BELLEVUE MANOR APARTMENTS
BELLEVUE, WA
PROJECT MANUAL BID PACKAGE
JANUARY 17TH 2020
FOR
INTERIOR REMODEL
FIRE SUPPRESSION SYSTEM

OWNER: ABBELL LLLP
ARCHITECT: ABBELL LLLP

600 Andover Park W. Seattle, WA 98188 119 S Main St. Ste 200 Seattle, WA 98104
DIVISION | TITLE
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Abbell LLLP will accept bids from qualified general contractors to furnish labor, materials and necessary equipment to perform the following:

**SCOPE OF WORK:** Work includes, but is not limited to, replacement of entry doors and water heaters in all units; renovations to common area HVAC systems, including mini-split systems, electrical panels, & interior lighting in hallways; work will also include rerouting of plumbing, common area painting, and common area flooring; and the installation of a fire sprinkler system that will involve some exterior work related to the water main connections; and other tasks as described in the bid documents.

**PROJECT MANUAL DISTRIBUTION:**
Address: Abbell LLLP, 600 Andover Park, Seattle, WA 98188
Distribution: * Documents are available for download on KCHA’s website at http://www.kcha.org/business/construction/open/

**PRE-BID CONFERENCE:**
Date and Time: February 6, 2020 at 2:00 P.M.
Jobsite Address: Bellevue Manor Apartments, 143 Bellevue Way SE, Bellevue, WA 98004.
In Addition: Contractors are strongly encouraged to attend a Pre-Bid Conference. Failure to attend a Conference will not relieve the Contractor of any responsibility for information provided at that time.
For Questions: Questions pertaining to the bid are to be sent via email to cristyt@kcha.org no later than seven (7) calendar days prior to bid due date. All responses shall be in the form of Addenda.
Posting: Addenda will be posted on KCHA’s website.

**BID GUARANTEE:**
Amount: Five (5%) Percent of the Total bid must accompany Each Bid
Payable to: Abbell LLLP

**BIDS ARE DUE:**
Time: 2:00 P.M.
Date: February 20, 2020
Address: Abbell LLLP
600 Andover Park West, Seattle, WA 98188
Submittal Process: * Sealed Envelope marked as “Bid Documents: Bellevue Manor Apartments Interior Renovations” (Mailing / Shipping Package or Wrapping must also be marked with this information).
Process: All Bids must be received and time and date stamped no later than the above due date and time. No Bids will be accepted after that date and time. No Fax or Email Bids will be accepted.

Abbell LLLP is an Equal Employment Opportunity Employer and strongly encourages minority-owned and women-owned businesses, socially and economically disadvantaged businesses, and small businesses to submit bids or to participate as subcontractors and suppliers.

Abbell LLLP reserves the right to reject any or all bids or to waive any informality in the bidding. No bid shall be withdrawn for a period of 60 calendar days subsequent to the opening of the bids without the written consent of Abbell LLLP.

**CONTACT PERSON:** Cristy Thompson at cristyt@kcha.org
1.0 BIDDER RESPONSIBILITY CRITERIA

A. It is the intent of Owner to award a contract to a responsible bidder submitting the lowest responsive bid. Before award, the bidder must meet the following bidder responsibility criteria to be considered a responsible bidder. The bidder may be required by the Owner to submit documentation demonstrating compliance with the criteria. The bidder must:

1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of bid submittal;
2. Have a current Washington Unified Business Identifier (UBI) number;
3. If applicable:
   a. Have Industrial Insurance (workers’ compensation) coverage for the bidder’s employees working in Washington, as required in Title 51 RCW;
   b. Have a Washington Employment Security Department number, as required in Title 50 RCW;
   c. Have a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;

1.1 SUBCONTRACTOR RESPONSIBILITY

A. The Contractor shall include the language of this section 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 section apply to all subcontractors regardless of tier.

B. At the time of subcontract execution, the Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:

1. Have a current certificate of registration in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;
2. Have a current Washington Unified Business Identifier (UBI) number;
3. If applicable, have:
   a. Have Industrial Insurance (workers’ compensation) coverage for the subcontractor’s employees working in Washington, as required in Title 51 RCW;
   b. A Washington Employment Security Department number, as required in Title 50 RCW;
   c. A Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
   d. An electrical contractor license, if required by Chapter 19.28 RCW;
   e. An elevator contractor license, if required by Chapter 70.87 RCW.

1.2 SUPPLEMENTAL BIDDER RESPONSIBILITY CRITERIA

A. For the work in this project a responsible/qualified Bidder must meet the following standards:
INSTRUCTIONS TO BIDDERS

1. Have a current certificate of registration as a contractor, in compliance with chapter 18.27 RCW, for the last three years under the same business name;

2. Have a good record of past performance that includes, but is not limited to, high quality work, ability to complete projects on time, contractor’s integrity, compliance with public policy, financial, contractual and tax obligations, as well as Federal and State rules and regulations in performing construction contracts.

3. Have a current Experience Modification Rate (EMR) of 1.0 or less, or an average EMR rate of 1.0 or less over the last three years. The requirement may, at the Owner’s sole discretion, be waived on review of a written explanation that includes details of accidents, L&I records, a Loss Ratio Report for the last five years, costs, dates of events, and changes that have been made by the contractor to reduce accidents. A current company Safety Plan shall also be reviewed.

4. Bidder shall provide evidence of previous successful completion of interior renovation projects, of similar scope and complexity. Poor performance, lack or response, or failure to complete projects successfully within the contract time may be grounds for the rejection of bidder.

B. Subcontractors shall have had three years minimum experience licensed in Washington State in the specific specialty contracting business.

1.3 PREPARATION OF BIDS – CONSTRUCTION

A. Bids must be submitted on the Bid Form furnished by the Owner.

B. All fields and questions on required forms must be fully answered and complete. Failure to do so may result in the bid being declared non-responsive.

C. Bidders shall acknowledge receipt of all addenda to this solicitation by inserting the addenda numbers in the space provided on the Bid Form. Failure to do so may result in the bid being declared non-responsive.

1. Bidder is responsible for ensuring that all addenda have been reviewed and included in their bid.

D. In order for a bid to be considered responsive, bidders must submit the following signed documents with their bid package:

1. Bid Form
2. Bidder’s Information Form
3. Bid Guarantee

E. The Bidder agrees to hold the base bid prices for sixty (60) days from date of bid opening.

1.4 BID GUARANTEE

A. A bid guarantee in the amount of 5% of the base bid amount is required. Failure of the Bidder to provide bid guarantee shall render the bid non-responsive.

B. Acceptable forms of bid guarantee are: A bid bond or postal money order, or certified check or cashier’s check made payable to Abbell LLLP.
C. The Owner will return bid guarantees (other than bid bonds) to unsuccessful bidders as soon as practicable, but not sooner than the execution of a contract with the successful bidder. The successful bidder’s bid guarantee will be returned to the successful bidder with its official notice to proceed with the work of the contract.

1.5 AMENDMENTS TO INVITATION TO BID

A. If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.

1.6 PRE-BID MEETING

A. All potential bidders are strongly encouraged to attend. Oral statements may not be relied upon and will not be binding or legally effective.

1.7 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE

A. Before submitting a bid, the Bidder shall carefully examine each component of the Contract Documents prepared for the Work and any other available supporting data so as to be thoroughly familiar with all the requirements.

B. The Bidder shall obtain copies of all agencies and associations guidelines and standards cited in the Contract Documents and necessary to perform the Work, including full size reproductions of material provided by Owner, at their own expense.

C. The Bidder shall make a thorough and reasonable examination of the project site, facility and conditions under which the Work is to be performed, including but not limited to: Building access; resident occupancy; fire lanes; landscaping; obstacles and character of materials which may be encountered; traffic conditions; public and private utilities; the availability and cost of labor; and available facilities for transportation, handling, and storage of materials and equipment.

1.8 EXPLANATION TO PROSPECTIVE BIDDERS

A. Any prospective bidder desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must submit a request in writing to the Owner seven (7) calendar days before the bid due date. Oral explanations or instructions given before the award of a contract will not be binding. Questions shall be submitted to:

Cristy Thompson
Abbell LLLL
600 Andover Park West
Seattle, WA 98188
Email: cristyt@kcha.org

1.9 WAGE RATES

A. Prevailing Wage Rates are included in the Bid Documents. Contractor shall pay no less than the rates indicated to all workers, laborers, or mechanics employed in the performance of any part of the Work.
INSTRUCTIONS TO BIDDERS

1. Residential rates may be used where available.
2. The Contractor shall submit an Agreement to Pay Prevailing Wages to the Owner prior to start of Work.

1.10 TAXES

A. All taxes imposed by law shall be included in the bid amount. The Contractor shall pay the WSST to the Department of Revenue and shall furnish proof of payment to the Owner if requested.

B. Washington State retail sales tax shall be included in the contract price.

1.11 ASSURANCE OF COMPLETION

A. Payment and performance bonds for 100% of the Contract Sum, including all Change Orders and taxes imposed by law, shall be furnished for the Work, and shall be in a form acceptable to the Owner.

1.12 BID ERROR

A. In the event Bidder discovers an error in its bid, the Bidder may, under certain conditions and if before the date and time that bids are due, modify, their bid, as detailed below:

1. Prior to Date and Time Bids are Due:
   a. A Bidder may withdraw its bid at any time prior to the date and time bids are due upon written request.
   b. After withdrawing an original submitted bid, a Bidder may modify and resubmit its bid at any time prior to the date and time bids are due.

2. After the Date and Time Bids are Due:
   a. A bidder who submits an erroneous low bid may withdraw the bid. The bid withdrawal is permissible if there was an obvious error in the low bid, and the mistake is readily apparent from the bid itself.
   b. Notification: Provide to the Owner, within 24 hours of bid opening, written notification of the bidder’s intent to withdraw the bid due to error.
   c. Documentation: Provide to the Owner within 48 hours of bid opening, documentation sufficient in content to justify bid withdrawal to the satisfaction of the Owner. Include description and evidence of the error.
   d. Approval: the Owner will approve or reject the request for withdrawal in writing.
   e. Any low bidder who withdraws its bid is prohibited from bidding on the same project if it is subsequently re-solicited.

1.13 ADDITIVE OR DEDUCTIVE BID ITEMS

A. The low bid, for purposes of award, shall be the lowest responsive bid from a qualified responsible bidder offering the low aggregate amount for the base bid, plus additive or deductive bid alternates selected by the Owner.
1.14 BID EVALUATION

A. Responsive Bids: A bid will be considered responsive if it meets the conditions of the solicitation, in addition to but not limited to the following requirements:

1. Bid is received not later than the time and date specified.
2. Bid is submitted in the proper format on the form(s) provided.
3. Bid includes the complete scope of work as defined in bid package.
4. Bid does not include any exclusions or qualifications.
5. Bid includes Unit and Lump Sum Costs as listed in Proposal Form.
6. Forms are complete.

B. After bid opening, bids will be checked for correctness of bid item prices, extensions and the total bid price. Discrepancies shall be resolved by accepting the bid item prices and the corrected extensions and total bid price.

C. Responsible Bidders: the Owner will award contracts only to responsible bidders who demonstrate the ability to successfully perform under the terms and conditions as set forth in the Contract Documents and have successfully completed apartment renovation projects similar in scope and complexity.

1. Bidders must demonstrate relevant experience on similar types of projects and submit detailed information as required on the Bidder Information Form.

D. The Owner reserves the right to contact references and investigate past performance and qualifications of the Bidder, subcontractor, and project team members, including contacting third parties and/or the references provided by the Bidder.

1. The Owner may contact references for other projects including those the Bidder did not identify and/or provided references.
2. References may be asked to rate the performance of and describe their experience with project team members and subcontractors. Bidder Information may be solicited and evaluated on the following subjects: type and features of work; overall quality of project performance and quality of work; experience and technical knowledge and competence of the Bidder and Project Team Members; ability, capacity and skill to perform the Work; ability to manage submittals, requests for information, prevailing wage filings, and other paperwork; compliance with laws, ordinances, and contract provisions; and other information as deemed necessary.
3. Poor reference(s) may be justification to determine a Bidder is not responsible.

E. At the Owner's request, provide any additional explanation or information, which would assist in evaluating the qualifications of the Bidder, subcontractors, project team members, and bid price.

F. The Owner will verify information submitted and if the lowest bidder is determined to be “not responsible,” the Owner will issue, in writing, the specific reasons for this determination. The bidder may appeal this decision. The appeal must be in writing and shall be delivered to the Owner within two business days. The appeal may include additional information that was not included in the original bid documents. Abbell LLLP will make a final determination after the receipt of the appeal. The final determination may not be appealed.

1.15 CONTRACT AWARD
A. Bonding and Insurance: Contract award will be contingent on ability to secure payment/performance bonding, and Contractor’s ability to meet the Owner insurance requirements as detailed in the Bid Documents.

B. Must, for the duration of the contract, procure and maintain Builders Risk insurance. This shall be in addition to General Liability, Automobile Liability, and Professional Liability/Errors and Omissions (if applicable) Coverage.

C. Bonding, insurance and Agreement to Pay Prevailing Wage Rates shall be submitted to the Owner within 10 days of contract award.

D. Right to Reject Bids/Waiver: The Owner reserves the right to reject any or all bids or to waive any informalities or irregularities in the bidding.

E. Retainage Funds: The Owner will not pay interest to the Contractor for accounts where retainage funds are maintained by the Owner. As part of the procurement by which the Contractor was selected for this work, the Contractor agrees to waive any other options and has made allowances for this waiver.
PART 1 - GENERAL PROVISIONS

1.1 DEFINITIONS

A. “Application for Payment” means a written request submitted by Contractor to Owner for payment of Work completed in accordance with the Contract Documents and approved Schedule of Values, supported by such substantiating data as Owner 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. “Authority Having Jurisdiction” or “AHJ” means a federal, state, local, or other regional department, or an individual such as a fire official, labor department, health department, building official, or other individual having statutory authority.

D. “Change Order” means a written instrument signed by Owner and Contractor stating their agreement upon all of the following: (1) a change in the Work; (2) the amount of the adjustment in the Contract Sum, if any, and (3) the extent of the adjustment in the Contract Time, if any.

E. “Claim” means Contractor’s exclusive remedy for resolving disputes with Owner arising from the Contract Documents (including disputes regarding the terms of a Change Order or a request for equitable adjustment), as more fully set forth in Part 8.

F. “Construction Schedule” means a schedule of the Work, in a form satisfactory to Owner, as further set forth in Part 3.2.

G. “Contract Award Amount” is the sum of the Base Bid, any accepted Alternates, and Washington State Retail Sales Tax.

H. “Contract Documents” means the Contract Form, Addenda, Instructions to Bidders, General Conditions, Bid Form and Bidder Information, applicable wage rates, drawings and specifications, hazardous material reports, performance and payment bonds, and all other parts of the bid solicitation.

I. “Contract Sum” is the total amount payable by Owner to Contractor for performance of the Work in accordance with the Contract Documents, including Washington State sales tax and all other taxes imposed by law and properly chargeable to the Work.

J. "Contract Time" is the number of consecutive Days allotted in the Contract Documents for achieving Substantial Completion of the Work.

K. “Contracting Officer” means the person delegated the authority by Owner to enter into, and/or terminate this Contract. The term includes any successor Contracting Officer and any duly authorized representative of the Contracting Officer.

L. “Contractor” means the person or entity who has agreed with Owner to perform the Work in accordance with the Contract Documents.

M. "Day" means calendar day, unless otherwise specified.

N. “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.

O. “Final Acceptance” means the written acceptance issued to Contractor by Owner after Contractor has completed the requirements of the Contract Documents.

P. “Final Completion” means that the Work is fully and finally complete in accordance with the Contract Documents.

Q. “Force Majeure” means those acts entitling Contractor to request an equitable adjustment in the Contract Time, as more fully set forth in Part 3.5A.
R. "Furnish" means supply and deliver to Project site, ready for unpacking, assembly, installation, and similar operations.

S. "Install" means operations at project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

T. “Manager” means the person who is an authorized agent of the Owner to administer the Contract.

U. “Notice” means a written notice which has been delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended or, if delivered or sent by registered or certified mail, to the last business address known to the party giving notice.

V. “Notice to Proceed” means a notice from Owner to Contractor that defines the date on which the Contract Time begins to run.

W. “Owner” means Abbell LLLP 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.

X. “Person” means a corporation, partnership, business association of any kind, trust, company, or individual.

Y. “Prior Occupancy” means Owner’s use of all or parts of the Project before Substantial Completion, as more fully set forth in Part 6.7A.

Z. "Provide" means furnish and install, complete and ready for the intended use.

AA. “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.

BB. “Project Record” means the separate set of Drawings and Specifications as further set forth in Part 4.2A.

CC. “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.

DD. “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.

EE. “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.

FF. “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.

GG. “Substantial Completion” means that stage in the progress of the Work where the Owner has full and unrestricted use and benefit of the facilities for the purposes intended [when the construction is sufficiently complete], as more fully set forth in Part 6.6.

HH. “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.

1.2 EXECUTION AND INTENT

Contractor makes the following representations to Owner:

A. 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;
B. Contractor has carefully reviewed the Contract Documents, had an opportunity to visit and examine the Project site, has become familiar with the local conditions in which the Work is to be performed, and has 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.

C. 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

D. 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.

E. All work is to be executed in accordance with the Building Codes, as adopted by the Authority Having Jurisdiction, and other applicable codes and generally accepted industry standards.

F. 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.

PART 2 - INSURANCE AND BONDS

2.1 INSURANCE REQUIREMENTS FOR BUILDING TRADES CONTRACTORS

A. Within 7 days from the date of the Notice of Award and prior to commencing Work, Contractor shall obtain, and maintain, for the duration of the Contract and for one year after Final Acceptance, insurance against claims for injuries to persons or damages to property that may arise from or in connection with the performance of the work hereunder by the Contractor, his agents, representatives, employees or Subcontractors. Contractor shall also maintain such insurance coverage during the performance of any corrective Work required by Part 5.15. Review of the Contractor’s insurance by Owner shall not relieve or decrease the liability of Contractor.

2.2 MINIMUM SCOPE OF INSURANCE

A. Contractors shall maintain coverages no less than:

1. Insurance Services Office Commercial General Liability coverage.
2. Insurance Services Office covering Automobile Liability, code 1 (any auto).
3. Workers’ Compensation insurance as required by State law and Employer’s Liability Insurance.
4. Builders Risk (Property / Course of Construction) insurance covering for all risks of loss.

2.3 MINIMUM LIMITS OF INSURANCE

A. Contractor shall maintain limits no less than:

1. General Liability: $1,000,000 per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit of $2,000,000.
2. Automobile Liability: $1,000,000 per accident for bodily injury and property damage.
3. Employer’s Liability: $1,000,000 per accident for bodily injury/sickness or disease.

2.4 DEDUCTIBLES AND SELF INSURED RETENTION

A. Any deductibles or self-insured retentions must be declared to and approved by the Owner. At the option of the Owner, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the Owner, its officers, officials, employees and volunteers; or the Contractor shall provide a financial guarantee satisfactory to the Owner guaranteeing payment of losses and related investigations, claim administration and
defense expenses. NOTE: If this contract deals with hazardous materials or activities (i.e. lead based paint, asbestos, armed security guards), additional provisions covering those exposures must be included in order to protect the Owner’s interests.

2.5 OTHER INSURANCE PROVISIONS

A. The policies are to contain, or be endorsed to contain, the following provisions:

1. The Owner, the Property Manager, its officers, officials, employees, partners, agents and volunteers are to be covered as additional insureds under a “completed operations” type of additional insured endorsement with respect to general liability arising out of work or operations performed by or on behalf of the Contractor including materials, parts or equipment furnished in connection with such work or operations. The endorsement(s) effectuating the foregoing additional insured coverage shall be ISO form CG 20 10 11 85, or CG 20 10 10 01 issued concurrently with CG 20 37 10 01, or their equivalent as long as it provides additional insured coverage, without limitation, for (1) completed operations; (2) automobile liability arising out of vehicles owned, leased, hired, or borrowed by or on behalf of the Contractor; (3) any insurance written on a claims made basis, shall have a retroactive date that coincides with, or precedes, the commencement of any work under this contract. Evidence of such coverage shall be maintained for a minimum of six (6) years beyond the expiration of the project.

2. The Owner will not accept Certificates of Insurance alone. Improperly completed endorsements will be returned to your insured for correction by an authorized representative of the insurance company.

3. For any claims related to this project, the Contractor’s insurance coverage shall be primary insurance as respects the Owner, its officers, officials, agents, partners, employees, and volunteers. Any insurance or self-insurance maintained or expired by the Owner, its officers, officials, agents, partners, employees, volunteers shall be excess of the Contractor’s insurance and shall not contribute with it. Owner’s Insurance is Non-Contributory in claims settlement funding.

4. The “General description of agreement(s) and/or activity(s) insured” shall include reference to the activity and/or to Owner’s specific project or site name, contract number, lease number, permit number or construction approval number.

5. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be canceled or materially changed, except after thirty (30) days’ [ten (10) days for non-payment of premium] prior written notice, by certified mail, return receipt requested, has been given to the Owner.

6. Maintenance of the proper insurance for the duration of the contract is a material element of the contract. Material changes in the required coverage or cancellation of the coverage shall constitute a material breach of the contract.

2.6 ACCEPTABILITY OF INSURERS

A. Insurance is to be placed with insurers with a current A.M. Best’s rating of no less than A-:VII. The name of the Insurance Company underwriting the coverage and its address shall be noted on the endorsement form. Contractors must provide written verification of their insurer’s rating.

2.7 VERIFICATION OF COVERAGE

A. Contractor shall furnish the Owner with original certificates and amendatory endorsements effecting coverage required by this clause. All certificates and endorsements are to be received and approved by the Owner before work commences in sufficient time to permit contractor to remedy any deficiencies. The Owner reserves the right to require complete, certified copies of all required insurance policies or pertinent parts thereof, including endorsements affecting the coverage, required by these specifications at any time. Contractor shall include in its bid the cost of all insurance and bonds required to complete the base bid work and accepted alternates.

2.8 SUBCONTRACTORS

A. Subcontractors shall include the Contractor as additional insured under their policies. All coverage for subcontractors shall be subject to all of the requirements stated herein. Contractor shall be responsible for the adequacy of required coverages for subcontractors, and compile related certificates of insurance and endorsements evidencing subcontractors’ compliance.
2.9 PAYMENT AND PERFORMANCE BONDS

A. Payment and performance bonds for 100% of the Contract Award Amount shall be furnished for the Work, using the Payment Bond and Performance Bond form AIA – form A312. Change order increases of cumulative 15% increments require revisions to the bond to match the new Contract Sum.

PART 3 - TIME AND SCHEDULE

3.1 PROGRESS AND COMPLETION

A. 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.

3.2 CONSTRUCTION SCHEDULE

A. Preliminary Progress Schedule: Unless otherwise provided in Division 1, Contractor shall, within seven Days after issuance of the Notice to Proceed, submit a preliminary Construction Schedule. The Construction 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.

B. Form of Construction Schedule: Unless otherwise provided in Division 1, the Construction Schedule shall be in the form of a bar chart or critical path method analysis, as specified by Owner. The preliminary Construction Schedule may be general, showing the major portions of the Work, with a more detailed Construction Schedule submitted as directed by Owner.

C. Owner comments on Construction Schedule: Owner shall return comments on the preliminary Construction Schedule to Contractor within 7 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 the progress payments until a Construction Schedule has been submitted which meets the requirements of this section.

D. Monthly updates and compliance with Construction Schedule: Contractor shall utilize and comply with the Construction Schedule. On a monthly basis, or as otherwise directed by Owner, Contractor shall submit an updated Construction Schedule at its own expense to Owner indicating actual progress. If, in the opinion of Owner, Contractor is not in conformance with the Construction Schedule for reasons other than acts of Force Majeure as identified in Part 3.5, Contractor shall take such steps as are necessary to bring the actual completion dates of its work activities into conformance with the Construction Schedule, or revise the Construction 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 Construction 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.

3.3 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:
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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 Section 7.

3.4 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.

3.5 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.

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 Part 7.2A. 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 Parts 7.2 and 7.2A.

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 7.2A, 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.
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3.6 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 in 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.

3.7 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, liquidated damages of $2000.00 per Day unless other amount indicated here or in Division 1] will be assessed.

