tests will be performed by Architect:
 1. Subgrade density prior to paving, Reference Section 014000 - Work Restrictions.
 2. Asphalt density.
 3. Compact asphalt paving per WSDOT Standard Specification, minimum 91 percent for Rice or 95 percent for Marshall Test.

3.07 CLEANING

- A. Clean surfaces within five days of substantial completion.
- B. Dispose of all surplus, unsuitable, or waste materials according to laws, regulations, and ordinances at an approved off-site waste site obtained by Contractor.

END OF SECTION

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Cement concrete walkways, pedestrian areas, and curbs.
- B. Preparing subgrade to receive base course material for concrete walkways.
- C. Base courses.
- D. Cement concrete walkway paving joint.
- E. Cement concrete walkway paving finishing.
- F. Concrete vertical curb.

1.02 RELATED REQUIREMENTS

- A. Section 017419 - Construction Waste Management and Disposal
- B. Section 312000 - Earth Moving.
- C. Section 321216 - Asphalt Paving.

1.03 REFERENCE STANDARDS

- A. WSDOT Standard Specifications - Washington State Department of Transportation 2026 Standard Specifications for Road, Bridge, and Municipal Construction.
- B. Whatcom County Development Standards.
- C. ACI 301 - Specifications for Structural Concrete for Building.
- D. ASTM D422-90 - Method for Particle Size Analysis of Soils.
- E. ANSI/ASTM D1557-91 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft lb./ft³.
- F. ASTM D2922-91 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- G. ASTM D3017-88 - Test Method for Moisture Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
- H. ASTM D1556-90 - Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Admixtures
 - 2. Portland cement
 - 3. Curing compound
- C. Quality Assurance/Control Submittals.
- D. Design Data: Concrete mix design.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Crew Foreman: Minimum 6 years' working experience and 4 years' experience as foreman performing similar work.
- B. Regulatory Requirements: Work and material shall be in accordance with WSDOT Standard Specifications.
- C. The color within the concrete from separate pours shall remain consistent with minimum deviation in appearance from the concrete in approved concrete sample panels.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Comply with WSDOT Standard Specifications Section 5 05.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Crushed Surfacing Base Course: Section 321216 - Asphalt Paving.
- B. Crushed Surfacing Top Course: Section 321216 - Asphalt Paving.
- C. Exposed Aggregate Materials: 3/8-inch minus locally mined clean pea gravel.
- D. Structural Fill: Section 312000.
- E. Portland Cement: Type II conforming to the requirements of Section 9-01 of the WSDOT Standard Specifications.
- F. Aggregates for Cement Concrete: In accordance with WSDOT Standard Specifications Section 9 03.
- G. Curing material and add mixtures: In accordance with WSDOT Standard Specifications Section 9 23.
- H. Joint Filler: In accordance with WSDOT Standard Specifications Section 9-04.1. Color: Gray.
- I. Joint Sealant: Sikaflex 1A, match color of concrete.
- J. Reinforcing Steel: In accordance with WSDOT Standard Specifications Section 9 07.
- K. Soil Residual Herbicide: Section 321216 - Asphalt Paving.
- L. Welded Steel Wire Fabric: Plain type, ASTM A185, plain finish, size as shown on Drawings.
- M. Concrete Boom Finish equipment and materials: Fiber or wire broom to meet requirements of a medium texture finish.

2.02 MIXES

- A. Cement Concrete Mix: In accordance with WSDOT Standard Specifications Section 5 05.3(1). Three-day mix.

2.03 SOURCE QUALITY CONTROL

- A. Submit proposed mix design for review prior to commencement of Work.
- B. Tests and analysis of aggregate material will be performed in accordance with WSDOT Standard Specifications.
- C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Site Verification of Conditions:
 - 1. Verify compacted subgrade is dry and ready to support paving and imposed loads and is approved by Owner.
 - 2. Verify base gradients and elevations are correct.
 - 3. Verify subsurface Work is completed and no further excavation will be required within limits of Work.
 - 4. Verify demolition Work within or adjacent to the Work is complete.
 - 5. Verify heavy construction traffic is as complete as possible and traffic remaining will not damage or degrade the Work.
 - 6. Verify fire department and Owner have been advised of restrictions to site access during Work.
 - 7. Verify weather forecast during planned time of placement is within weather limitations.