2. Calculation of Liquidated Damages amount: The liquidated damage amounts set forth above 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 any payments to the Contractor.

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.

4. If different completion dates are specified in the contract for separate parts or stages of the Work, the amount of liquidated damages shall be assessed on those parts or stages which are delayed.

B. Actual Damages

1. 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 administrative, financial, and other related costs attributable to the Project from the date when Substantial Completion should have been achieved to the date Final Completion is actually achieved. The amount of these costs may be retained by Owner and deducted from any payment due Contractor.

PART 4 - SPECIFICATIONS, DRAWINGS, AND OTHER DOCUMENTS

4.1 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 Owner 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 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 Owner: Questions regarding interpretation of the requirements of the Contract Documents shall be referred to the Owner.

4.2 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.”

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 Owner prior to Final Acceptance.

4.3 SHOP DRAWINGS

A. Definition of Shop Drawings: “Shop Drawings” means documents and other information required to be submitted to Owner 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 Owner 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. Owner 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 Owner has approved or taken other appropriate action. Owner 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
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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 Owner approves any such variation, an appropriate Change Order will be issued. If the variation is minor and does not involve an adjustment in the Contract Sum or Contract Time, a Change Order need not be issued; however, the modification shall be recorded upon the Project Record.

E. Contractor to submit 4 copies of Shop Drawings: Unless otherwise provided in Division 1, Contractor shall submit to Owner for approval 4 copies of all Shop Drawings. Unless otherwise indicated, 3 sets of all Shop Drawings shall be retained by Owner and 1 set shall be returned to Contractor.

4.4 ORGANIZATION OF SPECIFICATIONS

A. 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.

PART 5 - PERFORMANCE

5.1 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, if Owner reasonably deems the superintendent incompetent, careless, or otherwise objectionable, provided Owner has first notified Contractor in writing and allowed a reasonable period for transition.

C. Contractor responsible for acts and omissions of self and agents: Contractor shall be responsible to Owner for acts and omissions of Contractor, Subcontractors, and their employees and agents.

D. Contractor to employ competent and disciplined workforce: Contractor shall enforce strict discipline and good order among all of the Contractor’s employees and other persons performing the Work. Contractor shall not permit employment of persons not skilled in tasks assigned to them. Contractor’s employees shall at all times conduct business in a manner which assures fair, equal, and nondiscriminatory treatment of all persons. Owner may, by written notice, request Contractor to remove from the Work or Project site any employee Owner reasonably deems incompetent, careless, or otherwise objectionable.

E. Contractor to keep project documents on site: Contractor shall keep on the Project site a copy of the Drawings, Specifications, addenda, reviewed Shop Drawings, and permits and permit drawings.

5.2 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: If allowances for permits or utility fees are called for in the Contract Documents and set forth in Contractor’s bid, and the actual costs of those permits or fees differ from the allowances in the Contract Documents, the difference shall be adjusted by Change Order.

C. Contractor to comply with all applicable laws: Contractor shall comply with and give notices required by all federal, state, and local laws, ordinances, rules, regulations, and lawful orders of public authorities applicable to performance of the Work.

5.3 PREVAILING WAGES

A. Contractor to pay Prevailing Wages: Contractor shall pay the prevailing rate of wages to all workers, laborers, or mechanics employed in the performance of any part of the Work in accordance with the requirements of the Owner.

B. Agreement to Pay Prevailing Wages: Before commencing the Work Contractor shall submit to the Owner an Agreement to Pay Prevailing Wages.

C. Affidavit of Wages Paid: Prior to release of retainage, the Contractor shall submit to the Owner an Affidavit of Wages Paid, 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 to the Owner.

E. Certified Payrolls: Contractor and any subcontractor shall submit a certified copy of payroll records if requested.

5.4 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.

5.5 NONDISCRIMINATION

A. During performance of the Work:

1. Contractor shall not discriminate against any employee or applicant for employment because of race, creed, color, national origin, sex, age, marital status, the presence of any physical, sensory, or mental disability, sexual orientation, Vietnam-era veteran status, disabled veteran status or political affiliation, nor commit any unfair practices as defined in RCW 49.60.

2. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, of any physical, sensory, or mental disability, sexual orientation, Vietnam-era veteran status, disabled veteran status, or political affiliation.

3. The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations and orders in regard to Equal Employment Opportunity including but not limited to Executive Order 11246, as amended, Section 503 of the Rehabilitation Act of 1973, as amended, and the rules, regulations, and orders of the Secretary of Labor. The Contractor shall include the terms of this Clause in every subcontract so that such term shall be binding on each Subcontractor.

4. Non-Discrimination R.C.W. 49.60: These special requirements establish minimum requirements for affirmative action and are intended to define and implement the basic discrimination provisions of these specifications. Failure to comply with these requirements may constitute grounds for application of contract default.
5.6 SAFETY PRECAUTIONS

A. Contractor responsible for safety: Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Work.

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. 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 Chapter 19.27 RCW, State Building Code (Uniform Building, Electrical, Mechanical, Fire, and Plumbing Codes); Chapter 212-12 WAC, Fire Marshal Standards, Chapter 49.17 RCW, WISHA; Chapter 296-155 WAC, Safety Standards for Construction Work; Chapter 296-65 WAC; WISHA Asbestos Standard; WAC 296-62-071, Respirator Standard; WAC 296-62, General Occupation Health Standards, WAC 296-24, General Safety and Health Standards; Chapter 296-62 WAC, and Right to Know Act.

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 to prescribe safety conditions relating to employees, public, or agents of the Contractors.

C. Contractor to maintain safety records: Contractor shall maintain an accurate record of exposure data on all incidents relating to the Work resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment. Contractor shall immediately report any such incident to Owner. Owner shall, at all times, have a right of access to all records of exposure.

D. Contractor to provide HazMat training: Contractor shall provide all persons working on the Project site with information and training on hazardous chemicals in their work at the time of their initial assignment, and whenever a new hazard is introduced into their work area.

1. Information. At a minimum, Contractor shall inform persons working on the Project site of:
   a. WAC: The requirements of chapter 296-62 WAC, General Occupational Health Standards;
   b. Presence of hazardous chemicals: Any operations in their work area where hazardous chemicals are present; and
   c. Hazard communications program: The location and availability of written hazard communication programs, including the required list(s) of hazardous chemicals and material safety data sheets required by chapter 296-62 WAC.

2. Training. At a minimum, Contractor shall provide training for persons working on the Project site which includes:
   a. Detecting hazardous chemicals: Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
   b. Hazards of chemicals: The physical and health hazards of the chemicals in the work area;
c. Protection from hazards: The measures such persons can take to protect themselves from these hazards, including specific procedures Contractor, or its Subcontractors, or others have implemented to protect those on the Project site from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and

d. Hazard communications program: The details of the hazard communications program developed by Contractor, or its Subcontractors, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.

E. Hazardous, toxic or harmful substances: Contractor’s responsibility for hazardous, toxic, or harmful substances shall include the following duties:

1. Illegal use of dangerous substances: Contractor shall not keep, use, dispose, transport, generate, or sell on or about the Project site, any substances now or hereafter designated as, or which are subject to regulation as, hazardous, toxic, dangerous, or 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 on the Project site.

2. Contractor notifications of spills, failures, inspections, and fines: Contractor shall promptly notify Owner of all spills or releases of any hazardous substances which are otherwise required to be reported to any regulatory agency and pay the cost of cleanup. Contractor shall promptly notify Owner of all failures to comply with any federal, state, or local law, regulation, or ordinance; all inspections of the Project site by any regulatory entity concerning the same; all regulatory orders or fines; and all responses or interim cleanup actions taken by or proposed to be taken by any government entity or private party on the Project site.

F. Public safety and traffic: All Work shall be performed with due regard for the safety of the public. Contractor shall perform the Work so as to cause a minimum of interruption of vehicular traffic or inconvenience to pedestrians. All arrangements to care for such traffic shall be Contractor’s responsibilities. All expenses involved in the maintenance of traffic by way of detours shall be borne by Contractor.

G. Contractor to act in an emergency: In an emergency affecting the safety of life or the Work or of adjoining property, Contractor is permitted to act, at its discretion, to prevent such threatened loss or injury, and Contractor shall so act if so authorized or instructed.

H. No duty of safety by Owner or A/E: Nothing provided in this section 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.

5.7 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.
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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 Final Acceptance, and shall repair or replace without cost to Owner any damage or loss that may occur.

5.8 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 engage a locate service for all underground facilities or utilities and provide notice of the scheduled commencement of excavation to all owners of underground facilities or utilities. Contractor shall pay all fees for locator services and pay for all damages caused by excavation.

5.9 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.

5.10 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.

5.11 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.
5.12 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 Owner, is equal to that named in the Specifications, unless otherwise specifically provided in the Contract Documents.

B. Contractor responsible for fitting parts together: Contractor shall do all cutting, fitting, or patching that may be required to 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.

C. Owner may reject defective Work: Should any of the Work be found defective, or in any way not in accordance with the Contract Documents, this work, in whatever stage of completion, may be rejected by Owner.

5.13 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.

5.14 TESTS AND INSPECTION

A. Contractor to provide for all testing and inspection of Work: Contractor shall maintain an adequate testing and inspection program and perform such tests and inspections as are necessary or required to ensure that the Work conforms to the requirements of the Contract Documents. Contractor shall be responsible for inspection and quality surveillance of all its Work and all Work performed by any Subcontractor. Unless otherwise provided, Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. Contractor shall give Owner timely notice of when and where tests and inspections are to be made. Contractor shall maintain complete inspection records and make them available to Owner.

B. Owner may conduct tests and inspections: Owner may, at any reasonable time, conduct such inspections and tests as it deems necessary to ensure that the Work is in accordance with the Contract Documents. Owner shall promptly notify Contractor if an inspection or test reveals that the Work is not in accordance with the Contract Documents. Unless the subject items are expressly accepted by Owner, such Owner inspection and tests are for the sole benefit of Owner and do not:

1. Constitute or imply acceptance;
2. Relieve Contractor of responsibility for providing adequate quality control measures;
3. Relieve Contractor of responsibility for risk of loss or damage to the Work, materials, or equipment;
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.

5.15 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 Part 6.7, 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.

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.
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5.16 CLEAN UP
   A. 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.

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

5.18 OTHER CONTRACTS
   A. 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.

5.19 SUBCONTRACTORS AND SUPPLIERS
   A. Subcontractor Responsibility: The Contractor shall include the language of this paragraph in each of its first tier subcontracts, and shall require each of its subcontractors to include the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. Upon request of the Owner, the Contractor shall promptly provide documentation to the Owner demonstrating that the subcontractor meets the subcontractor responsibility criteria below. The requirements of this paragraph apply to all subcontractors regardless of tier. At the time of subcontract execution, the Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:

   1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;
   2. Have a current Washington Unified Business Identifier (UBI) number;
   3. If applicable, have:
      a. Industrial Insurance (workers’ compensation) coverage for the subcontractor’s employees working in Washington, as required in Title 51 RCW;
      b. A Washington Employment Security Department number, as required in Title 50 RCW;
      c. A Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
      d. An electrical contractor license, if required by Chapter 19.28 RCW;
      e. An elevator contractor license, if required by Chapter 70.87 RCW.
   B. Provide names of Subcontractors and use qualified firms: Before submitting the first Application for Payment, Contractor shall furnish in writing to Owner the names, addresses, and telephone numbers of all Subcontractors, as well as suppliers. 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.
   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. Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. However, nothing in this paragraph shall be construed to alter the contractual relations between Contractor and its Subcontractors with respect to insurance or bonds.
D. Coordination of Subcontractors; Contractor responsible for Work: Contractor shall schedule, supervise, and coordinate the operations of all Subcontractors. No Subcontracting of any of the Work shall relieve Contractor from its responsibility for the performance of the Work in accordance with the Contract Documents or any other obligations of the Contract Documents.

E. Automatic assignment of subcontracts: Each subcontract agreement for a portion of the Work is hereby assigned by Contractor to Owner provided that:

1. Effective only after termination and Owner approval: The assignment is effective only after termination by Owner for cause pursuant to Part 9.1 and only for those Subcontracts which Owner accepts by notifying the Subcontractor in writing; and
2. Owner assumes Contractor’s responsibilities: After the assignment is effective, Owner will assume all future duties and obligations toward the Subcontractor which Contractor assumed in the Subcontract.
3. Impact of bond: The assignment is subject to the prior rights of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.

5.20 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.

5.21 INDEMNIFICATION

A. The Contractor hereby agrees to indemnify, defend, and hold harmless the Owner, its successors and assigns, directors, officers, officials, employees, agents, partners and volunteers (all foregoing singly and collectively “Indemnitees”) from and against any and all claims, losses, harm, costs, liabilities, damages and expenses, including, but not limited to, reasonable attorney’s fees, arising or resulting from the performance of the services, or the acts or omissions of the Contractor its successors, and assigns, employees, subcontractors or anyone acting on the contractor’s behalf in connection with the Contract Documents or its performance thereof.

B. Provided, however, that the Contractor will not be required to indemnify, defend, or save harmless the indemnitee as provided in the preceding paragraphs of this section if the claim, suit, or action for injuries, death, or damages is caused by the sole negligence of the indemnitee. Where such claims, suits, or actions result from the concurrent negligence of (a) the Indemnitee or the Indemnitee’s agents or employees and (b) the Contractor or the Contractor’s agents or employees, the indemnity provisions provided in the proceeding paragraphs of this section shall be valid and enforceable only to the extent of the Contractor’s negligence or the negligence of its agents and employees.

C. The foregoing indemnity is specifically and expressly intended to constitute a waiver of the Contractor’s immunity under Washington’s Industrial Insurance act, RCW Title 51. The parties acknowledge that these provisions were specifically negotiated and agreed upon by them. If any portion of this indemnity clause is invalid or unenforceable, it shall be deemed excised and the remaining portions of the clause shall be given full force and effect.

D. The Contractor hereby agrees to require all its Subcontractors or anyone acting under its direction or control or on its behalf in connection with or incidental to the performance of the Contract Documents to execute an
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indemnity clause identical to the preceding clauses, specifically naming the Indemnitees as indemnitee, and failure to do so shall constitute a material breach of the Contract Documents by the Contractor.

PART 6 - PAYMENTS AND COMPLETION

6.1 CONTRACT SUM

A. Taxes: The Contract Sum shall include all taxes imposed by law and properly chargeable to the Project, including retail sales tax. The contractor shall pay the WSST to the Department of Revenue and shall furnish proof of payment to the Owner if requested.

6.2 SCHEDULE OF VALUES

A. 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.

6.3 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, 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 Part 1.2, 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. Each Application for Payment shall be consistent with previous applications and payments.

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;
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.

6.4 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 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 consent of surety to release of the retainage. The Owner will not pay interest to the Contractor for accounts where retainage funds are maintained by the Owner. The Contractor agrees to waive any other options and has made allowances for this waiver. 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. Waivers of Lien: With each Application for Payment, submit conditional waivers lien from every entity who is lawfully entitled to file a lien arising out of the Work covered by the payment.

1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

E. Final Payment Application: Submit final Application for Payment with releases and close out supporting documentation.

F. Approved payments shall be mailed to the Contractor within 30 days.

6.5 PAYMENTS WITHHELD

A. Owner’s right to withhold payment: Owner may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any payment to such extent as may be necessary to protect Owner from loss or damage for reasons including but not limited to:

1. Non-compliant Work: Work not in accordance with the Contract Documents;
2. Remaining Work to cost more than unpaid balance: Reasonable evidence that the Work required by the Contract Documents cannot be completed for the unpaid balance of the Contract Sum;
3. Owner correction or completion Work: Work by Owner to correct defective Work or complete the Work in accordance with Section 5.15;
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.

6.6 SUBSTANTIAL COMPLETION

A. Substantial Completion defined: Substantial Completion is the stage in the progress of the Work when the construction is sufficiently complete, in accordance with the Contract Documents, so Owner has full and
unrestricted use and benefit of the facilities 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.

6.7 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.

6.8 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 a final inspection of the Work by Owner following receipt of (1) written notice from the Contractor that the Work is ready for final inspection and (2) a final Application for Payment. When the Owner finds the Work acceptable and fully performed under the Contract Documents and the Contractor has delivered to the Owner all warranties, permits, and operations manuals, the Owner will issue a Notice of Final Completion. In no case shall Final Completion constitute Final Acceptance which is a subsequent, separate, and distinct action.

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

7.1 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 7.2 or 7.2A, 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 7 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 7.2 and 7.3, 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.

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 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.

7.2 CHANGE IN THE CONTRACT SUM

A. Change Order Pricing - Fixed Price: When the fixed price or time and materials 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:

1. 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 with documentation in a form approved by Owner.
2. Any request for adjustment of Contract Sum shall include only the following items:
   
a. Craft labor costs for Contractors and Subcontractors.
1) Basic wages and benefits: Hourly rates and benefits according to applicable prevailing wages.

2) Direct supervision shall not exceed 15% of the cost of direct labor. No supervision markup shall be allowed for a working supervisor’s hours.

3) Worker’s Insurance. Direct contributions to the State for industrial insurance, medical aid, and supplemental pension by the class and rates established by L&I.


5) Safety and small tools: 4% of the sum of the amounts calculated in (1), (2), and (3) above.

b. Material Costs: Material costs shall be developed from actual known costs, supplier quotations or standard industry pricing guides and shall consider all available discounts. Freight costs, express charges, or special delivery charges shall be itemized.

c. Equipment Costs: Itemization of the type of equipment and the estimated or actual length of time the equipment appropriate for the Work is or will be used on the change in the Work. Costs will be allowed for equipment only if used solely for the changed Work, or for additional rental costs actually incurred by the Contractor. The Quest 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 50% of the applicable rate.

d. Allowance for Overhead: This allowance shall compensate Contractor for all noncraft labor, temporary construction facilities, field engineering, schedule updating, as-built 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. This allowance shall be strictly limited in all cases an amount not to exceed the following:

   1) For Contractor, for any Work actually performed by Contractor’s own forces, 16% of the cost.

   2) For each Subcontractor (including lower tier subcontractors), for any Work actually performed by its own forces, 16% of the cost.

   3) For Contractor, for any Work performed by its Subcontractor(s), 6% of the amount due each Subcontractor.

   4) For each Subcontractor, for any Work performed by its Subcontractor(s) of any lower tier, 5% of the amount due the sub-Subcontractor.

e. Allowance for Profit:

   1) For Contractor or Subcontractor of any tier for work performed by their forces, 5% of the cost developed in accordance with subsections a, b & c above.

   2) For Contractor or Subcontractor of any tier for work performed by a subcontractor of a lower tier, 5% of the Subcontractor cost.

f. Insurance or Bond Premium: The costs of any change or additional premium of Contractor’s liability insurance and public works bond arising directly from the changed Work. The costs of any change in insurance or bond premium shall be added after overhead and profit are calculated.

g. Washington State sales tax as applicable.

B. Change Order Pricing - Unit Prices

   1. Work on a unit-price basis as stated in the Specifications and at the price submitted in the Bid Form or as subsequently modified.

   a. Unit prices shall include reimbursement for all direct and indirect costs of the Work, including overhead and profit, and bond, insurance costs and retail sales tax; and

   b. Quantities must be supported by field measurement verified by Owner.
GENERAL CONDITIONS

B. If the time of Contractor’s performance is changed due to an act of Force Majeure, Contractor shall request for an equitable adjustment in the Contract Time in writing within 24-hours of the occurrence.

PART 8 - CLAIMS AND DISPUTE RESOLUTION

8.1 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 Part 7.1, or on the resolution of any request for an equitable adjustment in the Contract Sum as provided in Part 7.2 or the Contract Time as provided in Part 7.3, 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 30 Days from Owner’s final offer made in accordance with Part 7.1E, 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 employees 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 Part 7.2; 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 with a decision within 30 Days from the date the Claim is received.

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 Part 8.2.

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 timely made in accordance with the requirements of this Section.
8.2 ARBITRATION

A. Timing of Contractor’s demand for arbitration: If Contractor disagrees with Owner’s decision rendered in accordance with Part 8.1D, 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.

8.3 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.);
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;
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

9.1 TERMINATION BY OWNER FOR CAUSE

A. 7 Day Notice to Terminate for Cause: Owner may, upon 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 Part 5.20; and
3. Finish the Work: Finish the Work by whatever other reasonable method it deems expedient.

C. Surety’s role: Owner’s rights and duties upon termination are subject to the prior rights and duties of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.

D. Contractor’s required actions: When Owner terminates the Work in accordance with this section, Contractor shall take the actions set forth in Part 9.2B, 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 Part 9.1A exist, then such termination shall be deemed a termination for convenience pursuant to Part 9.2.

9.2 TERMINATION BY OWNER FOR CONVENIENCE

A. Owner Notice of Termination for Convenience: Owner may, upon 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 Notice of termination for either cause or convenience, Contractor shall promptly:

1. Cease Work: Stop performing Work on the date and as specified in the notice of termination;
2. No further orders or Subcontracts: Place no further orders or subcontracts for materials, equipment, services or facilities, except as may be necessary for completion of such portion of the Work as is not terminated;
3. Cancel orders and Subcontracts: Cancel all orders and subcontracts, upon terms acceptable to Owner, to the extent that they relate to the performance of Work terminated;
4. Assign orders and Subcontracts to Owner: Assign to Owner all of the right, title, and interest of Contractor in all orders and subcontracts;
5. Take action to protect the Work: Take such action as may be necessary or as directed by Owner to preserve and protect the Work, Project site, and any other property related to this Project in the possession of Contractor in which Owner has an interest; and
6. Continue performance not terminated: Continue performance only to the extent not terminated

C. Terms of adjustment in Contract Sum if Contract terminated: If Owner terminates the Work or any portion thereof for convenience, Contractor shall be entitled to make a request for an equitable adjustment for its reasonable direct costs incurred prior to the effective date of the termination, plus reasonable allowance for overhead and profit on Work performed prior to termination, plus the reasonable administrative costs of the termination, but shall not be entitled to any other costs or damages, whatsoever, provided however, the total sum payable upon termination shall not exceed the Contract Sum reduced by prior payments. Contractor shall be required to make its request in accordance with the provisions of Part 7.

D. Owner to determine whether to adjust Contract Time: If Owner terminates the Work or any portion thereof for convenience, the Contract Time shall be adjusted as determined by Owner.

PART 10 - MISCELLANEOUS PROVISIONS

10.1 GOVERNING LAW

A. 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.

10.2 SUCCESSORS AND ASSIGNS

A. 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.

10.3 MEANING OF WORDS

A. 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.

10.4 RIGHTS AND REMEDIES

A. 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. Waiver of any provision of the Contract Documents shall not be construed to be a modification of the such provisions, unless the Contract Documents are modified pursuant to the Clause entitled “Contract Modifications” herein.

B. If any provision of the Contract Documents is or becomes void or unenforceable by operation of law, the remaining provisions shall be valid and enforceable.

10.5 TIME COMPUTATIONS

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

10.6 RECORDS RETENTION AND REPORTING

A. Record keeping: The Contractor and all Subcontractors shall maintain accounts and records in accordance with State Auditor’s procedures, including personnel, property, financial and programmatic records which sufficiently and properly reflect all direct and indirect costs of any nature expended and services performed in the performance of the Contract Documents and other such records as may be deemed necessary by the Owner to ensure proper accounting for all funds contributed by the Owner to the performance of the Contract Documents and compliance with this Contract.

B. Six year records retention period: Contractor and its Subcontractors shall maintain these records for a period of not less than 6 years after the date of Final Acceptance.

10.7 THIRD-PARTY AGREEMENTS

A. 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. Contractor is an independent contractor with respect to the Work. Nothing in the Contract Documents shall be considered to create a relationship of employer and employee between the parties hereto. Neither the Contractor nor any employee of the Contractor shall be entitled to any benefits accorded Owner employees by virtue of the services provided. The Owner shall not be responsible for withholding or otherwise deducting federal income tax or social security or contributing to the State Industrial Insurance Program, or otherwise assuming the duties of an employer with respect to the Contractor, or any employees of the Contractor.
10.8 ANTI TRUST ASSIGNMENT

A. 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.

10.9 AUDITS AND INSPECTIONS

A. The records and documents with respect to all matters covered by the Contract Documents shall be subject at all times to inspection, review or audit by the Owner or any other government agency so authorized by law during the performance of the Work. The Owner shall have the right to an annual audit of the Contractor’s financial statement and condition.

10.10 ORGANIZATION CONFLICTS OF INTEREST

A. The Contractor warrants that, to the best of its knowledge and belief and except as otherwise disclosed, it does not have any organizational conflict of interest which is defined as a situation in which the nature of work under the Contract Documents and the Contractor’s organizational, financial, contractual or other interests are such that:

1. Award of the Work may result in an unfair competitive advantage; or
2. The Contractor’s objectivity in performing the Work may be impaired.

B. The Contractor agrees that if after award it discovers an organizational conflict of interest with respect to performance of the Work, it shall make an immediate and full disclosure in writing to the Contracting Officer, which shall include a description of the action the Contractor has taken or intends to take to eliminate or neutralize the conflict. The Owner may, however, terminate the Work if it deems the action to be in the best interest of the Owner.

C. In the event the Contractor was aware of an organizational conflict of interest before the award of this Contract and intentionally did not disclose the conflict to the Contracting Officer, the Owner may terminate the Work for cause.

D. The provisions of this Section 10.11 shall be included in all subcontracts and consulting agreements wherein the work to be performed is similar to the services provided by the Contractor. The Contractor shall include in such subcontracts and consulting agreements any necessary provisions to eliminate or neutralize conflicts of interest.

10.11 INTERESTS OF MEMBERS OF CONGRESS

A. No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of the Contract Documents or to any benefit to arise therefrom, but this provision shall not be construed to extend to the Contract Documents if made with a corporation for its general benefit.

10.12 HEADINGS AND CAPTIONS

A. 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.
**PROJECT NAME AND LOCATION:**

<table>
<thead>
<tr>
<th>Bellevue Manor Apartment Renovations</th>
<th>Contract Number: TC2003331</th>
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<tr>
<td>Interior Renovations</td>
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**BID FORM**

The undersigned, Legal Name of Bidder: ________________________________

on this date: ______________________, 2020, having familiarized him/herself with the contract documents, site conditions, and has field verified all measurements contained in the project manual as prepared by the Owner, hereby proposes to furnish labor, materials and necessary equipment – all including, but not limited to, demolition, disposal, new installation and the required applicable taxes and fees to complete the work for the following bid amounts:

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<th>Description</th>
<th>Amount</th>
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<td>BASE BID</td>
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<td>RETAIL SALES TAX</td>
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<td>TOTAL BASE BID</td>
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**ADDENDA**

Acknowledge receipt of any addenda by inserting the number(s) above

In submitting this bid, it is understood that the right is reserved by the Owner to reject any and all bids. The undersigned hereby agrees that this proposal shall be a valid and firm offer for a period of Sixty (60) calendar days from the date of Bid Opening.

Bidder agrees that Work will be substantially complete and ready for final payment in accordance with the Contract Documents on or before the date, within the number of calendar days indicated.

I certify (or declare) under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

____________________________                             ________________________
Signature of Bidder                                           Print Your Name

Submitted on ____________________ day of ____________________ 2020

____________________________                             ________________________
City                                                            State
BIDDER INFORMATION

Name of Bidder (Company): ________________________________________________________________

Address: ___________________________________________________________________________

Contact Name: ________________________________________________________________________

Phone Number: ________________________ Email Address: __________________________________

Business Type: General Contractor (   ) Other (   ) (Please specify): __________________________

Bidder is a(n): □ Individual □ Partnership □ Joint Venture □ Incorporated in the state of____________

List business names & associated UBI # used by Bidder during the past 5 years if different than above:

_____________________________________________________________________________________

Bidder has been in business continuously from: ____________________________ Month, Year

Business License #: ___________________________ Federal ID #: ______________________________

Current UBI #: ________________________ Dept. of L&I Worker's Comp. Acct. #: __________________

Bidder has experience in work “Similar in Scope and Complexity” comparable to that required for this Project:

As a prime contractor for ____________ years. As a subcontractor for ____________ years.

OWNER(S) OF COMPANY (List all owners):

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<th>Name</th>
<th>Title</th>
<th>How Long With Bidder</th>
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No. of regular full-time employees other than owner(s): ______________________________________

Indicate clearly the kind of work your company will actually perform in this project:

____________________________________________________________________________________

Approximate % of work your company will actually perform: _________________________________

List the supervisory personnel to be employed by the Bidder and available for, and intended to, work on this project:

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## SUBCONTRACTORS

Do you intend to use Subcontractor(s) in this project?  Yes □ No □ (If yes, you must show the name of the subcontractors. Attach additional pages as necessary.)

<table>
<thead>
<tr>
<th>Subcontractors Name</th>
<th>Subcontractor’s UBI#</th>
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## BIDDER'S EXPERIENCE

Projects successfully supervised and completed by your company for work of similar scope and value as specified in bid documents in the last 5 years. Attach additional pages as necessary.

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Completion Date</th>
<th>Duration (Months)</th>
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<th>Owner’s Name (of project listed above)</th>
<th>Project Address</th>
<th>Contact Person</th>
<th>Phone Number</th>
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</tbody>
</table>

Has Bidder ever been found guilty of violating any State or Federal employment laws? □ No □ Yes  If yes, give details & attach additional pages as necessary: __________________________

Has Bidder ever filed for protection under any provision of the federal bankruptcy laws or state insolvency laws?  □ No □ Yes  If yes, give details & attach additional pages as necessary: __________________________
BIDDER INFORMATION

Has any lien, claim and/or adverse legal action related to construction been rendered against Bidder in the past five years? (i.e., open claims, lawsuits, warrants, judgements including but not limited to those that would show on the L&I website)  □ No □ Yes If yes, give details & attach additional pages as necessary: ________________________________

Has Bidder or any of its employees filed any claims with Washington State Worker's Compensation or other insurance company for accidents resulting in fatal injury or dismemberment in the past 5 years?  □ No □ Yes If yes, please state:

<table>
<thead>
<tr>
<th>Date</th>
<th>Type of Injury</th>
<th>Agency Receiving Claim</th>
</tr>
</thead>
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</table>

Bidders current Experience Modification Rate (EMR): ____________________________________________

(If Bidder is self-insured, attach proof of EMR stated, showing complete worksheet calculations)

The bidder hereby certifies that the information contained in this Bidder's Information is accurate, complete and current.

BY: __________________________ NAME: __________________________
    (signature)                      (print)

TITLE: __________________________ DATE: __________________________
### Wage Rate Schedule Applicable to Bellevue Manor Apartments Renovations

<table>
<thead>
<tr>
<th>County</th>
<th>Trade</th>
<th>Job Classification</th>
<th>Wage</th>
</tr>
</thead>
<tbody>
<tr>
<td>King</td>
<td>Asbestos Abatement Workers</td>
<td>Journey Level</td>
<td>$50.86</td>
</tr>
<tr>
<td>King</td>
<td>Building Service Employees</td>
<td>Janitor</td>
<td>$25.58</td>
</tr>
<tr>
<td>King</td>
<td>Cabinet Makers (In Shop)</td>
<td>Journey Level</td>
<td>$22.74</td>
</tr>
<tr>
<td>King</td>
<td>Landscape Construction</td>
<td>Landscape Construction/Landscaping Or Planting Laborers</td>
<td>$39.18</td>
</tr>
<tr>
<td>King</td>
<td>Playground &amp; Park Equipment Installers</td>
<td>Landscape Operator</td>
<td>$68.02</td>
</tr>
<tr>
<td>King</td>
<td>Residential Brick Mason</td>
<td>Journey Level</td>
<td>$58.82</td>
</tr>
<tr>
<td>King</td>
<td>Residential Carpenters</td>
<td>Journey Level</td>
<td>$32.06</td>
</tr>
<tr>
<td>King</td>
<td>Residential Cement Masons</td>
<td>Journey Level</td>
<td>$29.25</td>
</tr>
<tr>
<td>King</td>
<td>Residential Drywall Applicators</td>
<td>Journey Level</td>
<td>$46.43</td>
</tr>
<tr>
<td>King</td>
<td>Residential Drywall Tapers</td>
<td>Journey Level</td>
<td>$47.17</td>
</tr>
<tr>
<td>King</td>
<td>Residential Electricians</td>
<td>Journey Level</td>
<td>$36.01</td>
</tr>
<tr>
<td>King</td>
<td>Residential Glaziers</td>
<td>Journey Level</td>
<td>$44.15</td>
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<tr>
<td>King</td>
<td>Residential Insulation Applicators</td>
<td>Journey Level</td>
<td>$29.87</td>
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<tr>
<td>King</td>
<td>Residential Laborers</td>
<td>Journey Level</td>
<td>$26.18</td>
</tr>
<tr>
<td>King</td>
<td>Residential Marble Setters</td>
<td>Journey Level</td>
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<tr>
<td>King</td>
<td>Residential Painters</td>
<td>Journey Level</td>
<td>$27.80</td>
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<tr>
<td>King</td>
<td>Residential Plumbers &amp; Pipefitters</td>
<td>Journey Level</td>
<td>$39.43</td>
</tr>
<tr>
<td>King</td>
<td>Residential Refrigeration &amp; Air Conditioning Mechanics</td>
<td>Journey Level</td>
<td>$54.12</td>
</tr>
<tr>
<td>King</td>
<td>Residential Sheet Metal Workers</td>
<td>Journey Level (Field or Shop)</td>
<td>$51.89</td>
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<tr>
<td>King</td>
<td>Residential Soft Floor Layers</td>
<td>Journey Level</td>
<td>$51.07</td>
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<td>King</td>
<td>Residential Sprinkler Fitters (Fire Protection)</td>
<td>Journey Level</td>
<td>$48.18</td>
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<td>King</td>
<td>Residential Stone Masons</td>
<td>Journey Level</td>
<td>$58.82</td>
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<td>King</td>
<td>Residential Terrazzo Workers</td>
<td>Journey Level</td>
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<td>King</td>
<td>Residential Terrazzo/Tile Finishers</td>
<td>Journey Level</td>
<td>$24.39</td>
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<td>King</td>
<td>Residential Tile Setters</td>
<td>Journey Level</td>
<td>$21.04</td>
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<td>King</td>
<td>Roofers</td>
<td>Journey Level</td>
<td>$53.27</td>
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<td>King</td>
<td>Roofers</td>
<td>Using Irritable Bituminous Materials</td>
<td>$56.27</td>
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<tr>
<td>King</td>
<td>Sign Makers &amp; Installers (Electrical)</td>
<td>Journey Level</td>
<td>$50.90</td>
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<tr>
<td>King</td>
<td>Sign Makers &amp; Installers (Non-Electrical)</td>
<td>Journey Level</td>
<td>$31.52</td>
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<tr>
<td>King</td>
<td>Traffic Control Stripers</td>
<td>Journey Level</td>
<td>$47.68</td>
</tr>
<tr>
<td>King</td>
<td>Truck Drivers</td>
<td>Asphalt Mix Over 16 Yards</td>
<td>$61.59</td>
</tr>
<tr>
<td>King</td>
<td>Truck Drivers</td>
<td>Asphalt Mix To 16 Yards</td>
<td>$60.75</td>
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<tr>
<td>King</td>
<td>Truck Drivers</td>
<td>Dump Truck &amp; Trailer</td>
<td>$60.75</td>
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<tr>
<td>King</td>
<td>Truck Drivers</td>
<td>Dump Truck (W. WA-Joint Council 28)</td>
<td>$60.75</td>
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<tr>
<td>King</td>
<td>Truck Drivers</td>
<td>Other Trucks (W. WA-Joint Council 28)</td>
<td>$60.75</td>
</tr>
</tbody>
</table>
Abbell LLLP  
600 Andover Park West  
Seattle, WA 98188

**Agreement to Pay Prevailing Wages**

Contractor certifies that all workers, laborers, or mechanics employed in the performance of any part of the Work shall be paid the prevailing rate of wages to in accordance with the requirements of the Owner and the Wage Rate Schedule. Form must be filed with the Owner prior to commencement of Work.

### Company Details

- **Company Name:**
- **Address:**
- **Contractor Registration No.:**
- **WA UBI Number**
- **Phone Number**
- **Industrial Insurance Account ID**
- **Email Address**
- **Filed By**

### Prime Contractor

- **Company Name**
- **Contractor Registration No.:**
- **WA UBI Number**
- **Phone Number**

### Project Information

- **Contract Number**
- **Project Name**
- **Contract Amount**
- **Project Site Address**

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<table>
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<tr>
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<tbody>
<tr>
<td><strong>TC2003331</strong></td>
<td><strong>Bellevue Manor Apartments Renovations</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>143 Bellevue Way SE, Bellevue, WA 98004</strong></td>
<td></td>
</tr>
</tbody>
</table>
Intent Details

Expected project start date: (MM-DD-YYYY)

Does your company intend to hire **ANY** subcontractors?

Will your company have employees perform work on this project?

Do you intend to use any apprentices? (Apprentices are considered employees.)

Journey Level Wages

<table>
<thead>
<tr>
<th>County</th>
<th>Trade</th>
<th>Wage</th>
<th>Fringe</th>
<th># Workers</th>
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</thead>
<tbody>
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</table>

Apprentice Level Wages

<table>
<thead>
<tr>
<th>Step</th>
<th>Trade</th>
<th>Wage %</th>
<th>Wage</th>
<th>Fringe</th>
<th># Workers</th>
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<tbody>
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Signature: 

Print Name: 

Date:
# Affidavit of Wages Paid

Contractor certifies that all workers, laborers, or mechanics employed in the performance of any part of the Work have been paid the prevailing rate of wages to in accordance with the requirements of the Owner and the Wage Rate Schedule. Form must be filed with the Owner prior to Final Acceptance.

## Company Details

<table>
<thead>
<tr>
<th>Company Name:</th>
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<tbody>
<tr>
<td>Address:</td>
<td></td>
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<tr>
<td>Contractor Registration No.</td>
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<tr>
<td>WA UBI Number</td>
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<tr>
<td>Phone Number</td>
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</tr>
<tr>
<td>Industrial Insurance Account ID</td>
<td></td>
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<tr>
<td>Email Address</td>
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<tr>
<td>Filed By</td>
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</table>

## Project Information

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>TC2003331</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name</td>
<td>Bellevue Manor Apartments Renovations</td>
</tr>
<tr>
<td>Project Site Address</td>
<td>143 Bellevue Way SE, Bellevue, WA 98004</td>
</tr>
<tr>
<td>Prime Contractor Name</td>
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<tr>
<td>Prime Contractor Registration No.</td>
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<tr>
<td>Prime Contractor Phone Number</td>
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<tr>
<td>Dollar Amount of Your Contract:</td>
<td></td>
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<tr>
<td>Job Start Date: MM-DD-YYYY</td>
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<tr>
<td>Date Work Completed: MM-DD-YYYY</td>
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</tbody>
</table>
**Project Completion**

<table>
<thead>
<tr>
<th>Did your company hire any subcontractors?</th>
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<tbody>
<tr>
<td>Did your company have employees perform work on this project?</td>
</tr>
<tr>
<td>Did you use any apprentices on this job?</td>
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<tr>
<td>(Apprentices are considered employees.)</td>
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</tbody>
</table>

**Project Subcontractors**

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Primary Contact</th>
<th>Phone</th>
<th>UBI</th>
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**Journey Level Wages**

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<tr>
<th>County</th>
<th>Trade</th>
<th>Wage</th>
<th>Fringe</th>
<th># of Workers</th>
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**Apprentice Level Wages**

<table>
<thead>
<tr>
<th>County</th>
<th>Trade</th>
<th>Wage %</th>
<th>Wage</th>
<th>Fringe</th>
<th># of Workers</th>
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Signature: ____________________________________________
Print Name: __________________________________________
Date: ________________________________________________
This Contract is entered into by and between the Abbell LLLP, hereinafter referred to as the “Owner” whose principal office is located at 600 Andover Park West, Seattle, WA 98188 and [Contractor], referred to as the “Contractor”, whose principal office is located at [Contractor's Address].

IN CONSIDERATION OF the mutual benefits and conditions hereinafter contained, the parties hereto agree as follows:

1.1 Contract Documents

A. The provisions set forth in the Contract Documents are hereby incorporated into and made part of the Contract. Contractor acknowledges receipt and review of all Contract Documents applicable to performance of the work. The Contract shall consist of the following component parts:

1. This Instrument
2. Addenda
3. Specifications
4. Plans
5. Bid Form
6. Pre-Bid Agenda
7. General Conditions
8. Instructions to Bidders
9. Wage Rates
10. Agreement to Pay Prevailing Wage
11. Performance and Payment Bond
12. Hazardous Materials Reports

1.2 Scope of Services to be Performed by the Contractor: The Contractor shall provide all labor, materials, tools, equipment, transportation, supplies, and incidentals required to complete the work in accordance with the Contract Documents for:

Project: Bellevue Manor Apartments Interior Renovations
Contract No.: TC2003331

1.3 Compensation:
Base Bid - $
10% Washington State Retail Sales Tax - $
Total amount of the Contract shall be dollars and cents ($ ) subject to additions and deductions provided therein.

1.4 Duration of Contract: The Contractor shall commence work after receipt of Notice to Proceed, follow the schedule specified in the contract documents, and all work must be completed within one hundred and eighty (180) consecutive calendar days, as indicated in the Specifications, from the date of the Notice to Proceed unless sooner terminated pursuant to the General Conditions. Upon expiration of the original Contract term, the Contract, at the Owner’s sole discretion, may be extended for a period determined by the Owner.

1.5 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. If Completion of the Work does not occur within the Contract Time, the Contractor agrees that Liquidated Damages in the amounts stated in the Bid Documents will be assessed for each calendar day that the Contractor exceeds the time for completion.

The individuals signing this Contract warrant and represent for themselves and for their respective organizations that they are duly authorized to sign this Contract and that upon such signing their respective organizations are bound thereby.

DATED this day of , 2020

Contractor

Owner

President/Owner
Stephen Norman
Executive Director, KCHA
Its General Partner
## CERTIFICATE OF INSURANCE

**PRODUCER**
Vendor’s Insurance Agent  
Street Address  
City, State, Zip  
Phone Number

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

**COMPANIES AFFORDING COVERAGE**

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>INSURED</th>
<th>ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>ABC Insurance Company</td>
<td>Vendor Name, Street Address, City, State, Zip</td>
</tr>
<tr>
<td>B</td>
<td>DEF Insurance Company</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>GHI Insurance Company</td>
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<tr>
<td>D</td>
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</tr>
</tbody>
</table>

**INSURED**
Vendor Name  
Street Address  
City, State, Zip

**COVERAGES**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

<table>
<thead>
<tr>
<th>CO CTR</th>
<th>TYPE OF INSURANCE</th>
<th>POLICY NUMBER</th>
<th>POLICY EFFECTIVE DATE (MM/DD/YY)</th>
<th>POLICY EXPIRATION DATE (MM/DD/YY)</th>
<th>LIMITS</th>
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<tbody>
<tr>
<td>A</td>
<td>GENERAL LIABILITY</td>
<td>XXX123</td>
<td>01/01/00</td>
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<td>GENERAL AGGREGATE 2,000,000</td>
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<td>PRODUCTS-COMP/OP AGG 1,000,000</td>
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<td>PERSONAL &amp; ADV INJURY 1,000,000</td>
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<td>EACH OCCURRENCE 1,000,000</td>
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<td>FIRE DAMAGE (Any one fire) 50,000</td>
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<td>MED EXP (Any one person) 5,000</td>
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<td>B</td>
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<td>BODILY INJURY (Per person)</td>
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<td>PROPERTY DAMAGE</td>
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<td>AUTO ONLY-EA ACCIDENT</td>
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<td>OTHER THAN AUTO ONLY:</td>
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<td>EACH ACCIDENT AGGREGATE</td>
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<td>C</td>
<td>WORKERS’ COMPENSATION AND EMPLOYER’S LIABILITY</td>
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<td>DISEASE-POLICY LIMIT 1,000,000</td>
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**DESCRIPTION OF OPERATIONS/Locations/Vehicles/Special Items**
Abbell LLP, King County Housing Authority, RBC Tax Credit Equity, LLC, RBC Tax Credit Manager II, Inc., FNBC Leasing Corporation C/O JP Morgan Capital Housing Investments, ATTN: Alex Schalmo, 21 S. Clark 12th FL, Chicago, IL 60603-0502, & RBC Tax Credit Equity Fund-X Structured Housing I Limited Partnership, 600 Superior Ave, Ste 2300, Cleveland, OH 44114 are named as additional insureds with respect to above general liability and auto coverages. Re: Insured’s work/services provided at Bellevue Manor Apartments, 143 Bellevue Way SE, Bellevue, WA 98004

**CERTIFICATE HOLDER**
Abbell LLP, King County Housing Authority, RBC Tax Credit Equity, LLC, RBC Tax Credit Manager II, Inc., FNBC Leasing Corporation C/O JP Morgan Capital Housing Investments, & RBC Tax Credit Equity Fund-X Structured Housing I Limited Partnership, 600 Andover Park West, Seattle, WA 98188-3326

**CANCELLATION**
SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO MAIL SUCH NOTICE SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE COMPANY, ITS AGENTS OR REPRESENTATIVES.

**AUTHORIZED REPRESENTATIVE**
Signature of Insured’s Agent

ACORD 25-S (3/93)  
ACORD CORPORATION 1993
PROVIDE

GENERAL LIABILITY ENDORSEMENT

and

AUTO LIABILITY ENDORSEMENT
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Selective demolition and removal of building and site elements as indicated on drawings.
   2. Protect existing building and site elements scheduled to remain during demolition activities and while new work is being installed.

1.2 RELATED SECTIONS:

A. Division 1 Requirements apply
B. Section 061000 - Rough Carpentry
C. Section 062000 - Interior Finish Carpentry
D. Section 072500 - Weather Resistant Barrier
E. Section 076200 - Sheet Metal, Flashing and Trim
F. Section 081613 - Fiberglass Entry Doors
G. Section 085313 - Vinyl Windows and Patio Doors

1.3 REFERENCES


1.4 SUBMITTALS

A. See Division 1 Project Administration. Refer to BID PACKAGE for these GENERAL REQUIREMENTS.
B. Schedule: Submit for approval selective demolition schedule, including schedule for any interruption of utility service to affected units.
C. 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.
2. Identify demolition firm and submit qualifications.
3. Include a summary of safety procedures.
4. Indicate protection and separation of occupied premises.
5. Continuity of site utilities: Underground utilities, including water, telephone, data, cable television, gas must remain in full operation during the work.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

E. Schedule of demolition activities to be updated at each scheduled construction meeting.

1. Indicate detailed sequence of demolition and removal work with starting and ending dates for each activity.
2. Indicate any interruption of services.
3. Indicate locations of temporary protection from the work and means of egress from the building.
1.5 QUALITY ASSURANCE
   A. Codes and Regulations: Comply with governing codes and regulations. Use experienced workers. Maintain watertight integrity as needed to protect construction to remain from structural and environmental damage.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Comply with Section 016000

1.7 PROJECT CONDITIONS
   A. Building to be selectively demolished will remain fully occupied during the construction sequence. Isolating work areas to limit dust, dirt, noise and debris is critically important during the construction process.
   B. Protection of Existing Improvements: Provide, erect and maintain barricades, coverings, or other types of protection necessary to prevent damage to existing improvements. Restore any site improvements, including but not limited to landscaping, pavement, walks, structures, fences and planters, damaged by this work to their original condition, as acceptable to Owner.
   C. Existing Conditions: Refer to construction drawing sets for each site for information. No responsibility for portions of building to be demolished will be assumed by the Owner.

PART 2 PRODUCTS

2.1 DEMOLITION APPLICATIONS
   A. To Contractor: All other salvage becomes property of the Contractor.
   B. Selective Building Demolition:
      1. Demolition of specified building and site elements and as indicated on drawings.
      2. Protection of portions of building adjacent to or affected by selective demolition.
      3. Notification to Owner of schedule of shut-off of utilities which serve occupied spaces.
      4. Pollution control during selective demolition.
      5. Removal and legal disposal of materials.
      6. Protection of existing site improvements and adjacent construction.
      7. Utilities: Interruption, capping or removal as applicable.

PART 3 EXECUTION

3.1 SCOPE
   A. Remove portions of existing buildings as indicated on the drawings.
   B. 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 the site. Storage or sale of items at project site is prohibited.
   C. 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; Owner requires minimum ninety-six (96) hours’ notice of any utility shutoffs affecting non-remodeled units or common spaces. Email notice to Owner’s Project Manager is acceptable as official “written notice”.