3.02 PREPARATION

- A. Prepare and compact subgrade in accordance with Section 2-06 of the WSDOT Standard Specifications.
- B. Water and thoroughly mix subgrade until optimum moisture content is obtained when deficiency of moisture content exists. When excess moisture exists, rework and aerate subgrade until optimum moisture content is obtained.
- C. Adjust top of structures, manhole covers, valve boxes, grates, etc., to grade. Comply with Whatcom County Standards for utility structures. Comply with WSDOT Standards for other structures.

3.03 CONSTRUCTION

- A. Crushed Surfacing Top Course: Section 321216 - Asphalt Paving.
- B. Soil Sterilization: Section 321216 - Asphalt Paving.
- C. Base Course: Section 321216 - Asphalt Paving.
- D. Structural Fill: Section 312000 - Earth Moving.
- E. Concrete Paving: WSDOT Standard Specifications Section 5-05.
- F. Forming:
 - 1. Place and secure forms to correct location, dimension, and profile.
 - 2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
 - 3. Place joint fillers vertical in position in straight lines. Secure to formwork during concrete placement.
- G. Placing Reinforcing:
 - 1. Place reinforcement to achieve slab and curb alignment as detailed.
 - 2. Extend temperature steel through expansion and contraction joints.
 - 3. Place welded wire fabric centered in slab.
 - 4. Provide support for reinforcing bar.

- H. Construction Joints (Expansion Joints):
 - 1. Place construction joints as needed. Minimize number of construction joints.
 - 2. Incorporate construction joints into pattern of sidewalk or adjacent paving.
 - 3. Fit construction joints with filler of required profile, set perpendicular to longitudinal axis of sidewalks and curbs, or as shown on Drawings.
 - 4. Set joint fillers 3/8-inch below finish concrete surface. Fill top of joint with sealant. Place duct tape strip on top of joint filler as bond breaker prior to placing sealant.
 - 5. Place joint filler between paving components and building or other appurtenances and to separate sidewalks from driveways and curb ramps.
 - 6. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- I. Contraction Joints (Control Joints):
 - 1. Joint Pattern and location: Place contraction joints as shown on Drawings.
 - 2. Align curb and sidewalk joints.
 - 3. Tooled "U" shaped joints with radius trowel. No smooth shoulders. Seal joint in accordance with WSDOT Standard Specifications Section 5-05.3(8)B.
- J. Placing Concrete Curbs and Walks:
 - 1. Place concrete per ACI 301.
 - 2. Hot Weather Placement: ACI 301.
 - 3. Cold Weather Placement: ACI 306.
 - 4. Ensure reinforcement, inserts, embedded items, and formed joints are not disturbed during concrete placement.
 - 5. Place concrete, screed, and wood float surfaces so smooth and uniform, free of open texturing and exposed aggregate.
 - 6. Round all edges, including edges of expansion and contraction joints, with ½ inch radius edging tool.
- K. Surface Finishing:
 - 1. Finish: Float finish followed by medium broom textured finish. For medium broom finish, draw a fiber or wire broom across concrete surface, perpendicular to the line of traffic. Textured fine lines in the broom finish shall be straight and parallel to each other.
 - 2. Joint edges: Radius and trowel. Broom out any smooth shoulders. Retool joints filled by cement slurry.
 - 3. Joint pattern as shown on drawings.
 - 4. Curbs: Medium broom.
- L. Special Finishes:
 - 1. Sandblast Finish:
 - a. Protect building, adjacent surfaces, drains, planting areas from sandblast debris.
 - b. Apply sandblast finish in locations indicated on the Drawings.
 - c. Remove all sandblast debris at end of application.
 - 2. Exposed Aggregate Finish:
 - a. Apply an exposed aggregate finish in locations indicated on the Drawings.
 - b. Scrubbed Finish: After concrete has achieved compressive strength from 1000 to 1500 psi, apply scrubbed finish. Wet concrete surfaces thoroughly and scrub with

stiff fiber or wire brushes, using water freely, until top mortar surface is removed and aggregate is uniformly exposed. Rinse scrubbed surfaces with clean water.

- M. Color: Natural concrete color.
- N. Curing: WSDOT Standard Specifications Section 5-05.3(13). Use curing method that preserves surface finish.