02 41 00 - SELECTIVE DEMOLITION
3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Refer to Section 017419 Construction Waste Management and Disposal for additional requirements.
   2. Obtain required permits.
   3. Comply with applicable requirements of NFPA 241.
   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. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permit.
   9. 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.
  10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

D. 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.

E. If hazardous materials are discovered during removal operations, stop work and notify the Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

F. Perform demolition in a manner that maximizes salvage and recycling of materials.

3.3 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least seven (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 three (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.
3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

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

B. Separate areas in which demolition is being conducted from other areas that are still occupied
   1. Provide, erect and maintain temporary dustproof partitions of construction indicated on drawings in locations of work.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.

E. Services (including but not limited to HVAC, Plumbing, Fire Protection, Electrical and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

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.
   4. Patch as specified for patching new work.

3.5 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk and trash from site. Do not allow demolished materials to accumulate on site. See Division 1 Project Administration for compliance with Waste Management requirements and procedures. Refer to BID PACKAGE for these GENERAL REQUIREMENTS.

B. Remove from site all materials not to be reused on site.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

3.6 SCHEDULE

A. Items for Protection during Demolition and Construction:
   1. Common spaces and exterior walkways, including entryways.
   2. Adjacent construction.
   3. As required.
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Reinforcing steel and accessories for concrete reinforcement.

B. Related Requirements:
   1. Section 033000 - Cast-In-Place Concrete

1.2 REFERENCES

A. Reference Standards: Conform to provision of Sheet A0.1 – General Requirements. B.

American Concrete Institute (ACI):
   2. ACI 318 - Building Code Requirements for Reinforced Concrete.
   3. ACI SP-66 - ACI Detailing Manual (ACI 315 and ACI 315R)

C. ASTM International (ASTM):
   1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
   2. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
   3. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
   5. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   6. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed Bars and Plain Bars for Concrete Reinforcement.
   7. ASTM A722 - Standard Specification for Uncoated High-Strength Steel Bars for Prestressing Concrete.

D. American Welding Society (AWS): AWS D 1.4 - Structural Welding Code - Reinforcing Steel. E.


1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Conform to Plan sheet T1.1 – General Requirements for coordination with work of other Sections.

1.4 SUBMITTALS

A. Submit in accordance with Plan Sheet T1.1 – General Requirements and Division 1 – General Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with Plan Sheet A0.1 – General Requirements and Division 1 Section 015000 Temporary facility and controls.

B. Deliver reinforcement to site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.

C. Store and protect concrete reinforcement materials at site from damage, dirt and rust.
PART 2 PRODUCTS

2.1 REQUIREMENTS
   A. Conform to requirements listed on Plan Sheet T1.1 – General Requirements for referenced Codes, ordinances, and other regulatory requirements.
   B. Special Inspections: Conform to requirements of IBC Chapter 17 – Structural Tests and Special Inspections

2.2 PERFORMANCE / DESIGN CRITERIA
   A. Supply reinforcing steel in predetermined sizes and bends to eliminate field alterations. Do not make alterations to shop formed steel without prior acceptance for each instance by Owner or Owner’s Representative.

2.3 REINFORCEMENT
   A. Type, Size and Location: In accordance with Structural Notes and Drawings.
   B. Reinforcing Steel: Deformed bar, free from rust, dirt, and loose scale, uncoated. Factory mark with size and grade.
      1. Billet-Steel Reinforcing Bar: ASTM A615, Grade 60 (60 ksi yield strength).
   C. Welded Steel Wire Fabric: Conform to IBC Chapter 3, including ASTM A185 Plain Type or ASTM A497 Deformed Type, uncoated or galvanized, free from rust, dirt, and loose scale.

2.4 FABRICATION
   A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice and ACI 318.
   B. Reinforcing Bars Bend Dimensions and Fabrication Tolerances: Conform to IBC Chapter 19 and ACI 318, except as otherwise shown on Structural Drawings.

2.5 ACCESSORIES
   A. Deformed Bar Anchors (DBA): Welded deformed bar stud anchors for concrete connections. Manufacture for automatic stud welding, as instructed by manufacturer. Provide appropriate ferrule for each stud.
      2. Cold-rolled Deformed Steel Wire: ASTM A496.
      3. Manually Welded Normal Reinforcing Bars: Not accepted in place of DBA.
   B. Mechanical Splices:
      2. Conform to ACI 318 Section 12.14.3 and ACI 318 Section 21.2.6, as modified by IBC Chapter 19, and as specified or shown on Structural Drawings.
      3. Type 1 Splice: Develop minimum 125 percent of specified yield strength (fy) of rebar as required for tension or compression.
      4. Type 2 Splice: Develop 100 percent of the specified tensile strength, (fu) of rebar, and 125 percent of the specified yield strength, fy, of rebar.
      5. Tie Wire: No. 16 gage or heavier double annealed iron wire.
   C. Chairs, Bolsters, Bar Supports, Spacers:
      1. Detail in conformance to ACI SP-66 and CRSI Bar Support Classifications.
2. Design sizes and shapes as required to maintain strength and support of reinforcement during placement of concrete.

3. Include load bearing pads to prevent vapor retarder puncture.

D. Special Chairs, Bolsters, Bar Supports, and Spacers Adjacent to Weather-Exposed Concrete Surfaces:
   Plastic-coated steel or stainless steel type; size, and shape as required for Project conditions.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean reinforcing steel of loose rust, mud, dirt, debris, oil, and other foreign substances that may affect bond.

B. Verify below grade vapor retarder complete, unbroken, and sealed at overlaps, transitions, and penetrations.

3.2 INSTALLATION

A. Placement of Reinforcing Steel and Tolerances: Conform to IBC Chapter 19 and referenced ACI 318, and ACI 117.

B. Details of Placement and Support of Reinforcing Steel: Conform to ACI SP-66 and CRSI recommendations, as shown on accepted placement drawing submittals.

C. Displacement of Reinforcing: Where displaced, shifted, or moved to locations exceeding allowable tolerances, prior to placing concrete:
   1. Provide 48 hours notice to Owner or Owner’s Representative.
   2. Obtain acceptance for resulting arrangement.

D. Joints: Place reinforcement through expansion joints and as specified or shown on Drawings through construction and contraction joints.

E. Allowable Cover over Reinforcement: Conform to IBC Chapter 19 and as shown on Structural Drawings. Where not shown, provide minimum 3 inch cover.

F. Tie Wires: Bend or turn as necessary to prevent exposure of wires through concrete placement. G. Welded Wire Fabric:
   1. Place continuously where shown in slabs between control and expansion joints.
   2. Do not carry through expansion joints.
   3. Cut 1/2 of fabric through control joints, except as otherwise shown on Drawings
   4. Extend across beams and walls.
   5. Lap fabric minimum 8 inch on sides and ends.

H. Dowels:
   1. Install at right angle to joint being doweled.
   2. Accurately align dowels parallel to finished concrete surface.
   3. Rigidly support during concrete placement using dowel baskets.
   4. Coat one end of dowel with bond breaker.

I. Lapped Bars: Place in contact and tie securely, or space transversely apart to embed entire surface of bar into concrete. Do not space lapped bars more than 1/5th required length of lap and no more than 6 inch apart.

J. Splices: Conform to ACI 318 as modified by IBC Chapter 19 and Structural Drawings.

K. Vapor Barrier: Do not puncture or displace. Do not use grade stakes or other accessories that may puncture vapor barrier.

3.3 Formed Openings: Place reinforcing steel to accommodate openings and penetrations.
A. Soil at Footings: Maintain firm and compacted during placement of reinforcing steel.
B. Do not drive nails in forms for supporting steel.

C. Stubs and Other Projecting Bars: Place and secure before pouring.
D. Field Bending Reinforcing Steel: Not permitted, except as accepted by Owner or Owner’s Representative.
E. Torch Cutting: Do not use gas cutting torches in field for correcting fabrication errors in reinforcing steel, except as accepted by Owner or Owner’s Representative.
F. Reinforcing Conflict with Other Construction: Notify Owner or Owner’s Representative prior to placing concrete. Includes in conflict with conduit, piping, inserts, and sleeves
G. Field Welding of Reinforcement: Not permitted,

3.4 FIELD QUALITY CONTROL
A. Conform to independent inspections as required by AHJ.
B. Inspect for acceptability before beginning concrete work of Related Sections.

3.5 ADJUSTING
A. Defective Reinforcing: Remove and replace:
   1. Bars with kinks or bends not shown on Drawings.
   2. Bars damaged due to bending or straightening.
   3. Bars heated for bending.
   4. Reinforcing steel not placed in accordance with provisions of Contract Documents.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
A. Section Includes:
1. Cast-in-place concrete for building slabs
2. Cast-in-place concrete for exterior site concrete
B. Related Requirements:
1. Section 032100 - Reinforcing Steel

1.2 DEFINITIONS
A. Slump: The measurement of the vertical difference in height of the resulting concrete pile and the original 12 inch tall cone after the slump cone is filled then lifted.
B. Slump Flow: The measurement of the resulting horizontal diameter of the concrete pile after the slump cone is filled then lifted. This method measures the unconfined flow of the mixture.

1.3 REFERENCES
A. Reference Standards: Conform to provision of Sheet A0.1 – General Requirements
B. American Concrete Institute (ACI):
1. 117 - Standard Tolerances for Concrete Construction and Materials.
2. 301-305 - Specifications for Structural Concrete.
3. 315 - Details and Detailing of Concrete Reinforcement.
C. ASTM International (ASTM):
1. C615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
2. C33 - Specification for Concrete Aggregates.
4. C132 - Test for Slump of Portland Cement Concrete
8. C260 - Specification for Air-Entraining Admixtures for Concrete
11. C618 - Specifications for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
16. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
1.4 ACTION SUBMITTALS
   A. Submit in accordance with Division 1 Section 013300.
   B. Mix Designs: Sign by batch plant quality control engineer or responsible agent for each design.
      Include for each mix design:
      1. Method and test data used to establish mix proportions.
         a. Include supporting test records for field experience method or trial batch method for each mix design.
         b. Include date of test and batch plant location.
      2. Concrete compressive strengths.
      3. Water/cement ratios with corresponding cement content and water content.
      4. Linear shrinkage. Mix designs with no test data may substitute shrinkage reducing admixture in proportions conforming to manufacturer’s instructions.
      5. Aggregates, including types, pit or quarry locations, producer names, grading, specific gravities, certification, and evidence of conformance to this specification.
         a. Base aggregate weights on saturated surface dry conditions. b. Include concrete mix gradations of coarse to fine aggregates.
      6. Concrete compressive strength at 7, 28, and 56 day strengths
      7. Admixtures and additives.
      8. Chloride ion content.
     10. Slump or slump flow.
     11. Hot and cold weather designs.
     12. Air entrainment at exterior slabs.
     13. Ingredients, proportions, and source of materials.
     14. Locations and intended use.
   C. Product Data: Submit manufacturer's printed data and instructions for proprietary products and equipment, including for:
      1. Admixtures and additives.
      2. Fiber reinforcing.
      4. Screeding products and equipment.
      5. Hardener densifiers.
      7. Contraction joints, isolation joints, construction joints, and cold joints.

1.5 INFORMATIONAL SUBMITTALS
   A. Submit in accordance with Plan Sheet T1.1 – General Requirements and Division 1 – General Requirements.

1.6 QUALITY ASSURANCE
   A. Conform to Quality Assurance provisions of Plan Sheet T1.1 – General Requirements and Division 1 Section 014000
   B. Exposed Concrete: Conform to ACI 301, Section 6 and ACI 303R for Architectural Concrete at exposed-to-view exterior surfaces in public areas.
   C. Concrete Producer Qualifications:
   D. Installer Qualifications:
1. Company specializing in work of this Section.
2. Able to show minimum 5 year documented experience in successful commercial quality work of comparable scope and quality when requested by Architect.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Conform to provisions of Plan Sheet T1.1 – General Requirements and manufacturer's instructions.
B. Mixing and Delivery: Conform to ASTM C94.
D. Batch Tickets: Accompany with each load, fully executed, and signed by authorized batch plant representative. Log in with inspector at time of entry. Conform to Source Quality Control requirements specified by this Section.
   1. Information: Conform to ASTM C94, Option A or C. Include additional batch ticket information to that required by ASTM C94.
      a. Concrete mix design.
      b. Water content and water withheld at batch plant.
      c. Time to nearest minute that batch was dispatched from plant, when it arrived at site, and when unloading began and was finished.
      d. Ambient air temperature and concrete internal temperature at time of arrival.
      e. Written record of water and other additives added to design mix following time that mix truck has left batch plant.
   2. Truck loads not accompanied with batch tickets will be rejected.
E. Elapsed Time From Start of Batching at Plant to Discharge at Project Site: Conform to following except where set-reducing admixtures are added by batch plant for hauls requiring longer time periods
   1. Maximum 90 minutes and maximum 300 revolutions, whichever comes first, following introduction of mix water.
   2. Air Temperatures:
      a. Reduce mixing and delivery time to maximum 75 minutes for between 85 degrees F and 90 degrees F.
      b. Reduce mixing and delivery time to 60 minutes for temperature above 90 Degrees F.
      c. Monitor concrete in truck and reject if temperature rises to 89 degrees or 5 degrees F in 10 minutes, indicating that concrete is setting up prior to discharge.
F. Reject concrete that has reached internal temperature of 89 degree F or above and when temperature has risen 5 degrees in 10 minutes, indicating that concrete is setting up prior to discharge.

1.8 FIELD CONDITIONS
A. Ambient Conditions: Conform to ACI 301, 5.3.2 for placement of concrete weather considerations. Do not place concrete during falling rain, sleet, or snow.

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. Substitution Requests to Specified Products: Conform to provisions of Division 1 – General Requirements.

2.2 REGULATORY REQUIREMENTS
A. Conform to Regulatory Requirements specified by Division 1 – General Requirements.
B. Testing and Special Inspections: Conduct testing under provisions of Division 1 – General
Requirements.
1. Conform to provisions of IBC Chapter 17, reference standards specified by ACI 318, procedures specified by ACI 301
2. Conform to ASTM C31, ASTM C39, and ASTM C143

C. Batch Tickets: Retain record of concrete delivered and placed on site.
   1. Include exact mix proportions, slumps, test strength, date, time, location of placement, weather conditions at time of placement, and source of concrete.
   2. Submit copies to Owner.

2.3 PERFORMANCE / DESIGN CRITERIA
A. Do not change brands and sources of cement, aggregates, admixtures, and additives during course of construction, except as accepted by Architect.
B. Supply mix design from same batch plant, using same source for mix ingredients, as submitted for supporting test data.
C. Performance Mix Design:
   1. As basis for acceptance, submit new mix design from batch plant indicating that shrinkage, cracking, strength, and other properties are compatible with original mix design.
   2. Prepare mix design for each type and strength of concrete by either laboratory trial batch, verified by independent testing laboratory, or field experience methods as prescribed by ACI 301.
   3. Prepare mix design information for concrete batch weights with bulk-specific gravity determinations for aggregates based on saturated surface dry (SSD) condition. Include mix information sufficient to verify through absolute volume calculations:
      a. Concrete Yield. b. Cement Factor.
   4. When adjustment to mix design becomes necessary due to job conditions, weather, test results, changes in material properties, or other circumstances, resubmit new mix design for acceptance by Architect.
D. Proportioning and Mixing: Conform to requirements of IBC, including Chapter 19. E.

Design Strength:
1. Interior Concrete Slabs: Minimum 4,000 psi 28 day strength and as shown on Drawings by General Structural Notes.
2. Exterior Site Work Concrete: Assume 4,000 psi, 28 day strength, except as otherwise specified or Shown on Drawings by Civil Site Paving and Grading Notes or General Structural Notes.

F. Water/Cement Ratio for Interior Slabs: 0.40 to 0.44, based on total cementitious material, including slag, fly ash and other pozzolanic materials.
   1. Water Content for Slabs: Maximum 270 pounds per cubic yard.
   2. Total Combined Cement and Fly Ash Content for Slabs: Minimum 516 pounds per cubic yard and as accepted by Architect.
   3. Exterior Site Work Concrete: Assume 0.42 to 0.45 except as otherwise specified by Owner

G. Length Change: Where no test data is available, add shrinkage reducing admixture, conforming to manufacturer’s instructions.
   1. Slabs: Maximum 0.035 percent shrinkage in 28 days.

H. Superplasticizers: Add high range, mid-range, and low range water-reducing admixtures to batch plant mix as means to develop sufficient slump and workability, as instructed by manufacturer.
I. Air-Entraining Agents at Exterior Concrete:
   1. Achieve 5 percent entrained air, plus or minus 1-1/2 percent to batch plant concrete mix, for exterior concrete exposed to earth, weather, or freezing temperatures after curing.
   2. Do not add to interior slabs, except as accepted by Architect.

Fly Ash and Slag:
   1. Add to batch plant concrete mix as Portland cement replacement. Submit back-up data for mix design.
   2. Slag and Fly ash content as a percentage of total weight of cementitious material:
      a. Concrete Slabs: Minimum 20 percent, maximum 25 percent.

K. Concrete Slump: Optimize through performance mix design by batch plant to suite placement conditions, as accepted for each mix design.

2.4 CONCRETE MATERIALS

A. Cement: ASTM C150.
   1. Interior: Type I and Type II. Do not use air-entrained concrete at interior slabs.
   2. Exterior: Type I with specified air entrainment admixture, preferred to Type IA and Type IIA air-entrained concrete. Type IIIA accepted for cold weather construction.

B. Aggregates:
   2. Coarse Aggregate Class Designation: As indicated by Table 3 for Type or Location of concrete for Moderate Weathering Region, including 5M for exterior Architectural Concrete.
   3. Size: Do not exceed 3/4 distance between reinforcing steel or 1/3 thickness of concrete slabs and toppings.
      a. Curbs, Sidewalks, Pavements and Slabs-on-Grade. Maximum 1 inch aggregate.
      b. Slabs and Structural Concrete: Maximum 3/4 inch aggregate.
   4. Free of deleterious substances that may cause expansion of concrete or react with alkalis in concrete.

C. Mix Water: ASTM C94, para. 5.1.3

D. Fly Ash: ASTM C618, Class F or Class C Pozzolan, loss on ignition not exceeding 1 percent. Account for lower calcium content of Class F where used.

2.5 CONCRETE ADMIXTURES, ADDITIVES, AGENTS, AND COMPOUNDS

   1. Euclid, Air Mix.
   2. Grace, Daravair 1000.
   3. BASF, AE 90 or Micro Air.
   4. Or approved.

B. Water Reducer Normal: ASTM C494, Type A
   1. Master Builders, Pozzolith/Polyheed.
   2. Euclid, Eucon WR 75
   3. Or approved

C. Superplasticizers / Water-reducing Admixtures.
   1. High range water-reducing admixture, ASTM C494, Type F or G and shall be of the second or third generation type. Shall be batch plant added, extend plasticity time, reduce water 20 to 30 percent.
      a. Euclid, Eucon 37.

D. Accelerator: ASTM C494, Type C or E, non-corrosive, non-chloride;
   1. Master Builders, Pozzutech 20.
   2. Euclid, Accelgard 90
   3. Or approved.

E. Set Retarder: ASTM C494, Type B.

F. Shrinkage Reducing Admixture (SRA): As tested to ASTM C157 and conforming to accepted test data for linear shrinkage as instructed by manufacturer.
   2. BASF, Tetraguard AS20 and Tetraguard PW.

2.6 ACCESSORIES

A. Bonding Agent: acrylic type;
   1. Sonneborn, Sonnocrete.
   2. W.R. Grace, Duraweld C.
   3. Euclid, Flex-con
   4. Or approved

B. Non-Shrink Grouts: ASTM C1107, Grade B; non-shrink non-catalyzed natural aggregate grout; minimum compressive strength of 7000 PSI at 28 days; 25 to 30 second flow when tested in accordance with ASTM C939 at 45 to 90 degrees F; cement gray in color;
   1. Master Builders, Masterflow 928.
   2. Euclid, HiFlow Grout
   3. Or approved

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces when applied to forms or form liners.

D. Curing Materials:
   1. Waterproof Sheet Material: Waterproof paper in accordance with ASM C171; reinforced waterproof kraft paper; white color at exterior applications
   2. Mats and Burlap: Fabric covering composed of quilted polyethylene sheeting laminated to outer covering of burlap, cotton, or other approved fabric; outer covering shall weight not less than 6 ounces per square yard.
   3. Curing Compound: ASTM C309; clear or translucent with fugitive dye; moisture loss not more than 0.03gr./sq.cm. when tested in accordance with ASTM C156 and applied in a single coat at the manufacture’s recommended rate.
      a. Euclid, Kurz DR.
      b. Or approved.

2.7 SAW CUT CONTROL JOINTS EQUIPMENT

A. Husqvarna Soff-Cut, specified for type and quality.

B. Saw Blades for Cutting Green Concrete.

C. Model: As instructed by manufacturer for saw model and concrete composition and hardness.

D. Depth of Cut: Minimum 1 inch deep and 1/4 depth of concrete slab, except as otherwise shown on
2.8 SOURCE QUALITY CONTROL

A. Conform to provisions and limitations ACI 340R and ASTM C90.
B. Batching and Mixing: Conform to ASTM C94, Option A for exact proportioning of mix design. C. Admixtures: Add to within accuracy of 3 percent.
   1. Add separately and verify compatibility in design mix, conforming to manufacturer’s instructions.
   2. Reject concrete that shows signs of segregation due to use of admixtures.
D. Accelerating and Set Retarding Admixtures: Accepted for long hauls for extending transportation time, cold weather, and hot weather conditions conforming to hot and cold weather placement requirements.
E. Reject concrete that has reached internal temperature of 89 degree F or above and when temperature has risen 5 degrees in 10 minutes, indicating that concrete is setting up prior to discharge.
F. Admixtures: Add to within accuracy of 3 percent.
   1. Add separately and verify compatibility in design mix, conforming to manufacturer’s instructions.
   2. Reject concrete that shows signs of segregation due to use of admixtures.

G. Mix Water: When feasible, add mix water required for mix design at batch plant. H. Accelerating and Set Retarding Admixtures:
   1. Accepted for long hauls for extending transportation time, cold weather, and hot weather conditions conforming to hot and cold weather placement requirements.
   2. Measure concrete temperature and confirm that temperature has not exceeded 89 degrees F or 5 degrees F in 10 minutes before acceptance at site.

I. Batching of Dry Materials and Adding Mix Water at Site:
   1. Accepted for long hauls and for extending transportation time as an alternate procedure to adding accelerating and set retarding admixtures.
   2. Add mix water under pressure at both front and back of mixing drum.
   3. Mix at mixing speed for 70 to 100 revolutions before discharging.

J. Adding Mix Water at Project Site: Accepted as needed increase slump of concrete within first 15 minutes after truck arrives at site, under following conditions.
   1. Quantity of water does not exceed specified slump and maximum water/cement ratio and conforms to batch plant mix designer's written instructions.
   2. Special Inspector is present to monitor quantity of water added in comparison to that added at batch plant and make written record of that for each truck load delivered.
   3. Drum is turned an additional 30 revolutions or more as necessary to uniformly mix water into concrete.
   4. Water is not added to concrete batch after:
      a. Taking test cylinders, except where new test cylinders are taken at Contractor’s expense. b. Adding high-range water-reducing admixtures to concrete mix.

K. Do not use calcium chloride containing products.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify installation conditions as satisfactory to receive work of this Section before beginning. B.
Verify under slab vapor retarder is undamaged and conforming to Section 033000. Sand and granular fill layers over vapor retarder are not accepted.

C. Verify that seats, reinforcement, and other items cast into concrete are accurately located, securely in place, and approved before concrete placement.

3.2 PREPARATION

A. Protect Surrounding Areas: Preclude damage from work of this Section.
B. Interior Slab-On-Grade: Install vapor retarder sheeting directly under concrete slab.
C. Damaged Vapor Retarder: Lap new vapor retarder, 6 inch minimum, over damaged areas and seal watertight with tape.
D. Vapor Retarder, Formwork, Reinforcing, and Embedded Items: Remove deleterious matter, including snow, ice, water, frost, mud from surfaces contacting concrete placement.