3.04 FIELD QUALITY CONTROL

- A. In accordance with Section 014000 - Work Restrictions.
- B. Site Tests:
 - 1. Owner will perform compaction testing on subgrade and base course.
 - 2. Owner will perform concrete testing.
 - 3. If tests indicate work does not meet specified requirements, remove work, replace, and retest.
- C. Inspection: Architect will inspect subgrade prior to placing base, completed base course prior to placing concrete, and completed form work.

3.05 CLEANING

- A. Clean surfaces within five days of substantial completion.
- B. Dispose of all surplus, unsuitable, or waste materials according to laws, regulations, and ordinances at a site obtained by Contractor.
- C. Dispose of all waste material in accordance with project's Waste Management Plan in accordance with Section 017419 - Construction Waste Management and Disposal.

3.06 PROTECTION

- A. Protect concrete from effects of adverse weather and traffic during curing.
- B. Keep heavy equipment and vehicular traffic off new concrete until it has attained specified strength.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preparation for painting pavements and curbs.
- B. Painting parking stalls; marking fire lane, and crosswalks.
- C. Signage for parking lots.

1.02 RELATED REQUIREMENTS

- A. Section 017419 Construction Waste Management and Disposal

1.03 REFERENCE STANDARDS

- A. WSDOT Standard Specifications – Washington State Department of Transportation 2026 Standard Specifications for Road, Bridge, and Municipal Construction.
- B. MUTCD – Latest edition of Manual on Uniform Traffic Control Devices for Streets and Highways, with latest revisions per WSDOT.
- C. Whatcom County Development Standards.

1.04 SUBMITTALS

- A. Comply with Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Paints and colors.

1.05 REGULATORY REQUIREMENTS

- A. Comply with WSDOT Standard Specifications.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Pavement must be clean and dry.
- B. Comply with manufacturer's recommendations.
- C. Do not perform pavement marking in the rain.

PART 2 PRODUCTS

2.01 PAINT

- A. Non-reflectORIZED traffic line paint for parking stalls and reflectORIZED traffic line paint for road striping per WSDOT Standard Specifications Section 8-22.2. Fire lane markings per notes on drawings.
- B. Color:
 - 1. Fire Lane Markings: Red
 - 2. Parking Stalls: White
 - 3. Crosswalks: White

2.02 SIGNS

- A. Location and type as shown on drawings.
- B. Comply with Whatcom County Standard Plans and the MUTCD.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify paving and curbing is complete and surface is ready to receive striping.
- B. Verify distance between curbs to ensure adequate width for the indicated number of stalls.
- C. Verify weather forecast during planned time of placement is within weather limitations.
- D. Materials & Resources – Construction Waste Management: Comply with provisions of Section 017419 Construction Waste Management and Disposal.

3.02 PREPARATION

- A. Clean and prepare surface for receiving paint per WSDOT Standard Specification Section 8 22.3(2).
- B. Lay out lines and symbols to spacing and locations shown on Drawings.

3.03 CONSTRUCTION

- A. Painting: Per WSDOT Standard Specification Section 8-22.3(3).
- B. Fire Lanes:
 - 1. General: Match existing markings.
 - 2. Paint fire lane and curbs per notes on drawings.
- C. Crosswalks and Traffic Arrows:
 - 1. Painting per WSDOT Standard Specification Section 8-22.3(3).

3.04 PROTECTION

- A. Protect painted surfaces until dry.

3.05 CLEANING

- A. Dispose of all waste material in accordance with project's Waste Management Plan in accordance with Section 017419 – Construction Waste Management and Disposal.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Work in this section includes:
 - 1. Manufactured Waste Enclosure Screening with Trellis.
 - 2. Refer to the drawings for basis of design concept.
- B. Related work in other sections:
 - 1. Section 03 30 00 – Cast In Place Concrete.
 - 2. Section 06 73 00 – Composite Decking.
 - 3. Section 08 71 00 – Door Hardware.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Manufacturer's data sheets on each product to be used.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Typical installation methods.
 - 5. Sufficient data and detail to indicate compliance with these specifications.
- C. Verification Samples: Two representative units of each panel type.
 - 1. Color Selection: Submit paint chart with full range of colors available for Architect's selection. Custom color samples available upon purchase
- D. Shop Drawings: Indicate layout heights, component connection details, and details of interface with adjacent construction.
- E. Certification: Manufacturer's Certificate of Compliance certifying that panels supplied meet or exceed requirements specified.
- F. Closeout Submittals: Warranty documents, issued and executed by manufacturer, countersigned by Contractor