E. Weather Conditions:
   1. Prepare in advance for conditions where ambient temperature necessitates hot or cold weather concrete placements.
   2. Do not begin placement when sun, heat, wind, or other limitations may prevent proper consolidation, finishing, and curing.
   3. Do not place concrete when rain, sleet, or snow are falling, except where adequate means are taken to cover and protect concrete placements. Do not allow rain water to increase mixing water or to damage concrete surface finish during or following placement.
   4. Take measures to prevent rapid evaporation of surface bleed water due to high evaporation conditions, including high winds and low humidity.
F. Reinforcement Doweled into Previously Placed Concrete: Drill holes into previously placed concrete. Place adhesive grout, and insert steel dowels.
G. Formwork, Reinforcing, and Embedded Items: In place, and approved before placement of concrete.
H. Waterstop: locate at cold joints.

3.3 CONCRETE PLACEMENT


3.4 COLD WEATHER CONDITIONS

A. Conform to 306R and ACI 306.1.
B. Do not place concrete on ice, snow, frost, or frozen substrates including subgrades, formwork, reinforcement, and embedded items.
C. Temperature of Concrete: Maintain for 7 days between 50 degrees F and 90 degrees F curing temperature.
D. Take measures to protect concrete from freezing when for daily temperatures below 40 degrees F following first 5 days after placement.
E. In severe weather, at end of 5 days, gradually decrease temperature to ambient over 24 hour period.
F. Do not use calcium chloride, salt, or other materials containing anti-freeze agents or chemical accelerators.
G. Use of Heaters:
   1. Do not use propane or other moisture and carbon-dioxide producing heaters
   2. Maintain uniform temperature throughout heated areas.
   3. Prevent rapid drying of new concrete. Elevate heaters and protect floor slabs around heaters with damp
H. Insulation:
   1. Accepted to retain heat in newly placed concrete.
   2. Conform to ACI 306R and ACI 306.1 for type and amount satisfactory for given conditions.
   3. Protect corners and edges of concrete placement.

3.5 EMBEDDED ITEMS
A. Locate and embed expansion joints, joint fillers, waterstops, anchor bolts, embedded plates, dovetail anchor slots, piping, conduit, radiant heating tubes, and other items required for work for this and other Sections.
B. Use templates, setting diagrams, and drawings, conforming to manufacturer instructions.
C. Fill voids in sleeves, inserts, and anchor slots with temporarily, easily removable material to prevent entry of concrete.
D. Do not embed aluminum except where protected from contact with concrete.

3.6 CONSTRUCTION, ISOLATION, AND CONTRACTION JOINTS
A. Conform to ACI 302.1R. Locate where shown on Drawings and accepted shop drawings. Verify locations with Architect before proceeding.
B. Locate to least impair structural integrity. Locate joints perpendicular to primary reinforcing steel.
   1. Remove laitance and defective concrete. Wash surface.
   2. Apply bonding agent against hardened concrete.
C. Bonded Construction Joints (Cold Joints) between Successive Concrete Placements: Locate joints to least impair structural integrity, perpendicular to primary reinforcing steel.
   1. Dowel between slabs, as shown on Drawings
   2. Remove laitance and defective concrete. Wash surface.
   3. Apply bonding agent against hardened concrete.
   4. Dampen concrete surface. Remove excess water from formwork.
   5. Install expanding joint strip or saw cut contraction joints over construction joints between individual slab placements.
D. Isolation Joints:
   1. Establish complete separation through floor slabs at junctions with other building elements and points of restraint including walls, columns, equipment foundations, and stairways, except elements requiring lateral restraint from slab.
   2. Fill to complete depth of joint with preformed joint filler, leaving 1/2 depth of joint width clearance below top of slab for installation of backer rod and sealant.
E. Saw Cut Contraction Joints: Saw cut interior and exterior slabs using soft cut method over green concrete as soon as slab will support foot traffic and before slab begins to experience shrinkage cracking, conforming to ACI 302.1R Chapter 3.
   1. Space saw-cuts at 2 to 3 foot spacing for each 1 inch depth of concrete slab and as accepted by Architect.
   2. Saw-cut joints minimum 1 inch deep and not less than 1/4 depth of concrete slab, except as otherwise shown on Drawings.
   3. Saw-cut joints at 45 degree angle from corner of diamond shaped slab panels.
   4. Exactly meet corners of cut outs to prevent cracking from corners.
   5. Locate contraction joints over structurally supporting beams.
   6. Maximum length to width ratio of panels in floor slabs is 1.5 to 1, although 1 to 1 is preferred.
   7. Maximum length to width ration of panels in exterior pavement is 1.25 to 1, although 1 to 1 is preferred.
   8. Do not form T-shaped or L-shaped saw-cut joints in panels.
9. Make joints continuous. Do not offset or stagger.
10. Space contraction joints equal distance between contraction joints at column lines, over construction joints, supporting structural beams, and change of substrate.
11. Burnish edges of joints while concrete is still green.

3.7 FINISHES FOR SLABS AND OTHER UNFORMED SURFACES

A. Finish concrete slabs to ACI 301, ACI 302.1R Chapter 8
B. Edge Forms and Screeds: Use specified screed systems that will not penetrate underlying vapor retarder at interior slab-on-grade.
C. Placement: Place at rate that allows spreading, straight-edging, and darbying or bull floating before appearance of bleed water.
D. Float Finish: Provide as final finish at concrete slabs where a float finish is desirable for improved mechanical bonding of subsequent coatings, toppings, underlayments, and floor finishes.
   1. Place, consolidate, strike off, and level concrete, eliminating high and low spots.
   2. Do not work concrete again until it is ready for floating.
   3. Allow concrete time to bleed naturally before beginning work.
   4. When bleed water sheen has disappeared, begin floating with a hand float
   5. Bull float to achieve finish tolerance requirements.
   6. Float to conventional straightedge requirements and then refloat to a uniform texture.
   7. Slope exterior paved surfaces away from building in slopes to drain without ponding.
E. Troweled Finish: Provide at exposed concrete slabs, except where a float finish is desirable for improved mechanical bonding of subsequent coatings, toppings, underlayments, and floor finishes
   1. Float concrete surface then power trowel surface.
   2. Continue troweling until surface is hard enough to ring under trowel.
   3. Trowel smooth and free of trowel marks, uniform in texture and appearance.
   4. Finish to specified tolerances. Do not burn or overwork concrete.
   5. Retain moisture in slab surface during finishing. Provide fog spray in dry or windy weather.
   6. Do not blacken or burn concrete surface with power trowel.
F. Light Broom Finish
   1. Provide at exterior paved surfaces and as shown on Drawings.
   2. Float finish slab and promptly after initial set, broom finish surface uniformly and perpendicularly to traffic in accepted texture.
   3. Broom finish similar to existing onsite conditions.

3.8 FILLERS AND ELASTOMERIC JOINT SEALANTS

A. Exposed Interior Saw-Cut Contraction Joints:
   1. Install semi-rigid polyurea or epoxy joint sealer, approximately matching color of finish floor slab.
   2. Install to fill 1 inch deep saw-cut contraction joint.
   3. Overfill and shave sealant flush with floor surface to make smooth surface flush with top of adjacent slab.
B. Interior and Exterior Isolation and Control Joints:
   1. Install preformed joint fillers leaving 1/2 depth of joint width clearance below top of slab for installation of backer rod and sealant.
   2. Install backer rod and elastomeric joint sealant as specified by Section 079200.
   3. Tool to concave configuration at exterior joints and flat configuration at interior joints, flush to paving surface.
   4. Do not install elastomeric sealant at exterior saw cut contraction joints.

3.9 CURING CONCRETE SLABS
A. Conform to methods specified by ACI 301 Section 5.3.6, ACI 302.1R Section 9.2.1 through 9.2.3.2 and ACI 308.1 Section 2.2 through Section 2.3.2.

B. Sheet Membrane Curing: Conform to ACI 302.1R Section 9.2, excluding Section 9.2.4, and ACI 308.1 Section 2.2 or Section 2.3, excluding Section 2.3.3.
   1. Fog spray or sprinkle and take other measures to maintain continuous layer of water over concrete surface.
   2. Cover concrete slab with wet burlap or waterproof curing film. Use waterproof paper at stained concrete and integrally colored concrete. Do not use plastic.
   3. Secure edges and corners of curing film to maintain in place over concrete and prevent drying.
   4. Leave curing film in place as necessary to maintain suitable moisture content and temperature of concrete for minimum 7 day curing period.
   5. Keep concrete moist. Add water as needed to maintain wet surface.
   6. At exterior slabs not subject to drying, curing film may be omitted when accepted by Architect.

C. Following initial curing period, take measures to remove excess unhydrated moisture from slabs to reach moisture vapor emission rates (MVER) to acceptable levels for installation of finish flooring.
   1. Measures include heating and ventilating to exhaust moisture from interior of building areas.
   2. Do not use propane heaters or other moisture generating heating equipment.

3.10 GROUTING
A. Solid Grouting under Structural Base Plates, Mechanical Equipment and Obstructed Voids and Joints.
   1. Mix grout to fluid consistency.
   2. Construct liquid tight formwork and pour grout in place.
   3. To prevent voids, pour grout from only one side so that flow exits from opposite side. Work poured grout firmly in place.
   4. Dry packing not permitted.

B. General Use: Include anchoring, filling cracks, and repairs such as filling rock pockets and pipe penetrations:
   1. Mix non-shrink, aggregate grout to optimal fluid, flowable, or plastic consistency as necessary for solid grouting and repair.
   2. Trowel grout at plastic consistency at voids and around pipe penetrations to fill voids and to match adjacent surfaces.

C. Cold Weather Grouting: When ambient temperatures are below or are predicted to fall below 45 degrees F, use cold weather grout or build a cold weather enclosure over grouting placement area and maintain minimum enclosure temperature at 60 degrees for 72 hours after grout placement and as instructed by manufacturer.

3.11 TOLERANCES
A. General Tolerances: Provide Random Traffic floor tolerances as follows, when measured in accordance with ASTM E1155, ACI 302, including those floors to receive subsequent finishes.
   1. Slabs on grade to receive resilient or resinous floor covering: FF 35, FL 25, over test area; FF 24, FL 17, minimum local value.
   2. Slabs on grade to receive carpet: FF 25, FL 20, over test area; FF 17, FL 15, minimum local value.

3.12 CONCRETE SURFACE REPAIRS
A. Promptly report surface defects to Architect for direction prior to making repairs.
B. Repair, patch, and remove stains rust, efflorescence, and surface deposits, as directed by
Architect.

C. Where repairs and patching are not practical as a solution to achieve intended results, cut out and replace.

3.13 REPAIRING UNFORMED SURFACES

A. Surface Defects: Repair and replace defects to specified tolerances and specification, including:
   1. Crazing and cracks, in exceeding 0.01 inch wide or penetrating to reinforcing steel.
   2. Spalls, pop-outs, honeycombs, rock pockets, and other objectionable conditions.

B. Floor Slab Flatness and Levelness: Correct floor flatness and floor levelness, not meeting specified tolerances in conformance to ACI 301, to make suitable substrate for finish floor systems.

C. Correct high areas by wet grinding after concrete has cured at least 14 days. Make test on trial area and obtain acceptance from Architect before proceeding.

D. Correct low areas and swales at floors receiving finished flooring systems by cutting out and replacing with fresh concrete or by using cementitious underlayment.

3.14 STRUCTURAL CONCRETE REPAIR

A. Prior to Substantial Completion, repair:
   1. Cracks exceeding 0.005 inch width extending full depth through slabs and walls.
   2. Cracks that impair structural integrity.
   3. Cracks that are subject to water leakage.

B. Inject cracks with epoxy or methylmethacrylate resin.
   1. Use pressure or vacuum injection methods to monolithically bond and seal cracks without expanding cracks.
   2. Submit and follow procedures acceptable to Owner.

3.15 ADJUSTING

A. Correct defective work not conforming to specified tolerances and referenced ACI Standards and as necessary for smooth finished surface ready for installation of resilient flooring finishes specified under Section 096500 - Resilient Flooring.

B. Remove and replace slabs that show excessive shrinkage cracks and slabs that do not freely drain, as directed by Architect.

3.16 PROTECTION

A. Protect in-place concrete in conformance to ACI 301, Section 1.8.

B. Cover to protect interior exposed concrete slabs subject to foot traffic or other damage with clean, unwrinkled kraft curing paper.

C. Lay down plywood or OSB cover board over concrete slabs in pathways subject to heavy foot traffic or rolling loads over uncured concrete.

D. Stack and stockpile materials and equipment in manner to prevent mechanical and chemical damage to concrete surfaces. Maintain stacking and stockpiling loading within structural tolerances.

E. Contain and promptly clean spills to maintain concrete suitable for bonding of finish flooring and final finishing of exposed concrete slabs.

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.

1.2 SUMMARY

B. This Section includes the following:
   1. Wood framing.
   2. Wood supports.
   3. Wood blocking.
   4. Wood cants.
   5. Wood nailers.
   7. Wood preservative
   8. Plywood backing panels.
   9. Sub-framing thermal spacer

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product indicated.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that materials comply with requirements.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses.

C. Research/Evaluation Reports: For the following:
   1. Treated wood.
   2. Engineered wood products.
   5. Expansion anchors.
   6. Metal Framing anchors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
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 manufacturers specified.

2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Provide dressed lumber, S4S, unless otherwise indicated.
   4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

B. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
   1. Allowable Design Stresses: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Composite door, solid core doors, interior plywood, millwork, cabinetry, crown molding, counters, wood panel products used on the interior of the building shall contain ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde (NAF) resins.

D. Wood Structural Panels:
   1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise noted.
   2. Oriented Strand Board: DOC PS 2.

2.02 ADHESIVES, SEALANTS, PAINTS & COATINGS

A. Refer to VOC limit tables in Section 01 81 16 for VOC limits for products in this section

B. Adhesives used in field and shop-fabricated assemblies containing these composite wood products shall contain ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde (NAF) resins.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2 (lumber), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

C. Mark each treated item with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood framing members less than 6 inches above grade.
   4. Wood floor plates that are installed over concrete slabs directly in contact with earth.

2.4 DIMENSION LUMBER

A. General: Of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

B. Framing Species and Grade: As indicated on Structural Drawings.

C. Exposed Framing: Hand select material for uniformity of appearance and freedom from characteristics that would impair finish appearance.
   1. Framing Species and Grade: As indicated on Structural Drawings.

2.5 TIMBER AND MISCELLANEOUS LUMBER

A. For timbers of 5-inch nominal size and thicker, provide framing species and grade as indicated on Structural Drawings.

B. Provide miscellaneous lumber for support or attachment of other construction, including the following:
   1. Rooftop equipment bases and support curbs.
   2. Blocking.
   3. Cants.
   5. Furring.

C. For items of dimension lumber size, provide Construction, Stud or No. 2 grade lumber with 19 percent maximum moisture content of any species.

D. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
   1. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

2.6 ENGINEERED WOOD PRODUCTS

A. Laminated-Veneer Lumber: Composite of wood veneers with grain primarily parallel to member lengths, manufactured with exterior-type adhesive complying with ASTM D 2559. Allowable design values determined according to ASTM D 5456.
   1. Manufacturer:
      a. Trus Joist MacMillan
   2. Material Properties as indicated on Structural Drawings.

B. Wood I-Joists: Prefabricated units complying with APA PRI-400 depths and performance ratings not less than those indicated.
1. Manufacturer:
   a. Trus Joist MacMillan

2. Material Requirements as indicated on Structural Drawings.

3. Structural Capacities: Establish and monitor structural capacities according to ASTM D 5055.


   1. Manufacturer:
      a. Trus Joist MacMillan
   2. Material Requirements as indicated on Structural Drawings.
   3. Trademark: Factory mark with APA trademark indicating thickness, grade, and compliance with APA standard.

2.7 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated, or, if not indicated, not less than 1/2-inch thick.

2.8 SUB-FRAMING THERMAL SPACER

A. Sub-framing Thermal Spacer: 100 % Pultruded glass fibre and thermoset polyester resin insulation clip. For all exterior rainscreen cladding applications.
   1. Thermal Spacer thickness for top, base and web: 3/16 inches nominal.
   2. Thermal spacer depth: 2 inches nominal 0.1 Depth tolerance: ± 0.005 inches.

B. Spacer Fasteners: High hex head washer head with sharp twin lead threaded design of heat treated corrosion resistant coated steel.
   1. Fastener for steel framing: 1/4 - 14 x 4 inches long with hex head.
      b. Embedment depth: 1 1/2 inches, except when into hollow concrete masonry unit, not less than 1 inch.

2.9 MISCELLANEOUS MATERIALS

A. Fasteners:
   1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
   3. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

B. Metal Framing Anchors: Made from hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
1. Manufacturer:
   a. Simpson Strong-Tie Company, Inc.

2. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.

3. Allowable Design Loads: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated on Structural Drawings, complying with the following:
   1. CABO NER-272 for power-driven fasteners.
   2. Published requirements of metal framing anchor manufacturer.

D. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.


F. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.


H. Fastening Methods:
   1. Subflooring: Glue and nail to wood framing.
   2. Sheathing: Nail or staple to wood framing as indicated on Structural Drawings.
   3. Plywood Backing Panels: Nail or screw to supports.

I. Building Wrap Application: Cover wall sheathing with building wrap as indicated. Cover upstanding flashing with 4-inch overlap. Seal seams, edges, and penetrations with tape.

3.2 PREPARATION (SUB-FRAMING THERMAL SPACER)
A. Pre-drill concrete or concrete masonry unit substrate to 1/2 inch deeper than anticipated embedment depth of fastener into substrate.
   1. Use drill diameter approximately 1/16 inches less than screw diameter in accordance with fastener manufacturer’s written recommendations.

B. Sub-framing: Ensure thermal spacer type is selected to accommodate orientation of vertical and horizontal sub-framing.

C. Sub-framing Thermal Spacer Installation: Install thermal spacers in accordance with spacer manufacturer’s written recommendations.
   1. Thermal Spacer Installation: Clip thermal spacer to Z-girt and fasten girt directly to substrate [at 26 inches maximum on center vertically and 16 inches maximum on center horizontally] [or as directed by [Cladding Engineer] [Consultant]].
   2. Installation sequence for spacers, sub-framing, and insulation - Option 1:
      a. Pre-punch holes or pre-drill holes in Z-girts and tracks to accommodate fasteners.
      b. Position Z-girts directly over thermal spacer before installation of fasteners.
      c. Completely install thermal spacers and screws for first Z-girt / track. For subsequent girts:
         1) Fasten top spacer with single screw through Z-girt and spacer into substrate ensuring spacer can pivot for accurate alignment.
         2) Friction fit insulation in place before completing installation of remaining screws to secure Z-girt and thermal spacers.
            a) Ensure insulation is tightly fitted with sides of insulation slightly compressed at each insulation spacer.
            b) Ensure insulation pieces are in contact with no linear gaps between spacers.
   3. Installation sequence for spacers, sub-framing, and insulation - Option 2:
      a. Pre-punch or pre-drill holes in Z-girts and tracks to accommodate fasteners.
      b. Position Z-girts directly over thermal spacer before installation of fasteners.
      c. Completely install spacers, screws and sub-framing, prior to installing insulation.
      d. Friction fit insulation in place as follows:
         1) For semi-rigid insulation batts or boards, score or cut insulation down its centerline to 50 % maximum of its depth to enable fitting insulation in correct position.
         2) Fold edges of insulation board back to enable friction fitting in correct position. Position edges of partially folded board into space between girts and thermal spacers, and flatten partially folded board against substrate.
         3) Ensure insulation is tightly fitted with sides of insulation slightly compressed at each insulation spacer.
      e. Install corrosion resistant stick pins or other mechanical insulation retention devices 16 inches maximum on center along centreline of insulation batts or boards and in accordance with insulation manufacturer’s written recommendations.
         1) Use sufficient number of stick pins or retention devices to ensure insulation remains flat and in correct position.
         2) Use 3 minimum stick pins or retention devices for each 4 feet long batt or board.
      f. Ensure insulation pieces are in contact with no linear gaps between spacers.

END OF SECTION 06 10 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.

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Parapet sheathing.
5. Subflooring.
6. Underlayment.
7. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for shear walls and plywood backing panels.
2. Section 07 25 00 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, including list of ABAA-certified installers and supervisors employed by Installer, who work on Project.

B. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.
3. Foam-plastic sheathing.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS


B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

C. Factory mark panels to indicate compliance with applicable standard.
2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat plywood indicated on Drawings, and the following:

1. Subflooring and underlayment for raised platforms.

2.5 WALL SHEATHING

A. Plywood Sheathing: As indicated.

B. Oriented-Strand-Board Sheathing: As indicated.
2.6  ROOF SHEATHING
   A.  Plywood Sheathing: As indicated.

2.7  PARAPET SHEATHING
   A.  Plywood Sheathing: As indicated.

2.8  SUBFLOORING AND UNDERLAYMENT
   A.  Plywood Combination Subfloor-Underlayment: As indicated.
   B.  Plywood Subflooring: As indicated.

2.9  FASTENERS
   A.  General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
      1.  For fire treated plywood sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M of Type 304 stainless steel.
   B.  Nails, Brads, and Staples: ASTM F1667.
   C.  Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
   D.  Screws for Fastening Sheathing to Wood Framing: ASTM C1002.
   E.  Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
   F.  Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117. Provide washers or plates if recommended by sheathing manufacturer.

2.10 MISCELLANEOUS MATERIALS
   A.  Adhesives for Field Gluing Panels to Wood Framing: As indicated.
PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. As indicated on drawings.
2. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
4. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall, parapet, and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION


B. Fastening Methods: Fasten panels as indicated below:

1. Combination Subfloor-Underlayment:
   a. Glue and nail to wood framing.
   b. Space panels 1/8 inch apart at edges and ends.

2. Wall and Roof Sheathing:
   a. Nail to wood framing.
   b. Space panels 1/8 inch apart at edges and ends.

3.3 FIBERBOARD SHEATHING INSTALLATION

A. Comply with ASTM C846 and with manufacturer's written instructions.
3.4 HARDBOARD UNDERLAYMENT INSTALLATION

A. Comply with CPA's recommendations and hardboard manufacturer's written instructions for preparing and applying hardboard underlayment.

1. Fastening Method: Nail underlayment to subflooring.

3.5 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.

B. Testing and Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier sheathing assemblies will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers.

D. Air barriers will be considered defective if they do not pass tests and inspections.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

F. Prepare test and inspection reports.

END OF SECTION 06 16 00
PART 1 GENERAL

1.1 SUMMARY
A. Section includes installation of interior trim at windows and doors including miscellaneous auxiliary materials, fasteners, connectors and accessories.
B. Interior wood handrails and wall-mounted metal support brackets.

1.2 RELATED SECTIONS:
A. Section 024100 - Selective Demolition
C. Section 061000 - Rough Carpentry
D. Section 062013 - Exterior Finish Carpentry
E. Section 092100 - Gypsum Wallboard
F. Section 099100 - Painting

1.3 REFERENCES
A. Standards and References:
   1. PS20 - American Softwood Lumber Standard
   2. AWS - Architectural Woodwork Standards
   3. WCLIB - Standard Grading Rules No. 17
   4. WWPA - Western Lumber Grading Rules

1.4 SUBMITTALS
A. Submit in accordance with Section 013300 and the following:
   1. Product Data: For each product and material specified.
   2. Include grading certifications and moisture certifications if requested by Owner.
B. Samples: For each exposed product and for each color and texture specified.

1.5 QUALITY ASSURANCE
A. Refer to Section 014000 Quality Requirements.
B. Regulatory: Comply with requirements of the City of Shoreline
C. Grading and Marking: Identify lumber and sheet products by official grade mark.
   1. Lumber: Mark each piece or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency certified by the ALSC Board, to grade the species used.

1.6 DELIVERY, STORAGE AND HANDLING
A. Delivery, Storage and Handling:
   1. Deliver finish carpentry to jobsite only after painting, wet work, grinding, and similar operations are completed. Maintain environmental conditions at the site, including both storage and installation areas as recommended by manufacturer and fabricator.
   2. Protect from damage at all times.
1.7 PROJECT SITE CONDITIONS

A. Environmental Requirements:
   1. Building shall be thoroughly dry, finish work completed and HVAC system operational maintaining temperature and relative humidity at occupancy levels for remainder of the construction period before finish woods are placed in it.
   2. Maintain ambient relative humidity at the site, for both storage and installation.
   3. Acclimate materials prior to installation as recommended by manufacturer.

B. Refer to AWS Section 2, for additional requirements.

PART 2 PRODUCTS

2.1 TRIM MATERIALS

A. Casing Header: ½” x 2-1/2” MDF Flat Stock; stack on legs / ½” overhang @ sides
B. Casing Legs: Net 9/16” x 2-1/2” MDF Flat Stock
C. ByPass Closets Perimeter jamb w/ 1”x2” valance and casing to match doors
D. Windows: Full casing with stool and apron
E. Comply with AWS “Custom” Grade quality standards.
   1. Interior Millwork (including standing and running trim): AWS Section 6.

2.2 HANDRAILS

A. Hardwood Lumber Trim for Transparent Finish (aka Wood):
   1. Species and Grade: White maple, NHLA Clear.
   2. Maximum Moisture Content: 9 percent.
   4. Gluing for Width: Not allowed
   5. Veneered Material: Not allowed
   6. Face Surface: Surfaced (smooth).
   7. Matching: Selected for compatible grain and color.
   8. Profiles/Sizes: per drawings

2.3 ACCESSORIES AND HARDWARE

A. Glue for Woodwork: Aliphatic-resin, polyurethane, or resorcinol wood glue, waterproof for work subject to moisture; AWS Type I or Type II, best quality for intended use.

B. Rough Hardware:
   1. Provide necessary nails, screws and the like, or material, type, size and finish as required for each substrate condition, for secure anchorage.
      a. Use recessed screws, finish or casing nails for exposed work, unless otherwise indicated.
   2. Fastenings/Quantities: Furnish as necessary whether indicated or not.

C. Metal Wall-Mounted Handrail Brackets
   1. Manufacturer: Inline Design, 1420 Terry Ave, Unit 1601, Seattle, WA 98101 (425) 405-5505
2. Product: Stainless Steel Handrail Wall Bracket, Quasar Series. Model HBWA.013 w/ round Saddle Adapter and wall bracket screw/hanger bolt for mounting through drywall into wood blocking.

3. Locations: All interior handrail locations. Maximum 4’ spacing.

D. Miscellaneous Items: Provide miscellaneous items required for completion of architectural woodwork as indicated with quality consistent with that specified for related woodwork.

PART 3 EXECUTION

3.1 PREPARATION

A. Field Verification:
   1. Measurements: Take dimensions necessary prior to installation.
   2. Verify adequacy of support framing.
   3. Verify mechanical, electrical and building items affecting work of this section are placed and ready to receive this work.

B. Verify moisture content of finish carpentry materials; do not install materials that are wet, moisture damaged or mold damaged. Condition materials to average prevailing temperature and humidity in installation areas for a minimum of twenty-four (24) hours prior to installing interior finish carpentry.

C. Protect surrounding areas or surfaces to preclude damage during installation.

3.2 INSTALLATION

A. Install work in accordance with referenced AWS Manual for “Premium” Quality Standard unless otherwise specified.
   1. Carefully scribe work butting other components with maximum 1/32 inch gap.
   2. Prior to securing items, adjust to ensure proper matching at joints and correct alignment throughout their length. Shim as required using concealed shims.
   3. Ease exposed edges of finish work to match existing adjacent.
   4. Set and secure materials and components in place, plumb and level with tight joints.
   5. Do not use additional overlay trim to conceal larger gaps unless specifically approved by Owner after review of conditions of installation.
   6. Miter casings and moldings where indicated or directed.
   7. Use finish nails except where screws required or other fastening indicated.
   9. Where screw attachment required, space screws at equal intervals.
   10. Select and cut material to exclude damaged, marked or defective areas.
   11. Provide for thermal and building movements.

B. Erection Tolerances:
   1. Maximum variation from true positions: 1/32 inch.
   2. Adjoining Surfaces of Same Material: No variance permitted.
   3. Maximum offset from true alignment with abutting materials: 1/32 inch.
   4. Final Adjustment and Cleaning: Whenever the hardware installation is made more than one (1) month prior to acceptance of the Work, make final adjustment and check of hardware during the week immediately prior to acceptance, unless otherwise directed by the Owner's Representative.
      a. Clean and re-lubricate operating items as necessary.
      b. Make final adjustment of locksets and closers to compensate for operation of heating and ventilating systems under the supervision of manufacturer’s representative.
      c. At completion of work, factory representatives for door closers and locksets are required to inspect and adjust their materials.
d. Turn over to Owner one (1) copy of template and installation instructions for each type of hardware.
e. Make further adjustments required during one (1)-year guarantee period.

C. Miscellaneous: Install other items necessary to complete normal finish carpentry work.

3.3 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION

A. Fitting and Adjustment: Make final fitting and adjustments as required.
   A. Repair or replace damaged, stained, scratched or otherwise disfigured work. Repairs shall match undamaged work, replace items where repairs are noticeable from one (1’) foot distance.
   B. Remove dirt and foreign materials from woodwork and casework on exposed and semi-exposed surfaces upon completion of installation. Clean interior and exterior surfaces; clean and polish hardware.

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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Thermal Glass-fiber insulation blankets
   2. Acoustic Glass-fiber insulation blankets installed as part of this section
   5. Rigid Insulation
   6. Loose-fill Insulation
   7. Rafter Attic Vents (Baffles)

B. Related Sections include the following:

   1. Division 6 Section "Rough Carpentry".
   2. Division 9 Section “Gypsum Board.”

1.3 SUBMITTALS

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

B. Test performance certificates for rated duct wrap.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one (1) source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.


1.5 DELIVERY, STORAGE, AND HANDLING
A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer’s written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:
   1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
   3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: The manufacturer listed below is the basis-of-design product, equivalent products by other manufacturers, provided they comply with requirements of the contract documents, will be considered (if applicable).

B. R-value/product dimensions: See drawings.

2.2 GLASS-FIBER BLANKET INSULATION

A. Available Manufacturers:
   1. Owens Corning

B. EcoTouch™ Unfaced Insulation: Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

C. EcoTouch™ Kraft-Faced Insulation: Kraft-faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on one (1) face.

2.3 MINERAL-WOOL BLANKETS (MINERAL FIBER INSULATION)

A. Mineral-Wool Blanket, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.
   1. Basis-of-Design Products:
      a. Exterior Wall, Batt: Rockwool Comfortbatt

B. Mineral-Wool Board, Types IA and IB, Unfaced: ASTM C612, Types IA and IB; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics. Nominal density of 4 lb/cu. ft..
   1. Basis-of-Design Product: Rockwool Comfortboard 110
a. Insulated Sheathing for Continuous Exterior wall Insulation: Rockwool Comfortboard 80

2.4 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
   a. Attic spaces.

C. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space between face of insulation and substrate to which anchor is attached.

D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

2.5 LOOSE-FILL INSULATION

A. Cellulosic-Fiber Loose-Fill Insulation: ASTM C 739, chemically treated for flame-resistance, processing, and handling characteristics, at upper level ceiling / attics.

1. Recycled Content: 82% recycled content with 70% recycled cardboard and the balance recycled newsprint and Boric acid fire retardant as a minimum of 18% of the product weight.

2.6 RIGID INSULATION

A. Basis of Design, Owens Corning FOAMULAR® 250 rigid XPS foam insulation.

2.7 ATTIC RAFTER VENTS (BAFFLES)

A. Basis of Design, Owens Corning RAFT-R-MATE® attic rafter vents.

2.8 AUXILIARY INSULATING MATERIALS AND ACCESSORIES

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturer for sealing joints and penetrations in vapor-retarder facings.

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
C. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.

2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

D. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

E. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Install rigid insulation at foundations and slabs as indicated on drawings.
C. Install thermal and acoustic mineral-fiber insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one (1) length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Install kraft-faced mineral fiber insulation at ceiling/floor assemblies. Staple insulation to adjoining framing. Install un-faced mineral fiber insulation elsewhere, unless noted otherwise.

D. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness/R-value as indicated, lightly settle to uniform density, but do not compact excessively.

1. For cellulosic-fiber loose-fill insulation, comply with CIMA's Bulletin #2, "Standard Practice for Installing Cellulose Insulation."
2. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.

3.5 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
   A. Composite sheet membrane system as required for a continuous barrier to resist air and water infiltration through differential air pressure into building wall enclosure at sheathing, fenestrations, penetrations and other openings.
   B. Section Includes:
      1. Weather Resistant Barrier (WRB)
      2. Accessories as required for installation of continuous barrier,
      3. Self-Adhering Membranes (SAM) - Flexible Flashing, Sill Flashing, Flashing Tape
      4. Liquid Applied Flashing (LAF)
      5. Window Sill Pan and Back Dam
      6. Rainscreen Drain Mat
      7. Flashing Panels

1.2 RELATED SECTIONS
   A. Section 061000 - Rough Carpentry for “Building Wrap”, denoted in this section for sequence of installation/coordination
   B. Section 074646 - Fiber Cement Siding and Trim
   C. Section 079200 - Joint Sealants

1.3 REFERENCES
   A. Reference Standards: Most current edition at date of Bid.
   B. ASTM International (ASTM):
      1. ASTM D882 – (Standard Test Method for Tensile Properties of Thin Plastic Sheeting)
      2. ASTM D5034 – (Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)

1.4 SUBMITTALS
   A. Submit in accordance with Section 013300 Submittal Procedures:
      1. Product Data: Manufacturer’s literature for each item specified.
      2. Warranty: Manufacturer’s ten (10) Year Limited Product and Labor Sample Warranty form

1.5 CLOSEOUT SUBMITTALS
   A. Submit in accordance with Section 013300 Submittal Procedures:
      1. Warranty: Manufacturer’s ten (10) Year Limited Product and Labor Sample Warranty form; submit signed warranty to Owner at Project Closeout.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS
   A. Conform to requirements of regulatory authorities.
2.2 MANUFACTURERS

A. Manufacturer: The manufacturer listed below is the basis-of-design product, equivalent products by other manufacturers, provided they comply with requirements of the contract documents, will be considered (if applicable)

2.3 WEATHER RESISTANT BARRIER

A. Basis of Design: Dupont Tyvek “DrainWrap,” spunbonded polyolefin, non-woven, non-perforated, weather barrier and related assembly components or accepted equal.

1. Air Penetration: 0.004 cfm/ft² at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677.
2. Water Vapor Transmission: 50 perms, when tested in accordance with ASTM E96, Method B.
3. Water Penetration Resistance: 210 cm when tested in accordance with AATCC Test Method 127.
4. Basis Weight: 2.1 oz/yd², when tested in accordance with TAPPI Test Method T-410.
5. Air Resistance: 300 seconds, when tested in accordance with TAPPI Test Method T-460.
6. Tensile Strength: 30/30 lbs/in., when tested in accordance with ASTM D882, Method A.
7. Tear Resistance: 7/9 lbs, when tested in accordance with ASTM D1117.
8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 5, Smoke Developed: 25

2.4 ACCESSORIES

A. Seam Tape

1. Basis-of-Design: Three (3”) inch wide, DuPont Tyvek® Tape for commercial applications or approved equal.

B. Fasteners

1. Basis-of-Design: Tyvek® Wrap Caps for use with wood construction, as distributed by DuPont: #4 nails with large one (1”)-inch plastic cap fasteners, or one (1”)-inch plastic cap staples with leg length sufficient to achieve a minimum penetration of 5/8-inch into the wood stud or approved equal

C. Sealants

1. Provide sealants that comply with ASTM C920, elastomeric polymer sealant to maintain watertight conditions. Reference Section 079200 - Joint Sealants.

D. Adhesives

1. Liquid Nails® LN-109
2. Denso Butyl Liquid
3. 3M High Strength 90
4. SIA 655
5. Adhesives recommend by the weather barrier manufacturer

E. Primers

1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
2. Products:
a. 3M High Strength 90  
b. Denso Butyl Spray  
c. SIA 655  
d. Permagrip 105  
e. ITW TACC Sta’ Put SPH  
f. Primers recommended by the flashing manufacturer

2.5 FLEXIBLE SILL FLASHING, VAPOUR PERMEABLE, SELF-ADHERED MEMBRANE (SAM)  
A. Basis-of-Design: DuPont™ FlexWrap™ NF, as distributed by DuPont: flexible membrane flashing materials for window openings and penetrations or approved equal.

2.6 LIQUID APPLIED FLASHING (LAF) ASSEMBLY:  
A. Liquid-Applied Flashing (LAF): Prosoco R-Guard Fast Flash, a liquid-applied vapor permeable air barrier flashing material with vapor permeance and resistance to air leakage properties compatible with the primary air barrier membrane.
B. Liquid-Applied Flashing (LAF): VaproLiqui-Flash, a liquid-applied vapor permeable air barrier flashing material with vapor permeance and resistance to air leakage properties compatible with the primary air barrier membrane. Compatible with all VaproShield products.

2.7 FLASHING TAPE, SELF-ADHERED MEMBRANE (SAM, BUTYL BASED):  
A. Basis-of-Design: Four (4”) inch wide, DuPont™ Flashing Tape, as distributed by DuPont: flexible membrane flashing materials for adhering metal head flashing or approved equal.
B. Basis-of-Design: DuPont™ StraightFlash™, as distributed by DuPont: straight flashing membrane materials for flashing windows and doors and sealing penetrations or approved equal.

2.8 WINDOWSILL PANS (Aluminum angle installed inboard of window at sill, coated with liquid flashing):  
A. Back Angle: 1.5”x1.5”x0.050 Aluminum. Cut to fit full width of opening and installed behind window frame at sill. Set in sealant and make watertight with VaproLiqui-Flash.

2.9 RAINSCREEN DRAIN MAT  
A. Manufacturer: Benjamin Obdyke Incorporated.  
   1. Contact: 400 Babylon Road, Suite A, Horsham, PA 19044; Telephone: (800) 523-5261; Fax: (215) 672-3731; E-mail: info@benjaminobdyke.com; website: www.benjaminobdyke.com.)
B. Proprietary Products/Systems: Rainscreen, including the following:  
   1. Slicker® HP  
      a. Description: Vertically-channeled three-dimensional matrix bonded to a detachable water-resistive barrier in roll form.  
      b. Material: Polypropylene (up to 40% post-industrial recycled content)  
      c. Width: 39.37 inches (1 m)  
      d. Length: 61 1/2 feet  
      e. Thickness: 0.25 inches (6.4 mm)  
      f. Weight: 15 lbs/roll; 10 oz/yd².  
      g. Matrix Design: 8 channels per 4 inches (102 mm); 2 channels per inch (25.4 mm).

2.10 FLASHING PANELS, SELF-ADHERED MEMBRANE (SAM):  
A. Basis-of-Design: Manufactured by QuickFlash, Inc. Size and type to suit application and conditions in field or approved equal.
B. Mechanical/Plumbing Flashing Panels  
   1. Materials:  
      a) Panel: Combination of high-density polyethylene (HDPE) and low-density polyethylene
2. Weatherproof Seal: Thermoplastic elastomer.
   a) Hardness, ASTM D 2240, Shore A, 10 Seconds: 46.
   b) Specific Gravity, ASTM D 792: 1.05 g/cm$^3$.
   c) Tensile Strength, ASTM D 412: 490 psi.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Verify conditions ready to receive work of this Section before beginning.
   B. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION OF WEATHER RESISTANT BARRIER
   A. Conform to manufacturer's instructions and provisions of Contract Documents.
   B. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
   C. Install weather barrier prior to installation of windows and doors.
   D. Start weather barrier installation at a building corner, leaving six to twelve (6”-12”) inches of weather barrier extended beyond corner to overlap.
   E. Window and Door Openings: Extend weather barrier completely over openings.
   F. Overlap weather barrier:
      1. Exterior corners: minimum twelve (12”) inches.
      2. Seams: minimum six (6”) inches.
   G. Weather Barrier Attachment:
      1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, space twelve to eighteen (12” -18”) inches vertically on center along stud line, and twenty-four (24”) inches on center, maximum horizontally.

3.3 SEAMING
   A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.
   B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 OPENING PREPARATION
   A. Cut weather barrier in an “I-cut” pattern. A modified “I-cut” is also acceptable.
      1. Cut weather barrier horizontally along the bottom and top of the window opening.
      2. From the top center of the window opening, cut weather barrier vertically down to the sill.
      3. Fold side and bottom weather barrier flaps into window opening and fasten.
   B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose eight (8”) inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.
3.5 EXTERIOR OPENING / WINDOW FLASHING INSTALLATION – See sequencing details
   A. See steps as described as “window sequencing detail” per detail drawings
   B. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer’s instructions and ASTM C 1193.

3.6 FIELD QUALITY CONTROL
   A. Notify manufacturer’s designated representative to periodically observe weather barrier assembly installation as required to obtain manufacturer’s ten (10) Year Limited Product and Labor Warranty.

3.7 PROTECTION
   A. Protect installed weather barrier from damage.

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.

1.2 SUMMARY

A. Section Includes:
   1. Asphalt shingles.
   2. Underlayment.
   3. Ridge vents.
   4. Metal flashing and trim.
   5. Air & Vapor Barrier (Temporary Roof)

B. Related Requirements:
   1. Section 07 62 00 "Sheet Metal Flashings and Trim."

1.3 DEFINITION

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.
   1. Asphalt Shingles: Full size.
   2. Ridge and Hip Cap Shingles: Full size.
   3. Ridge Vent: 12-inch-long Sample.
   4. Exposed Valley Lining: 12 inches square.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For asphalt shingles to include in maintenance manuals.
1.7 MAINTENANCE MATERIAL SUBMITTALS
   
   A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Asphalt Shingles: 100 sq. ft. of each type, in unbroken bundles.

1.8 QUALITY ASSURANCE
   
   A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING
   
   A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture according to manufacturer's written instructions.

   B. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.

   C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

   D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.10 FIELD CONDITIONS
   
   A. Environmental Limitations: Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.11 WARRANTY
   
   A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.

   1. Failures include, but are not limited to, the following:

      a. Manufacturing defects.

   2. Material Warranty Period: 40 years from date of Substantial Completion, prorated, with first 10 years non-prorated.

   3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 80 mph for five years from date of Substantial Completion.

   4. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for 20 years from date of Substantial Completion.

   5. Workmanship Warranty Period: Two years from date of Substantial Completion.

   B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of asphalt-shingle roofing that fail in materials or workmanship within specified warranty period.

   1. Warranty Period: Two years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Manufacturer: GAF, 1 Campus Drive, Parsippany, NJ 07054 Tel: 1-973-628-3000. Requests for substitutions will be considered in accordance with provisions of specifications.

B. Owens Corning, Tru-Definition Duration

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. UL 2218, Class 4, granule surfaced, self-sealing asphalt shingle with a strong fiberglass reinforced Micro Weave core and mineral granule surfacing. Special cut tabs and bold profile provide a rugged hand-split shake appearance with an 8 in. exposure. UL 790 Class A rated with UL 997 Wind Resistance Label; ASTM D 7158, Class H; ASTM D 3161, Type 1; ASTM D 3018, Type 1; ASTM D 3462; Passes UL 2218, Class 4 Impact Test; AC438 compliant; CSA 123.5-98; Dade County Approved, Florida Building Code Approved, Texas Dept of Insurance Approved, ICC Report Approval. Grand Sequoia® ArmorShield™ II Lifetime Designer Shingles, by GAF®.

B. 1. Color: As selected from manufacturers’ full range.

2.3 HIP AND RIDGE SHINGLES

A. High profile self sealing hip and ridge cap shingle matching the color of selected roof shingle. Each bundle covers approx. 20 lineal feet (6.10m). Timbertex® Premium Ridge Cap Shingles, by GAF®.

2.4 STARTER STRIP

A. Self sealing starter shingle designed for premium roof shingles. Each bundle covers approx. 100 lineal feet (30.48m) for English and metric shingles or 50 lineal feet (15.24m) for oversized shingles. WeatherBlocker™ Eave/Rake Starter Strip by GAF®.

2.5 LEAK (ICE MEMBRANE) BARRIER

A. Self-adhering, self-sealing, bituminous leak barrier surfaced with fine, skid-resistant granules. Approved by UL, Dade County, ICC, State of Florida and Texas Department of Insurance. Each roll contains approx. 150 sq ft (13.9 sq. m), 36” X 50’ (0.9m x 20.3m) or 200 sq ft (18.6 sq. m), 36” X 66.7’ (0.9m x 20.3m). WeatherWatch® Leak Barrier, by GAF®.

2.6 UNDERLAYMENT MATERIALS

A. Synthetic, non-asphaltic, non-woven, anti-skid back coated, polypropylene constructed non breathable underlayment. Meets or exceeds ASTM D226 and D4869 approved by UL, Florida Building Code, ICC and CSA A220.1. Each roll contains approximately 10 squares (1000 gross sq. ft.) of material and is 48 in. x 250 ft. (14.6 m x 76.2 m), Tiger-Paw™ Roof Deck Protection by GAF®.

B. Number of layers: (1) layer (PLUS temporary roofing membrane) See below for “low slope” conditions.
2.7 RIDGE VENTS

A. Flexible rigid plastic ridge ventilator designed to allow the passage of hot air from attics, while resisting snow infiltration. For use in conjunction with eave/soffit ventilation products. Provides 12.5 sq inches Net Free Ventilation Area per lineal foot (26460 sq.mm/m). Each package contains 20 lineal feet (6.10m) of vent. Cobra® Ridge Runner™ Ridge Vent by GAF®.

2.8 FASCIA AND SOFFIT/UNDER EAVE VENTS

A. Flexible rigid plastic ridge ventilator designed to allow the passage of hot air out of attics at the roof top along the eaves. For use in conjunction with ridge ventilation products. Provides 9.0 sq inches (11613 sq.mm/m) in NFVA per lineal foot. Each package contains 40 lineal feet (12.19m) of vent, Cobra® IntakePro™ Rooftop Intake Vent (includes 1-3/4” (44.5 mm) coil nails), by GAF®

2.9 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- diameter, sharp-pointed, with a minimum 3/8-inch- diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.

1. Shank: Barbed or Smooth.
2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

2.11 AIR & VAPOR BARRIER (TEMPORARY ROOF)

a. Basis-of-Design Manufacturer and Product: Versico 725TR Air & Vapor Barrier / Temporary Roof: 725TR is a 40-mil composite consisting of 35-mils of self-adhering rubberized asphalt factory laminated to a 5-mil polyethylene film with an adhesion textured surface. 725TR roll dimensions are 39” x 75’ and the product is applied after priming an acceptable substrate with substrate primer.

b. Temporary Roof Substrate Primer: CCW 702, 702-LV or Cav-Grip primer.

2.12 METAL FLASHING AND TRIM

C. General: Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim."

D. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA’s "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

1. Apron Flashings: Fabricate with lower flange a minimum of 4 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
2. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 4 inches over the underlying asphalt shingle and up the vertical surface.
3. Cricket or Backer Flashings: Fabricate with concealed flange extending a minimum of 18 inches beneath upslope asphalt shingles.
4. Open-Valley Flashings: Fabricate in lengths not exceeding 10 feet with 1-inch high, inverted-V profile at center of valley and equal flange widths of 10 inches.
5. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.

E. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches from pipe onto roof.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provisions have been made for flashings and penetrations through asphalt shingles.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Synthetic Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides and ends and treat laps as recommended in writing by manufacturer. Stagger end laps between succeeding courses at interval recommended in writing by manufacturer. Fasten according to manufacturer's written instructions. Cover underlayment within period recommended in writing by manufacturer.

1. Install in single layer on roofs sloped at 4:12 and greater.
2. Install in double layer on roofs sloped at less than 4:12.

C. Metal-Flashed, Open-Valley Underlayment: Install two layers of minimum 36-inch wide underlayment centered in valley. Stagger end laps between layers at least 72 inches. Lap ends of each layer at least 12 inches in direction to shed water, and seal with asphalt roofing cement. Fasten each layer to roof deck.

1. Lap roof-deck underlayment over first layer of valley underlayment at least 6 inches.

3.3 TEMPORARY ROOF (AIR AND VAPOR BARRIERS)

A. Air and Vapor Barriers noted in this section, and related roofing sections are to be installed per manufacturer’s requirements to act as a temporary, weatherproof roof immediately after the barrier substrate (sheathing) is disturbed or newly installed to avoid potential water damage during installation of
roofing components or any interior components of conditioned or non-conditioned spaces. Living units are occupied at time of renovation. **Water intrusion is completely unacceptable.**

### 3.4 METAL FLASHING INSTALLATION

**A. General:** Install metal flashings and other sheet metal to comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim."