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum one years documented experience.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
- C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
- D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
 - 1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
 - 2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
 - 3. Retain mock-up during construction as a standard for comparison with completed work.
 - 4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- B. Storage and Handling: Protect materials and finishes during handling and installation to prevent damage.
- C. Protect from damage due to weather, excessive temperature, and construction operations.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. If any part of the screen system fails because of a manufacturing defect within 5 years from the date of substantial completion, the manufacturer will furnish the required replacement parts without charge.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
 - 1. CityScapes International Inc. (www.cityscapesinc.com).
 - 2. Or approved equal.
- B. Basis of Design:
 - 1. Covrit Gates and Screening System by CityScapes International Inc.
- C. Design Criteria: Manufacturer is responsible for the structural design of all materials, assembly, and attachments to resist snow, wind, suction and uplift loading at any point without damage or permanent set.
 - 1. Framing: Designed in accordance with the Aluminum Design Manual to resist the following loading:
 - 2. ASCE 7-18 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers.
 - 3. Refer to the Structural General Notes for minimum design requirements.

2.02 MATERIALS

- A. Paneling:
 - 1. Plankwall vertical, color to match composite decking specified in Section 06 73 00.
 - 2. Refer to the drawings for basis of design.
- B. Operable Access Gates:
 - 1. Plankwall vertical, color to match composite decking specified in Section 06 73 00.
 - 2. Refer to the drawings for basis of design.
- C. Framing: Aluminum Plate, Shapes and Bar: ASTM B221, alloy 6005-T5, 6061-T5 or 6063-T5.
- D. Threaded Fasteners: Screws, bolts, nut and washers to be Stainless Steel.
 - 1. Post Backer assembly fasteners shall be #10-16 stainless steel Self-Drilling screws.
 - 2. Provide lock washer or other locking device at all bolted connections.
 - 3. Coordinate embedment with Section 03 30 00 – Cast In Place Concrete.

2.03 FABRICATION

- A. Factory-Formed Panel Systems: Continuous interlocking panel connections and indicated or necessary components.
- B. Form components true to shape, accurate in size, square and free from distortion or defects. Cut panels to precise lengths indicated on approved shop drawings.
- C. Fabricate products to the following configurations:
 - 1. Panel Style: Plankwall vertical.
 - a. Planking to match finish specified in Section 06 73 00 – Composite Decking.
 - 2. Gate Style: Plankwall Vertical.
 - a. Planking to match finish specified in Section 06 73 00 – Composite Decking.
 - 3. Panel Height: As indicated on the drawings.
 - 4. Gate Height and Width: As indicated on the drawings.
 - 5. Column Cap Style: Prefinished aluminum cap.
 - 6. Screen Layout: As indicated on the drawings.
- D. Framing: Fabricate and assemble components in largest practical sizes, for delivery to the site.
 - 1. Construct corner assemblies to required shape with joints tightly fitted.
 - 2. Supply components required for anchorage of framing. Fabricate anchors and related components of material and finish as required, or as specifically noted.
- E. Gate Hardware: Provide manufacturer's adjustable standard of size required to fit support pipe provided.
 - 1. Hinge Type: Hold Open.

2.04 FINISHES

- A. Aluminum Framing: Manufacturer's standard powder coating system, factory applied.
 - 1. Color: Selected from full range of manufacturer's standard colors.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Installer's Examination: Examine conditions under which construction activities of this section are to be performed.
 - 1. Submit written notification to Architect and Screen manufacturer if such conditions are unacceptable.
 - 2. Beginning erection constitutes installer's acceptance of conditions.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install units in accordance with the manufacturer's instructions and approved shop drawings. Keep perimeter lines straight, plumb, and level. Provide brackets, anchors, and accessories necessary for complete installation.
- B. Fasten structural supports to/into paving, footings, or piers at spacing as indicated on approved shop drawings.

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SITE SCREENING DEVICES

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- C. Metal Separation: Where aluminum materials would contact dissimilar materials, insert rubber grommets at attachment points, thus eliminating where dissimilar metals would otherwise be in contact.
- D. Do not cut or abrade finishes which cannot be restored. Return items with such finishes to shop for required alterations.

3.04 ERECTION TOLERANCES

- A. Maximum misalignment from true position: 1/4 inch (6 mm).