1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

**B. Apron Flashings:** Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.

**C. Step Flashings:** Install with a headlap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

**D. Cricket or Backer Flashings:** Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.

**E. Open-Valley Flashings:** Install centered in valleys, lapping ends at least 8 inches in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.

1. Secure hemmed flange edges into metal cleats spaced 12 inches apart and fastened to roof deck.

**F. Rake Drip Edges:** Install rake drip-edge flashings over underlayment and fasten to roof deck.

**G. Eave Drip Edges:** Install eave drip-edge flashings below underlayment and fasten to roof sheathing.

**H. Pipe Flashings:** Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

### 3.5 ASPHALT-SHINGLE INSTALLATION

**A. General:** Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

**B. Install starter strip along lowest roof edge,** consisting of an asphalt-shingle strip with tabs removed with self-sealing strip face up at roof edge.

1. Extend asphalt shingles 1/2 inch over fasciae at eaves and rakes.
2. Install starter strip along rake edge.

**C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.**

**D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.**
E. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.

F. Fasten asphalt-shingle strips with a minimum of four roofing nails located according to manufacturer's written instructions.
   1. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
   2. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.

G. Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips. Maintain uniform width of exposed open valley from highest to lowest point.
   1. Set valley edge of asphalt shingles in a 3-inch- wide bed of asphalt roofing cement.
   2. Do not nail asphalt shingles to metal open-valley flashings.

H. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

I. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
   1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 07 31 13
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.

1.2 SUMMARY
   A. Section Includes:
      1. Fiber-cement panel and lap siding.
      2. Fiber-cement soffit.
      3. Fiber-cement trim boards
      4. Metal Flashings and Trims for Fiber-Cement Siding
      5. Mounting Blocks for Fiber-Cement Siding
      6. Metal Soffit Vents for Fiber-Cement Soffits
      7. Metal Corners for Fiber-Cement Lap Siding
      8. Accessories
   B. Related Sections:
      1. Section 061000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
      2. Section 061600 "Sheathing" for wall sheathing.
      3. Section 072500 “Weather Barriers” for rainscreen drainage mat, weather resistant barrier, flashing
         panel and and related products.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated. Include material descriptions, dimensions of
      individual components and profiles, and finishes.

1.4 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For each type of siding, soffit and related accessories to include in maintenance
      manuals.

1.5 QUALITY ASSURANCE
   A. Source Limitations: Obtain each type, color, texture, and pattern of siding and soffit from single source
      from single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Store materials in a dry, well-ventilated, weathertight place.

1.7 COORDINATION
   A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.
PART 2 - PRODUCTS

2.1 FIBER-CEMENT PANEL SIDING
   A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product, as determined by Architect, by one of the following:
      1. James Hardie.
   B. Product: HardiePanel® vertical siding
   C. Texture: smooth.
   D. Widths: 4’x8’
   E. Factory Priming: Manufacturer's standard acrylic primer.

2.2 FIBER-CEMENT LAP SIDING
   A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product, as determined by Architect, by one of the following:
      1. James Hardie.
   B. Product: HardiePlank® lap siding
   C. Lengths: 12’ planks
   D. Widths: 7.25”
   E. Exposure: 6”
   F. Factory Priming: Manufacturer's standard acrylic primer.

2.3 FIBER-CEMENT SOFFIT
   A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product, as determined by Architect, by one of the following:
      1. James Hardie.
   B. Product: HardieSoffit® Panels, non-vented smooth
   C. Size: varies
   D. Factory Priming: Manufacturer's standard acrylic primer.

2.4 FIBER-CEMENT TRIM BOARDS
   A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product, as determined by Architect, by one of the following:
      1. James Hardie.
   B. Product: 5/4 HardieTrim® NT3™ Boards Smooth
   C. Size: varies, see drawings
   D. Factory Priming: Manufacturer's standard acrylic primer.
2.5 METAL FLASHING AND TRIM FOR FIBER-CEMENT SIDING

A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product, as determined by Architect, by one of the following:

1. Tamlyn

B. Product: XtremeTrim®
C. Profiles: numerous, see drawings
D. Factory Priming: Manufacturer's standard acrylic primer.

2.6 MOUNTING BLOCKS FOR FIBER-CEMENT SIDING

A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product, as determined by Architect, by one of the following:

1. SturdiMount by Mid-America

B. Product: SturdiMount
C. Profiles: Split Mount, Universal Mount, Receptacle Mount, Oversized Mount. See drawings.
D. Factory Priming: Manufacturer's standard paintable finish

2.7 METAL SOFFIT VENTS FOR FIBER-CEMENT SOFFITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product, as determined by Architect, by one of the following:

1. Decomesh

B. Product: 4-1/2” Continuous Soffit Vent
C. Size: 5-1/2” x 96”
D. Color: White, to be painted.

2.8 METAL CORNERS FOR FIBER-CEMENT LAP SIDING

A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product, as determined by Architect, by one of the following:

1. Simplicity Tool Corporation

B. Product: 199 Series corners
C. Length: 12”
D. Texture: Smooth
E. Return Lip: As required to fit selected fiber-cement lap siding
F. Color: Manufacturer's standard paintable finish

2.10 ACCESSORIES

A. Fasteners:

1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
2. For fastening fiber cement, use hot-dip galvanized fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding and soffit and related accessories.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. All surfaces to be primed, including field cuts, prior to installation.

3.3 INSTALLATION

A. General: Comply with siding, soffit and related product manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Do not install damaged components.

B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074600
PART 1 GENERAL

1.1 SUMMARY
A. Section includes:
   1. Flashings, counter-flashings, drip edges and the like as required for a weather-tight installation.

1.2 RELATED SECTIONS:
A. Section 072500 – Weather Resistant Barrier
B. Section 074646 - Fiber Cement Siding and Trim
C. Section 079200 - Joint Sealants
D. Section 081613 - Fiberglass Entry Doors
E. Section 085313 - Vinyl Windows
F. Section 099100 - Painting

1.3 REFERENCES
A. Applicable provisions of the following standards shall apply to the work of this Section, except as modified herein, and are hereby made a part of these Contract Specifications to the extent required:
   1. ASTM A240-05 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
   2. ASTM B32-04 - Standard Specification for Solder Metal
   3. ASTM B370-03 - Standard Specification for Copper Sheet and Strip for Building Construction
   4. FS SS-C-153C - Cement, Bituminous, Plastic

1.4 SUBMITTALS
A. Submit the following:
   1. Product Data: Manufacturers’ product data for each product supplied.
   2. Shop Drawings: Describe general construction, configurations, material profile, jointing pattern, jointing details, fastening methods and installation details.
   3. Samples: Submit samples of materials for gutters, downspouts and gutter debris protection.

1.5 QUALITY ASSURANCE
A. Able to document minimum ten (10) years continuous experience in commercial quality projects of similar type and scope.
B. Employ qualified journeymen painters with apprentices under direction of qualified journeymen, conforming to trade regulations.
C. Testing:
   1. Demonstrate for the Owner, by hose or standing water, that the gutters are completely watertight.
   2. Prove flow in conductors.

1.6 DELIVERY, STORAGE AND HANDLING
A. Comply with the following:
   1. Acceptance at site:
      a. Verify undamaged condition.
b. Protect from damage at all times.
c. Stack preformed material to prevent twisting, bending or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

1.7 WARRANTY
A. Comply with the following:
   1. Contractor Warranty: Warranty work of this Section to be waterproof and weather-tight against ordinary wear and usage for two (2) years from date of Substantial Completion, including material and labor. This is an extension of the standard one (1)-year warranty.

PART 2 PRODUCTS

2.1 GENERAL
A. Sheet metal not otherwise called for to be minimum gauges per SMACNA for comparable construction. Use heavier gauges where required by conditions of installation.

B. Materials shall be best quality, thickness not less than that noted below.

2.2 MATERIALS
A. Flashing Material: Fabricate from prefinished G90 galvanized sheet steel, 24 gauge, Kynar 500 (PVDF) finish. Color as selected by Owner from standard color chart.
   1. Perimeter edge flashings: Fabricate to detail. Provide minimum six (6”) inch end-laps set in two (2) continuous beads of sealant.
   2. Roof-to-Wall Flashing: 8”x 7-5/8” step flashing. Field form to detail.
   3. Clips and cleats: 20 gauge minimum.
   4. Miscellaneous flashings and counter-flashings not noted above.

B. Fastenings:
   1. Fasteners: Nails shall be hot-dip galvanized or stainless steel. Bolts, and nuts, power driven fasteners, screws, washers, etc., shall be hot-dip galvanized or stainless steel. Screws shall be a high-dome, neoprene gasketed, hex head type, or incorporate a washer with a laminated neoprene gasket. Masonry anchors shall be ¼” shank and long enough to penetrate 1” into concrete or masonry (install neoprene gaskets where exposed to weather).
   2. Silicone rubber washers.

C. Plastic Cement (as applicable): In accordance with referenced FS SS-C-153, Type I-asphaltic.

D. Miscellaneous Materials: Provide other incidental and accessory materials, methods, tools and equipment. Include materials of sheet metal, flashing and trim required.
   1. Uncured Butyl Tape. ¼”x1” Minimum.
   2. Flexible Flashing: Specified 072500

E. Electrolytic Protection to separate dissimilar materials: Cold-applied asphalt-mastic complying with SSPC-Paint 12 requirements, containing no asbestos, formulated for 30-mil thickness per coat.

F. Solder (as applicable): Conform to ASTM B32, commercial quality, type suited to material to be soldered.

G. Sealant: Specified 079200.

2.3 FABRICATION
A. Conform to SMACNA and as detailed. Conform to following general requirements:
   1. Form sections true to shape, accurate in size, square and free from distortion or defects.
2. Fabricate cleats and starter strips same material as sheet, in widths required by SMACNA, interlockable with sheet.
3. Form pieces in longest practical lengths.
4. Provide expansion joints at minimum forty (40') foot intervals or as required by SMACNA or as indicated.
5. Hem exposed edges on underside one-half (1/2") inch; fabricate separate corner pieces.
6. Form material with cover plate type seam; butt adjacent sections to within one-eighth (1/8") inch, set cover plate under seam, minimum length of plate twelve (12") inches unless noted otherwise.
7. Fabricate vertical faces with bottom edge formed outward one-quarter (1/4") inch and hemmed to form drip.
8. Cap neat ends as required or indicated.

B. Flashing:
   1. As detailed and in accordance with SMACNA. Self-supporting flashing 24 gage minimum.
   2. Provide folded end dams at ends of horizontal flashing.
   3. Seal laps. Provide a minimum six (6") inch end lap and seal with two (2) continuous beads of approved sealant.

C. Accessories: Furnish and install as indicated required by conditions of installation. Items of same materials as items to which applied.

PART 3 EXECUTION

3.1 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.
   B. Verify base flashings are in place, sealed and secure.

3.2 INSTALLATION
   A. Follow manufacturer’s directions and SMACNA.
   B. Execute by skilled mechanics according to best methods known to trade.
   C. Line, moldings and edges to be sharp and true. Reinforce as required for stiffness.
   D. Allow for expansion and contraction.
   E. Neatly form and finish joints and seams:
      1. Surfaces to be free from waves and buckles.
      2. Laps, where allowed, six (6") inches weather-wise or flow-wise minimum.
   F. Corners shop formed and soldered, extending at least one (1') foot each side of corner.
   G. Use concealed fastenings wherever possible.
   H. Make Exterior Work Weather-tight: Follow standard SMACNA construction manual, whether item indicated or not. Block ends of flashings at openings to prevent water migration.
   I. Sealant: Install where indicated and where required to make weather-tight.
   J. Electrolytic Protection: Where materials dissimilar in galvanic range contact, paint contacting surfaces two coats specified bituminous paint.
   K. General flashings, counter-flashings and the like: Install to detail in accordance with SMACNA, and as required for watertight installations.
   L. Flexible Flashing: Specified 072500
1. General:
   a. Use flexible flashing and accessory materials in coordinated fashion with metal flashings and other waterproofing materials so as to achieve absolutely watertight, sealed, properly shingled and drainable assemblies.
   b. Install per manufacturer recommendations.
   c. Pre-treat substrates to be flashed where required for adequate adhesion.
   d. Overlap adjacent pieces three to four (3-4") inches with sealant, and roll overlaps with a steel hand roller or blunt object. Shingle laps for proper drainage.
   e. Seal metal flashing at tops, laps, terminations, and end dams with flexible flashing and mastic.
   f. At horizontal terminations for flashing, turn up ends a minimum of two (2") inches, cut and make careful folds to form a pan and seal with mastic.
   g. Apply a bead or trowel coat of mastic along top edges, seams, cuts, and penetrations.
   h. Shingle end dams.
   i. Seal penetrations through flashing with mastic.

M. Sweat Soldering:
   1. Pre-tin edges of sheet metal to a width of 1-1/2” inches before beginning soldering.
SECTION 077200 - ROOF ACCESSORIES

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.

1.2 SUMMARY

A. Section Includes:
   A. Pre-finished metal gutters, downspouts and accessories
   B. Related Sections:
      A. Section 055000 “Metal Fabrications.”
      B. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 COORDINATION

A. Coordinate layout and installation of roof accessories with interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.
   A. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.
   A. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions.

C. Samples: Submit manufacturer’s color samples of materials, consisting of complete color chart representing manufacturer’s full range of available colors.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 GUTTERS & DOWNSPOUTS

A. Basis-of-Design Manufacturer: CertainTeed Roofing, 750 E Swedesford Rd, Valley Forge, PA 19482, or approved alternate by Architect.

B. Basis-of-Design Product: FlintEdge Edge Metal Systems

C. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, hidden gutter hangers, downspout hangers and other accessories as required. Fabricate in minimum 96-inch-2400-mm-long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers and gutter accessories from same metal as gutters.

   A. Gutter Style: A Style
   C. Fabricate from the following materials:
      a. Aluminum-Zinc Coil-Coated Steel: 24 gauge
      b. Color: Kynar 500 coating, color as selected from Manufacturer’s standards
      c. Size: per drawings

D. Downspouts: Fabricate downspouts complete with mitered elbows. Furnish with metal hangers and straps from same material as downspouts, and anchors.

   a. Aluminum-Zinc Coil-Coated - Steel:24 GA
   b. Color: To match gutters
   c. Size: 4”x4”

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.
   A. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
   B. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
   C. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
   D. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   A. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   B. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
   C. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Firestop systems for penetrations, joints, and perimeter fire containment, designed and tested to maintain fire-resistance rated assemblies, conforming to provisions of 2012 International Building Code (IBC).

B. Related Requirements:
   1. Section 092900 - Gypsum Board
   2. Division 22 - Plumbing

1.2 REFERENCES

A. Applicable provisions of the following standards shall apply to the work of this Section.

   B. ASTM International (ASTM):
      4. ASTM E136 - Test Method for Behavior of Materials in a Vertical Tube Furnace at 750F.
      7. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Fire Stops

C. FM Global (FM) Research: FM Approval Standard of Firestop Contractors – Class 4991 - UL Qualified Firestop Contractor Program.

D. Firestop Contractors International Association (FCIA): FCIA Manual of Practice (MOP)

   E. International Firestop Council (IFC):
      1. Recommended IFC Guidelines for Evaluating Firestop Engineering Judgments.
      2. Inspectors Field Pocket Guide.


      1. UL 263 - Standard for Fire Test of Building Construction and Materials
      2. UL 1479 - Fire Tests of Through-Penetration Firestops.
      4. UL ISMA - Intermediate Scale Multi-Story Apparatus-Slab Edge/Curtain Wall Joints.

1.3 DEFINITIONS

A. Refer to Chapter 7 of IBC-2012 for additional definitions and terms applicable to this Section.

B. F Rating (Flame Rating): Time period that a penetration firestop system limits passage of fire through a penetration, as tested to ASTM E814 or UL 1479.

C. T Rating (Temperature Rating): Time period that a through-penetration firestop system, including penetrating item, limits maximum temperature rise on non-fire side to 325 degrees F (163 degrees
C) above initial temperature, as tested to ASTM E814 or UL 1479. Applies to penetrants traveling through floors which are not encased within a wall cavity or shaft enclosure.

D. Air Leakage (L Rating):
   1. Fire-Resistive Penetrations in Smoke Barriers: Air leakage at 5 cfm per square foot of penetration opening or total cumulative leakage of 50 cfm for 100 sf of wall or floor area at air pressure differential of 0.30 inch of water, as tested at both ambient and elevated air temperature [of 400 degree F] to UL 1479.
   2. Fire-Resistive Joints in Smoke Barriers: Air leakage at 5 cfm per lineal foot through fire-resistant joint systems in smoke barriers, and at joints at intersections of a horizontal smoke barrier and an exterior curtain wall, as tested at both ambient and elevated air temperature [of 400 degree F] to UL 2079.

E. Intumescent Firestop Systems: Designed to expand, fill, and close off openings to maintain fire-resistance construction where penetrating materials are subject to combustion, melting, or deformation, including materials such as plastic pipe, cable, jacketing, pipe insulation, and sheet metal ductwork.

F. Through-Penetration: Penetration that passes through both sides of an assembly.

G. Membrane Penetration: Penetration that penetrates only one side (or membrane) of an assembly. H. Joint: A linear opening in or between adjacent fire-resistance rated assemblies allowing independent differential movement caused by thermal, seismic, wind, or other loading.

I. Fire Barrier: A fire-resistance rated vertical or horizontal assembly designed to restrict spread of fire, as tested to ASTM E119.

J. Smoke Barrier: Continuous vertical or horizontal membrane designed and constructed to restrict movement of smoke through an assembly, such as a wall, floor, or ceiling assembly with minimum 1-hour fire-resistance rating as defined by IBC.

K. Fire-Resistance Rated Assemblies: Wall, floor, and ceiling assemblies constructed to confine fire, structural function, or both for time period as tested to ASTM E119 for a fire-resistance rating as prescribed by IBC.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination, Scheduling, and Sequencing: Conform to Division 1 – General Requirements for coordination with work of related Sections.
   1. Section 092900 for gypsum board. Sequence firestop system to precede gypsum board taping and finish systems such as painting.
   2. Plumbing and other Divisions for firestop system requirements for penetrations through construction.

B. Pre-installation Conference: Arrange, in conformance to Division 1 – General Requirements.
   1. Attendance: Contractor, installer, Owner, manufacturer’s authorized representative, firestop system installer, and those requested to attend.
   2. Meeting Time: Minimum 2 weeks prior to beginning work of this Section and work of related Sections affecting work of this Section.
   3. Location: Project Site.
   4. Agenda: Verify and adjust firestop systems and construction of penetrations, construction joints, and perimeter fire containment systems of fire-resistive rated construction to meet and verify provisions of this Section.

1.5 SUBMITTALS

1. Submit in accordance with Division 1 – General Requirements

B. Manufacturer's Certification:
1. Installer: Trained by manufacturer to perform work of this Section.
2. Firestop System at Exposed Surfaces: Paintable.
3. VOC and Hazardous Materials: Non-toxic and free of asbestos and other hazardous materials
4. Field Quality Control: Certify firestop system installation complete and conforming to manufacturer's instructions and provisions of IBC and rules and regulations of authority having jurisdiction (AHJ).

C. Samples: Firestop system Warning Labels conforming to specified requirements.

D. Manufacturer's Installation Instructions: Include procedures for each condition anticipated complete with drawings and tested assemblies.

E. Engineering judgments: Where UL tested/classified system is not available:
   1. Submit manufacturer’s engineering judgment derived from similar UL system designs or other tests acceptable to local authorities having jurisdiction for their review and approval prior to installation.
   2. Engineer judgment drawings are required to follow criteria set forth by the International Firestop Council.

1.6 CLOSEOUT SUBMITTALS
A. Conform to provisions of Division 1– General Requirements.

1.7 QUALITY ASSURANCE
A. Manufacturer Qualifications:
   1. Company specializing in manufacturing and supplying work of this Section.
   2. Able to document minimum 5 year continuous experience.
   3. Supplying tested firestop systems conforming to provisions of this Section, and able to supply signed and sealed engineering judgments by accredited firestop engineers in case where tested systems do not exist.
   4. Maintain technical representatives and technical services locally available for identifying and verifying firestop systems conforming to provisions of this Section.
   5. Firestop Systems: Products by more than one manufacturer, are accepted under condition that:
      a. Only one manufacturer’s product is installed consistently for each type of firestop system or condition of use.
      b. Firestop system products from different manufacturers are not permitted to be in contact with one another.

B. Installer Experience:
   1. 5 years of continuous work in the field.
   2. Specialty Firestop Contractor (SFC), Member of Firestop Contractors International Association (FCIA).
   3. FM 4991 Approved Contractor or qualified under UL Qualified Contractor Program.
   4. Trained and authorized by manufacturer to install manufacturer’s firestop systems with certified documentation by manufacturer showing date and location of training.
   5. Able to provide firestop systems conforming to IBC and requirements of Authorities Having Jurisdiction (AHJ), signed and sealed by licensed firestop engineers.
   6. Installer Single Source Responsibility:
      a. Penetration Firestop System: Provide by or under direct responsibility of single installer for mechanical, electrical, fire protection, telecommunication, and other membrane penetration and through-penetration firestop system at fire-resistance rated assemblies.
      b. Construction Joint and Perimeter Fire Containment firestop system: Provide by or under direct responsibility of single installer for joints, openings, and voids at fire-resistance rated assemblies.
1.8 DELIVERY, STORAGE, AND HANDLING

A. Conform to provisions of Division 1 – General Requirements and manufacturer’s instructions for delivery, storage, and handling.

B. Deliver products in manufacturer’s unopened, labeled containers or packaging. Schedule delivery to reduce storage time at Project site.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Firestop Systems from following manufacturers conforming to specified requirements, are accepted for work of this Section.

B. Hilti, Inc:
   1. Web Site http://www.us.hilti.com

C. Specified Technologies, Inc. (STI):
   1. Web Site http://www.stifirestop.com

D. 3M Fire Protection Products.
   1. Web Site http://www.3m.com/firestop

E. Substitution Requests: Conform to provisions of Division 1 – General Requirements.

2.2 REGULATORY REQUIREMENTS

A. Conform to regulatory requirements specified by Division 1 – General Requirements.

B. IBC Chapter 7 for through-penetration systems, construction joint systems, and perimeter fire containment systems as required for maintaining fire-resistance rated construction.

2.3 DESIGN CRITERIA

A. Firestop Systems: Provide fire barrier and smoke barrier firestop systems designed to resist flame, hot gases, and smoke as required to maintain fire-resistance rated assemblies at through-penetrations, membrane penetrations, construction joints, openings, and voids, conforming to IBC Chapter 7.

B. Fire-Resistive-Rated Walls -Through Penetrations and Membrane Penetrations: Conform to IBC Section 713.3.1 and 713.3.2, as tested to ASTM E814 or UL 1479.
   1. Steel, Ferrous, or Copper Pipes, Tubes, or Conduits at Fire-Resistance-Rated Walls and Partitions:
      a. Provide firestop systems to maintain fire-resistance rated assemblies to fill annular spaces to prevent passage of flame and hot gases sufficient to ignite cotton waste, as tested to ASTM E119 or UL 263 time-temperature fire conditions with a minimum positive pressure differential of 0.01 inch of water for time period equivalent to fire-resistive rating of construction penetrated.
      b. Refer to IBC exceptions at membrane penetrations, including for electrical boxes of less than 16 square inch and 100 square inch area, pipes and tubes of maximum 6 inch diameter, and fire-sprinklers with escutcheon plates.
   2. Through-Penetration Firestop System - F Rating: Not less than time period for fire-resistance rating of wall penetrated.
   3. Membrane Penetration by Boxes Other than Electrical Boxes - F and T Rating: Not less than time period for fire-resistance rating of wall penetrated and installed according to their listing.
C. Fire-Resistive-Rated Horizontal Assemblies -Through-Penetration and Membrane Penetrations: Conform to IBC Section 713.4, as tested to ASTM E814 or UL 1479.
   1. Steel, Ferrous, or Copper Pipes, Tubes and Vents, and Concrete and Masonry Items at Fire-Resistance-Rated Horizontal Assemblies:
      a. Provide firestop systems to maintain fire-resistance rated assemblies, to fill annular spaces to prevent passage of flame and hot gases sufficient to ignite cotton waste, as tested to ASTM E119 or UL 263 time-temperature fire conditions with a minimum positive pressure differential of 0.01 inch of water for time period equivalent to fire-resistive rating of construction penetrated.
      b. F and T Ratings: Not less than time period for fire-resistance rated assembly.
         1) Exception: Floor penetrations located within a wall cavity or enclosures do not require a T Rating.
   2. Refer to IBC exceptions for through-penetrations and membrane penetrations for electrical boxes, pipes, and conduits of less than 100 square inch aggregate area within each 100 square foot ceiling area, and fire-sprinklers with escutcheon plates.
   3. Provide firestop systems at non-fire-resistance rated horizontal assemblies for firestop systems where penetrating items connect more than one horizontal assembly or non-combustible penetrating items connect than three horizontal assemblies, conforming to IBC requirements.