3.05 CLEANING AND PROTECTION

- A. Remove all protective masking from material immediately after installation.
- B. Protection:
 - 1. Ensure that finishes and structure of installed systems are not damaged by subsequent construction activities.
 - 2. If minor damage to finishes occurs, repair damage in accordance with manufacturer's recommendations; provide replacement components if repaired finishes are unacceptable to Architect.
- C. Prior to Substantial Completion: Remove dust or other foreign matter from component surfaces; clean finishes in accordance with manufacturer's instructions.
 - 1. Clean units in accordance with the manufacturer's instructions.

END OF SECTION 35 32 00

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Storm Drains.
- B. Cleanouts.
- C. Pipe Outlets and Inlets.
- D. Trench Drains

1.02 RELATED REQUIREMENTS

- A. Section 312000 – Earth Moving.

1.03 REFERENCES

- A. WSDOT Standard Plans – Washington State Department of Transportation 2026 Standard Plans for Road, Bridge, and Municipal Construction.
- B. WSDOT Standard Specifications – Washington State Department of Transportation 2026 Standard Specifications for Road, Bridge, and Municipal Construction.
- C. Whatcom County Development Standards.

1.04 QUALITY ASSURANCE

- A. Qualifications: Crew Foreman: Minimum six years' working experience and four years' experience as foreman performing similar work.
- B. Regulatory requirements:
 - 1. Whatcom County Standards.
 - 2. WSDOT Standards.

1.05 SUBMITTALS

- A. Submit under provisions of Section 013000 - Administrative Requirements for submittal procedures..
 - 1. Product Data:
 - a. Catalog cuts and specifications for pipe, fittings, cleanouts, trench drains, castings, and accessories.
- B. Manufacturers' Installation Instructions: Indicate special procedures required to install products specified.
- C. Record Documents: Submit under provisions of Section 017800 - Closeout Submittals. Record actual structure locations of pipe runs, connections, and invert elevations accurately. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- D. Closeout Submittals:
 - 1. Accurately record actual locations of pipe runs, connections, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 SEQUENCING AND SCHEDULING

- A. Maintain on-site storm drainage during construction.
- B. Construct the erosion control facilities as shown in the Drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Fill: Section 312000 - Earth Moving.
- B. Bedding: Section 312000 - Earth Moving.
- C. Storm Drain Pipe: WSDOT Standard Specifications Section 9-05. Comply with Whatcom County standards. Acceptable pipe materials:
 - 1. Corrugated Polyethylene Storm Sewer Pipe in accordance with WSDOT Section 9 05.20.
 - 2. Polypropylene Storm Sewer Pipe (12 inches and larger) in accordance with WSDOT Section 9-05.24.
 - 3. Ductile Iron Sewer Pipe in accordance with WSDOT Section 9-05.13.
- D. Metal Castings: Load ratings: HS20. Locking type.
- E. Grates in pedestrian access areas to comply with ADA requirements.
- F. Cleanouts: WSDOT Standard Plan B-85.40-00.
- G. Trench Drain:
 - 1. The channels must be manufactured of HDPE with a 0.75% built-in slope. The channels shall have an inside width of four inches and the channel inverts shall be radiused. The channels should be a minimum of 80 inches in length (to minimize the number of joints) with mechanically interlocking ends. The channels must be manufactured with vertical ribs twenty inches on-center. Black Dura-coated heavy duty steel frames with concrete embedment studs must be attached to the channels prior to installation. Integral galvanized steel edge rails will not be allowed. Exposed polymer concrete edges will not be allowed.
 - 2. The channels must have integral tie-down/leveling devices at twenty-inch intervals to assist installation. The channels must have 0% water absorption.
 - 3. Grates: Transversely slotted ductile iron with a width of 5.375 inches and an open area of nominally 18.5 square inches per linear foot of grating. Locking.
 - 4. Load Rating: Load Class C
 - 5. Acceptable channel product:
 - a. Zurn, Z886-HD
 - b. ABT, Polydrain
 - c. ACO, K1000s
 - d. Approved substitute

2.02 SOURCE QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Tests and analyses of aggregate material will be performed in accordance with WSDOT Standard Specifications.
 - 2. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Site Verification of Conditions: Verify as follows:
 - 1. Verify survey benchmark and intended elevations for the Work are as indicated.
 - 2. Verify excavation is ready to receive Work and excavations, dimensions, and elevations are as indicated on Drawings.
 - 3. Verify existing utilities have been marked.
 - 4. Verify erosion control is in place and operating properly.
 - 5. Verify inverts at points of connection. Pothole, expose pipes, determine invert elevations, verify with design, and inform Architect of deviations affecting design prior to mobilizing crews and beginning construction.
 - 6. Verify vegetation to remain is protected and marked prominently.
 - 7. Verify removal of abandoned utilities is complete.

3.02 PREPARATION

- A. Protection:
 - 1. Locate existing utilities; avoid damage or disturbance. For aid in utility location, call "Dial Dig 1 800 424 5555," 48 hours (two working days) prior to beginning construction. Dial Dig will only locate Gas. Provide and pay for additional marking as required.
 - 2. Protect and maintain existing utilities that are to remain.
 - 3. Protect utilities to be abandoned until they have been abandoned.
 - 4. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
 - 5. Protect benchmarks, existing structures, sidewalks, railings, paving, and curbs.
 - 6. Use all means necessary to prevent erosion of freshly graded areas during construction or until such time that permanent drainage and erosion control measures are fully operational.
- B. Preparation:
 - 1. Survey and stake limits. Slope stake toe and top of cuts and fills. Construct orange fence at construction limits.
 - 2. Identify required lines, levels, contours, and datum. Should indicated figures conflict with actual conditions, notify Architect and await direction before proceeding.
 - 3. Verify elevations where matching existing grade. Notify Architect where grading to match existing creates adverse effects, such as blocking grading, abrupt change in grade, or slopes steeper than allowed.

3.03 CONSTRUCTION

- A. Excavation:
 - 1. Comply with Section 312000 - Earth Moving.
 - 2. Remove large stones or other hard matter that could damage piping or impede consistent backfilling or compaction.
- B. Pipe:
 - 1. Install in accordance with manufacturer's recommended procedures, ASTM Standards, and WSDOT Standard Specifications.
 - 2. Maintain line and grade per Drawings.

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STORM DRAINAGE UTILITIES
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3. Join pipe in accordance with manufacturer's recommended procedure and WSDOT Standard Specifications.
 4. Comply with WSDOT Section 7 04.3.
- C. Cleanouts:
1. Construct plumb and level.
 2. Adjust top to finish grade. Verify top of cleanout elevation.

3.04 FIELD QUALITY CONTROL

- A. In accordance with Section 014000: Low pressure air test in accordance with WSDOT Standard Specification Section 7-04.3(1)F.
- B. Site Tests:
- C. Perform compaction test.
- D. If tests indicate Work does not meet specified requirements, recompact and retest.
- E. Inspection: Owner will observe the Work at the following milestones: After completion of pipe, manholes, cleanouts, bedding, and before backfilling.

3.05 CLEANING

- A. Prior to final acceptance, flush out accumulated construction debris and remove other foreign matter from storm drains. Do not allow flushed material to enter downstream system.

3.06 PROTECTION

- A. Protect completed work from damage.
- B. Protect slopes from erosion.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Underdrains.

1.02 RELATED REQUIREMENTS

- A. Section 312000 - Earth Moving
- B. Section 321611 - Cement Concrete Sidewalk, Curbs and Gutters
- C. Section 334000 - Storm Drainage Utilities

1.03 REFERENCES

- A. Whatcom County Development Standards.
- B. WSDOT Standard Specifications - Washington State Department of Transportation 2026 Standard Specifications for Road, Bridge, and Municipal Construction.
- C. WSDOT Standard Plans - Washington State Department of Transportation Standard Plans for Road and Bridge Construction, latest edition.
- D. ASTM D1527 Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedule 40 and 80.

1.04 DEFINITIONS

- A. French Drain: A drainage system below ground surface designed to collect and convey groundwater.

1.05 SUBMITTALS

- A. Submit under provisions of Section 013000 - Administrative Requirements.
- B. Product Data: Catalog cuts and specifications for pipe, fittings, filter fabric, and castings.
- C. Manufacturers' Installation Instructions: Indicate special procedures required to install products specified.
- D. Shop Drawings: Drawings indicating various details, such as how to seal top edge and fitting connection from perforated pipe to conveyance pipe and drain system. Manufacturer's drawings and pictures are acceptable if they show sufficient detail.
- E. Quality Assurance/Control Submittals:
 - 1. Test Reports: Submit sieve analysis for each material.
 - 2. Certificates: Submit WSDOT pit certification for each pit.
- F. Record Documents: Submit under provisions of Section 017800 - Closeout Submittals. Record actual locations of pipe runs and connections. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE

- A. Qualifications: Crew Foreman: Minimum six years' working experience and four years' experience as foreman performing similar work.
- B. Regulatory Requirements: Whatcom County Standards.

PART 2 PRODUCTS

2.01 AGGREGATE

- A. Drain Rock: Section 312000 - Earth Moving.
- B. Foundation Material: Section 312000 - Earth Moving.

2.02 STORM DRAIN PIPE

- A. General: Comply with WSDOT standards.
- B. Pipe and Coupling Bands: WSDOT Standard Specifications Section 9-05.1.
- C. Acceptable Pipe Materials: Section 334000 - Storm Drainage Utilities.

2.03 UNDERDRAIN PIPE

- A. Pipe and Coupling Bands: WSDOT Standard Specifications Section 9 05.02.
- B. Acceptable Pipe Materials:
 - 1. PVC: WSDOT Section 9-05.02(6).
 - 2. ABS: ASTM D1527, Schedule 80.
- C. Perforations: 1/2-inch-diameter holes on 60-degree radial lines, 8 inches on center.

2.04 CONCRETE

- A. Comply with Section 321611 - Cement Concrete Sidewalk, Curbs and Gutters.
- B. Minimum 3,000 psi.

2.05 METAL CASTINGS

- A. Cleanout Frame and Cover: Section 334000 - Storm Drainage Utilities.

2.06 FILTER FABRIC

- A. Non-woven geotextile fabric. Mirafi 140 N or approved substitute.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify excavation is ready to receive Work and excavations, dimensions, and elevations are as indicated on Drawings.
- B. Verify existing utilities are marked.
- C. Verify erosion control is in place and operating as specified.
- D. Verify inverts at points of connection. Pothole; expose pipes; determine invert elevations, pipe material, and diameter; verify with design; and inform Architect of deviations affecting design before mobilizing crews and beginning construction.
- E. Verify foundation wall and waterproofing is complete.

3.02 PREPARATION

- A. Protect elements surrounding Work from damage or disfiguration.
- B. Protect existing utilities from damage and disturbance. Provide shoring to support existing utilities and their support prism or remove and replace utilities where shoring is not practical. Removing and replacing to be performed in accordance with utility owner's standards.

- C. Field-locate and mark existing utilities, whether shown or not, before construction and avoid damage or disturbance. Protect, maintain, and repair where damaged. For aid in utility location, call 1 800 424 5555, 48 hours (two working days) before beginning construction.
- D. Field-stake alignment and grade.
- E. Maintain existing drainage during construction. Provide temporary ditches, drains, pipe, sumps, and pumps as required.

3.03 CONSTRUCTION

- A. Excavation:
 - 1. Comply with Section 312000 - Earth Moving.
 - 2. Remove large stones or other hard matter that could damage piping or impede consistent backfilling or compaction.
- B. Pipe:
 - 1. Install in accordance with manufacturer's recommended procedures, ASTM standards, and WSDOT Standard Specifications.
 - 2. Install perforated pipe with perforations down.
 - 3. Maintain line and grade in accordance with Drawings.
 - 4. Join pipe in accordance with manufacturer's recommended procedures and WSDOT Standard Specifications.
- C. Filter Fabric:
 - 1. Install at locations shown on Drawings.
 - 2. Overlap joints minimum 2 feet.
 - 3. Lap against building wall at top and bottom, minimum 1 foot.
- D. Cleanouts: Install in accordance with Section 334000 - Storm Drainage Utilities.
- E. Backfilling: Section 312000 - Earth Moving.

3.04 FIELD QUALITY CONTROL

- A. Comply with Section 014000.
- B. Compaction Testing: Section 312000 - Earth Moving.
- C. Architect Inspection: After completion of pipe and bedding, but before backfilling.

3.05 PROTECTION

- A. Protect footing drains and wall drains against accumulation of silt and debris. Do not allow soils or silt-laden water to enter system.
- B. Protect pipe and drain systems from damage. Do not allow heavy construction traffic to damage pipe.

END OF SECTION