D. Air Leakage Rate (L Rating) at Penetrations in Smoke Barriers: Conform to IBC Section 713.5, as tested to UL 1479 for air leakage at 0.30 inch of water for both ambient temperature and elevated temperature tests. Do not exceed:
   1. Through-Penetration and Joint Firestop Systems: 5.0 cfm per sf of penetration opening.
   2. Wall Areas and Floor Areas: Total cumulative leakage of 50 cfm per 100 sf.

E. Fire-Resistant Joint Systems: Conform to IBC Section 714, as tested to ASTM E1966 or UL 2079.
   1. Provide approved fire-resistant joint systems designed to maintain fire-resistance rated assemblies by resisting passage of flame and hot gas for time period of not less than time period for fire-resistance rated assembly
   2. Refer to exceptions for where fire-resistive joint systems are not required including control joints not exceeding a maximum width of 0.625 (5/8) inch and tested to ASTM E 119 or UL 263.
   3. Refer to testing provisions for fire-resistant non-symmetrical wall joint systems and exception for walls with horizontal fire-separation distance of greater than 5 foot.

F. Air Leakage Rate (L Rating) at Fire-Resistant Joint Systems in Smoke Barriers and Exterior Curtain Wall: Conform to IBC Section 714.6, as tested to UL 2079 for air leakage. Do not exceed 5 cfm per lineal foot of joint at 0.30 inch of water for both ambient and elevated temperature tests.

2.4 PERFORMANCE CRITERIA

A. Intumescent Firestop Systems: Provide systems to maintain F Ratings, including collars and putties, designed to expand, fill, and close off openings where penetrating materials are subject to combustion, melting, or deformation (such as plastic pipe, cable jacketing and pipe insulation).

B. Joints and Penetrations Subject to Movement or Vibration:
   1. Provide firestop systems incorporating flexible sealants or moldable putties tested to provisions of this Section for cyclic movement.
   2. Cement mortar firestop systems not accepted.

C. Firestop Mortars and Sealants: Suitable for firestopping horizontal or vertical applications, including large openings, with no shrinkage during curing process. Types that shrink, become brittle, crack, pull back from contact surfaces, or dissolve in water after curing are not accepted.
D. Cast-In-Firestop Systems Devices: Injection molded plastic insert with integral intumescent insert or collar designed for casting into concrete fire-resistance rated assemblies for through-penetration of pipes.
   1. Accepted for cast-in-place concrete installations.
   2. Include plastic top and bottom closure caps.

E. Pillow Firestop Systems: Intumescent firestop systems material designed to fill large openings and penetrations that are too large for other systems. Dust free, impervious to water, humidity, frost, and ultra violet (UV) degradation.
   1. Accepted for use at large fire-resistance rated wall opening where through-penetrations, such as telecommunications cables and pipes, are to be continuously removed and replaced over time and where opening is too large for a metal box device specified by this Section.
   2. Not accepted in finished room areas other than utility areas, except as accepted by Owner.

F. Paintability: Provide paintable firestop systems at exposed surfaces designated to receive paint, adhesive coatings, and other finish applications. Do not use silicone sealants.

G. Restoration Characteristics: Removable and repairable, allowing full restoration of fire-resistance rated assembly when membrane penetrations and through-penetrations are removed, added, or replaced.

H. Hazardous Material Content: Free of asbestos, solvents containing high volatile organic compound (VOC) content, and other hazardous substances, including pentabrominated diphenyl ether, octabrominated diphenyl ether, and decabrominated diphenyl ether.

I. Fire-Resistance Rating of Fire Stop Components: UL/IBC Class A, as tested to ASTM E84.
   1. Flame Spread: Less than 20, not contributing to combustion.
   2. Smoke Developed: Less than 450.

2.5 MATERIALS

A. Firestop System Materials: Conform to specified provisions of this Section including Design Criteria, Performance Criteria, IBC requirements, and other requirements by Authorities Having Jurisdiction.

B. Provide components including mortars, sealants, putties, collars, wrap strips, mineral wool fire safing, devices, and accessories as required to complete each Firestop system, conforming to manufacturer’s instructions and provision of Contract Documents.

2.6 ACCESSORIES

A. Firestop Plugs: Re-enterable, foam plug impregnated with intumescent material for use in blank openings and cable sleeves. Specified for type and quality:
   3. 3M Fire Barrier Pillows for use in sleeves or blank openings.

B. Fire-Rated T Rating Collar Device: Collar system with coolant wrap installed on metallic pipes where T Ratings are required by IBC. Specified for type and quality.
   2. 3M 615+ Blanket for UL Listed T Rating Applications.

C. Cast-In Floor Sleeves: Water, fire, and smoke tight, conforming to UL 1479 for L and W rating.

D. Firestop System Warning Label: Minimum 3 inch by 5 inch label. Red color or with red colored type. Adhesive backed or other means for permanent attachment. “WARNING” written in bold type. Identify or include spaces for following information:
   1. Name of manufacturer.
2. Name of installer.
3. Date firestop system was installed.
4. Firestop System Assembly Reference Number included in O&M Manual specified Section 017824
5. Firestop System UL number or manufacturer’s engineered design number.
6. F Rating and T Rating (as applicable).

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify conditions as satisfactory to receive work of this Section before beginning installation.

3.2 PREPARATION
A. Provide coverings, masking, and other means as necessary to limit contact of firestop system materials to those materials and penetrations designated or required by Code for firestop system.
B. Take measures to prevent firestop system material from contacting or adhering to finish materials and surfaces not receiving firestop system.
C. Remove dirt, loose materials, oil, grease, bond breakers, and other materials that may interfere with firestop system adhesion and performance.
D. Apply primers and other materials and methods as instructed by manufacturer to achieve bonding of firestop system materials and to hold securely and permanently in place.

3.3 INSTALLATION
A. Conform to manufacturer’s instructions and provisions of Contract Documents as required to maintain fire-resistance-rated assemblies.
B. Install approved designed and tested firestop systems as required to prevent passage of flames, hot gases, and excessive heat from passing through penetrations, joints, and perimeter conditions.
1. Penetration firestop systems at ducts, pipes, conduit, cable, and sleeves penetrating fire-resistance rated assemblies.
2. Construction joint firestop systems at head-of-wall and other joints, voids and other openings within at fire-resistance rated assemblies.
3. Exterior firestop systems as required to maintain fire-resistance rated assemblies at curtain wall and floor intersections.
C. Install firestop systems to restrict passage of smoke, flame, and hot gases at exterior building perimeter joints and curtain wall spandrels at intersections of exterior curtain walls with fire-resistance rated floor and ceiling assemblies.
D. Install mineral wool at joints and openings with layers or grain of mineral wool laid parallel, exerting positive pressure, against joint and opening.
E. Install firestop system sealants at joints and openings conforming to ASTM C1193.
F. Tool non-sag sealants in place to force sealant into joints to compress, shape, eliminate air pockets, and completely adhere to contacting materials.
G. Completely fill voids and cavities within openings and penetrations with Firestop system. H. Tool visually exposed fireproofing to make smooth, uniform, finished surfaces.

3.4 FIELD QUALITY CONTROL
A. Firestop System Warning Labels:
1. Install labels with information for identifying firestop system as specified this Section.
2. Locate at firestopped openings and penetrations, except at finished surfaces, exposed to view.

3.5 ADJUSTING
A. Repair or replace defective installations not conforming to specified requirements, manufacturer's instructions, and provisions of IBC provisions.
B. Remove firestop systems that sag, crack, do not adhere to substrate, do not accept paint at exposed finishes, and which do not conform to specified requirements. Replace with new firestop systems conforming to provisions of this Section.

3.6 CLEANING
A. Clean excess fill materials and sealants as work progresses.
B. Use cleaning methods and materials approved by manufacturers of firestop system products. C. Leave installations clean and premises free from residue and debris from work of this Section.

3.7 PROTECTION
A. Protect in-place firestop systems from contaminants, abrasives, removal, and other damage from construction activities.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
A. Work includes but is not limited to following:
   1. Interior joint sealants
   2. Exterior joint sealants

1.2 RELATED SECTIONS:
A. Division 1 Requirements apply.
B. Section 072500 - Weather Resistant Barrier
C. Section 074646 – Fiber Cement Siding and Trim
D. Section 076200 - Sheet Metal, Flashing and Trim
E. Section 099100 - Painting

1.3 REFERENCES
A. Applicable provisions of the following standards shall apply to the work of this Section, except as modified herein, and are hereby made a part of these Contract Specifications to the extent required:
   1. ASTM C661 - Test Method for Indentation hardness of Elastomeric –Type Sealants by Means of a Durometer
   3. ASTM C834 - Specification for Latex Sealing Compounds
   4. ASTM C920 - Specification for Elastomeric Joint Sealants
   5. ASTM C1193 - Standard Guide for Use of Joint Sealants
   7. ASTM D2240 - Standard Test Method for Rubber Property—Durometer Hardness
B. Sealant, Waterproofing & Restoration Institute (SWRI), Tel. (816) 472-7979. Fax: (816) 472-7765, Email info@swrionline.org / Web Site http://www.swrionline.org

1.4 SYSTEM DESCRIPTION
A. Definition:
   1. Sealant systems installed with pressure gun.
      a. Include sealing of vertical and horizontal joints as required to make air and water tight.
   2. Regardless of terminology used on Drawings, where "caulking" or "sealant" called for, use specified sealant continuously, entire area and assembly.

1.5 SUBMITTALS
A. Submit in accordance with the following:
   1. Product Data:
a. Indicate sealant chemical characteristics, performance criteria, limitations and color availability.

b. Include printed statement of VOC content for applicable products.

2. Samples: Color and type of sealant proposed on work. Obtain acceptance from Owner before proceeding.
   a. Include sealant installation in mock-ups.

3. Provide certification from sealant manufacturers that their products are suitable for the project use intended and comply with specification requirements.

1.6 QUALITY ASSURANCE

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

B. Installer Qualifications:
   1. Applicator shall have at least three (3) years’ experience in installing materials of types specified and shall have successfully completed at least three (3) projects of similar scope and complexity.
   2. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.

C. Single Source Responsibility for Joint Sealant Materials:
   1. Obtain joint sealants from a single manufacturer for each different product required to ensure compatibility.
   2. Manufacturer shall instruct applicator in procedures for intersecting sealants.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature or weather conditions deviate from manufacturer's recommendations. Comply with manufacturer's recommended requirements for temperatures, relative humidity and substrate moisture content during application and curing of materials.

B. Ensure proper ventilation in areas to receive solvent and moisture cured materials, and in enclosed spaces when installing two-component foam sealant.

C. Comply with manufacturer’s MSDS Sheets for use and handling of products.

1.8 SEQUENCING AND SCHEDULING

A. Do not install work of this Section until work of other trades having an effect on this Section of work has been completed.

B. Schedule applications of waterproofing, water repellents and preservative finishes after sealant installation unless sealant manufacturer approves otherwise in writing. Ensure that installed sealant is allowed to cure sufficiently prior to subsequent applications.

1.9 WARRANTY

A. Deliver to the Owner signed copies of the following written warranties against adhesive and cohesive failure of the sealant and against infiltration of water and air through the sealed joint for a period of five (5) years from date of completion.
   1. Manufacturer’s standard warranty covering sealant materials.
   2. Applicator’s standard warranty covering workmanship.
PART 2 PRODUCTS

1.1 MATERIALS - GENERAL

A. General:
   1. Color: White, or as selected by Owner from samples of manufacturer's standard color range.
   2. Sealant must be compatible with back-up material.
   3. Compatibility:
      a. Provide joint sealants, joint fillers and accessory joint materials that are compatible with
         one another and with joint substrates under project conditions.
      b. Install joint sealants, joint fillers and related joint materials that are non-staining to
         visible joint surfaces and surrounding substrate surfaces.
   4. Pre-compressed foam joint sealant backup sealant at masonry and other rainscreen weather joints.
   5. Sealing of vertical and horizontal construction joints, making air and watertight.
   6. Primers: As required and recommended by the sealant manufacturer for surface conditions
      encountered.

2.2 SILICONE JOINT SEALANTS:

   A. As manufactured by: Pecora, Dow Corning Corp, Sika Corporation, Tremco Incorporated or accepted
   B. Silicone Joint Sealants:
      1. Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade
         NS, Class 100/50, for Use NT.

2.3 INTERIOR JOINT SEALANTS

   A. Manufacturer: AP Alex Plus 40yr, All purpose Acrylic Latex Caulk, Color: White

2.4 EXTERIOR JOINT SEALANTS – (CONFIRMED CAPATIBILITY WITH PRODUCTS BEING SEALED)

   A. Sherwin Williams 950A Siliconized Acrylic Latex Caulk, Color: White
   B. VaproBond, Dow 758
   C. VaproLiqui-Flash

2.5 JOINT SEALANT BACKING

   A. Joint-Sealant Backing: ASTM C1330, polyethylene foam rod, closed or open cell to suit job
      conditions and approved in writing by joint sealant manufacturer; non-staining; compatible with joint
      substrates, sealants, primers and other joint fillers; and accepted for applications indicated by sealant
      manufacturer based on field experience and laboratory testing.
      1. Diameter twenty-five (25%) percent greater than width of joint where it is to be installed.
      2. Polystyrene foam not acceptable.
   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 where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

D. Firestop Joint Sealants (flamesafe saing sealant): Elastomeric sealing material intended to resist the passage of fire and toxic gasses in non-fire-resistance rated assemblies, acceptable to AHJ.

E. Other Materials: Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the sealant manufacturer as compatible, subject to review of the Owner.

PART 3 EXECUTION

3.1 EXAMINATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Applicator shall examine the areas and conditions under which work of this Section will be performed.
   1. Verify conformance with manufacturer’s requirements.
   2. Report unsatisfactory conditions in writing to the Owner.
   3. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Clean and prime joints in accordance with manufacturer’s instructions.

B. Remove loose materials and foreign matter which might impair adhesion of sealant.

C. Verify that joint backing and release tapes are compatible with sealant.

D. Protection: Completely protect surfaces adjacent to joints. Apply masking around joints to protect adjacent surfaces from defacement and staining during sealing operations.

3.3 INSTALLATION, APPLICATION, PERFORMANCE

A. Install in accordance with manufacturer’s directions for conditions of installation.

B. Apply sealants before application of water repellents or other coatings at surfaces to ensure sealant adhesion.

C. Keep sealants back from adjacent faces of surfaces.

D. Backing for surfaces:
   1. Apply foam rod back-up material allowing proper space for sealant per the sealant manufacturer’s data guide.
      a. Where more than 3/4” wide pack with foam backer rod material to within 1/2” of surface.
      b. Where less than 1/2” wide install foam rod backer rod material to within 1/4” of surface.
E. Sealing: Recess joints as indicated, minimum recess equal to joint width.

1. Apply sealant in accordance with manufacturer’s directions and the following:
   a. Use sealant dispensing equipment to push sealant bead into opening. Fill joint opening to full and proper configuration. Apply in continuous operation, ensure sealant fills entire joint and firmly contacts all surfaces.
   b. Install sealant vertically or horizontally as necessary to allow moisture to drain.

2. Examine installation carefully. Repair any areas where sealant is not properly adhered due to bubbles, foreign matter or other defects.

3. Seal joints before final coat of finish is applied to adjacent surfaces.

3.4 CURING

A. General: Prior to painting or coating, allow sealant joints to cure as directed by sealant manufacturer, minimum seven (7) days for a single component and three (3) days for a multi-component.

B. Environmental Conditions: Ambient temperatures and humidity affect the cure rate and time required for joint to be “tack-free”. Notify Owner if cure times exceed the minimums listed.

3.5 FIELD 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 ten (10) tests for the first one thousand (1,000’) feet of joint length for each type of elastomeric sealant and joint substrate.
   b. Perform one (1) test for each one thousand (1,000’) feet of joint length thereafter or one (1) test per each floor per elevation.

   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 whether the sealants:
   a. Filled joint cavities and are free of voids.
   b. Dimensions and configurations comply with specified requirements.
   c. 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. Field-Adhesion-Test Log: Record test results. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration and sealant dimensions.

6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.6 CLEANING, INSPECTION AND PROTECTION

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials accepted 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 or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Fiberglass Entry Doors installed in existing openings with new composite frames.

1.2 RELATED SECTIONS

Section 061000 - Rough Carpentry
Section 062000 – Interior Finish Carpentry
Section 072500 - Weather Resistant Barrier
Section 074646 - Fiber Cement Siding, Trim and Soffit
Section 076200 - Sheet Metal, Flashing and Trim
Section 079200 - Joint Sealants
Section 087100 - Door Hardware
Section 099113 – Exterior Painting

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E 331 – Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

B. Environmental Protection Agency and Department of Energy:

C. Code of Federal Regulations:

D. National Fire Protection Association
   1. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies

E. Underwriters Laboratory
   1. UL 10B – Standard for Fire Testing Door Assemblies
   2. UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies

1.4 SUBMITTALS

A. Product Data: Submit door manufacturer’s current product literature, including installation instructions.

B. Samples: Submit full-size or partial full-size verification sample of door illustrating glazing system, quality of construction, texture and color of finish.

1.5 QUALITY ASSURANCE

A. Mockup:
   1. Provide sample unit of representative product size and using manufacturer’s approved installation methods to determine acceptability of door installation methods.
   2. Approved mockup shall represent minimum quality required for the work.
   3. Approved mockup shall be part of the Work in place.
B. Quality Assurance Submittals:
   1. Provide documentation for specified performance as required.
   2. Manufacturer’s installation instructions.

1.6 DELIVERY, STORAGE AND HANDLING
A. Delivery: Deliver materials to site undamaged with labels clearly identifying manufacturer, product name and 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.

1.7 WARRANTY
A. Manufacturer’s standard limited warranty applies.

PART 2 PRODUCTS

2.1 MANUFACTURER(S)
A. Therma-Tru products specified as basis of design.
   1. Exterior Entrances: Six Panel Flush (Embossed); Mill Finish; Style “Steel Edge No. SE210HD
   2. Frames: Compatible composite door frames. Include Therma-Tru integral door gaskets
   3. Door Threshold: Therma-Tru adjustable threshold. Provide out swinging at exterior storage doors.
   4. Additional Door Hardware Specified in Section 087100.
   5. Sill Extender: Therma-Tru metal sill extender
   6. Door Bottom: Therma-Tru Door bottom
B. Jeld-Wen

PART 3 EXECUTION

3.1 EXAMINATION
A. Examine areas to receive doors. Notify Owner in writing of any unacceptable conditions that would adversely affect installation or subsequent performance of the product. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION
A. Pre-Hang doors in composite frames specified.
B. Install doors in accordance with manufacturer’s written instructions and best practice.

3.3 FINISHING
A. Finish specified 099100.
3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products prior to Substantial Completion in accordance with specifications.
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.

1.2 SUMMARY

A. Section Includes:

1. Access doors and frames for walls and ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES FOR WALLS

A. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

B. Flush Access Doors with Exposed Flanges:

1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Locations: Wall
3. Door Size: Varies (18" x 18").
4. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage


5. Frame Material: Same material, thickness, and finish as door
6. Hinges: Manufacturer's standard
7. Hardware: Lock, cylinder
8. Quantity: 16, verify locations w/ Architect

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Frame Anchors: Same type as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:

   1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.
PART 1 GENERAL

1.1 SUMMARY

A. Hardware for fiberglass/composite entry doors including, but not limited to: locksets, hinges, closers, stops, kick plates, sweeps and thresholds.

B. Weatherstripping, seals and door gaskets.

C. Work includes but is not limited to following:
   1. Provide complete finish hardware and suitable fastenings for the Project in accordance with Drawings, Specifications and Schedules.
   2. Furnishing items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function.
   3. Furnishing items not specifically mentioned, but necessary to complete work. These are to match quality and finish of the items specified.
   4. Include all items as required by the authority having jurisdiction for Fire Rated Doors.
   5. Coordinate keying with Owner. Unit doors to be supplied with five (5) keys each door.

D. Quantities: Those listed in any instance are for Subcontractor’s convenience only and are not guaranteed.

1.2 RELATED SECTIONS

A. Section 024100 - Selective Demolition

B. Section 061000 - Rough Carpentry

C. Section 062000 - Interior Finish Carpentry

D. Section 062013 - Exterior Finish Carpentry

E. Section 079200 - Joint Sealants

F. Section 081613 - Fiberglass Entry Doors

1.3 REFERENCE STANDARDS


C. BHMA A156.1 - American National Standard for Butts and Hinges; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.1).

D. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; Builders Hardware Manufacturers Association; 2011 (ANSI/BHMA A156.2).

E. E. BHMA A156.4 - American National Standard for Door Controls - Closers; Builders Hardware Manufacturers Association, Inc.; 2008 (ANSI/BHMA A156.4).

F. BHMA A156.6 - American National Standard for Architectural Door Trim; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.6).

G. BHMA A156.7 - American National Standard for Template Hinge Dimensions; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.7).

H. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; Builders Hardware Manufacturers Association, Inc.; 2010 (ANSI/BHMA A156.8).
I. BHMA A156.13 - American National Standard for Mortise Locks & Latches; Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.13).


K. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.18).

L. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2012 (ANSI/BHMA A156.22).

M. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2010.


1.4 COORDINATION

A. Refer to Section 013100 Project Management and Coordination for additional requirements.

B. Coordinate the manufacture, fabrication and installation of products onto which door hardware will be installed.

C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

D. Convey Owner's keying requirements to manufactures during the course of the Work.

E. Pre-installation Meeting: Convene a pre-installation meeting one (1) week prior to commencing work of this section; require attendance by all affected installers.

F. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.5 SUBMITTALS

A. Refer to Section 013300 Submittal Procedures for additional submittal requirements.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.

C. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.

D. Submit manufacturer's parts lists, templates and special tools.

E. Keying Schedule: Submit for approval of Owner.

F. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

G. Maintenance Data: Include data on operating hardware, lubrication requirements and inspection procedures related to preventative maintenance.

H. Submit manufacturer's parts lists and templates.

I. Operation and Maintenance shall be included in Project Operation and Maintenance Manuals. To include in manuals: catalog cuts, manufactures names, address and phone numbers.

J. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.
K. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three (3) years of documented experience.
B. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware approved by manufacturer.
   1. Supplier to maintain stock and parts inventory of all standard items for future service by the Owner.
   2. Authorized representatives for door closers and locksets are to inspect and adjust their hardware.
   3. To be factory direct authorized distributor – not a broker.
C. To be staffed with a certified Architectural Hardware Consultant (AHC) and locksmiths available at all reasonable times during construction to meet with Owner, and Contractor for hardware or keying problems.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Refer to Section 01600 Product requirements for additional requirements.
B. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.
C. Storage of hardware shall be protected, under lock and key, and storage kept dry for protection of the hardware.

1.8 WARRANTY
A. Refer to section 017700 Closeout Procedures for additional warranty information.
B. Provide twenty-five (25) year warranty against ordinary wear and usage for door closers from date of substantial completion.

PART 2 PRODUCTS

2.1 DOOR HARDWARE – GENERAL
A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes and secure to the extent indicated.
B. Attach all closers and panic bars to door reinforcement blocking.
C. Provide all items of a single type of the same model by the same manufacturer.
D. Provide products that comply with the following:
   1. Applicable provisions of Federal, State and local codes.
   2. ADA Standards for Accessible Design.
E. Finishes: All door hardware the same finish unless otherwise indicated.
   1. Primary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
   2. Finish Definitions: BHMA A156.18.
   3. Exceptions:
a. Where base metal is specified to be different, provide finish that is an appearance equivalent according to BHMA A156.18.
b. Door Closer Covers and Arms: Color to be selected by Owner from manufacturer's standard colors.

2.2 HINGES AND PIVOTS

A. Hinges, Pivots and Butts: Provide hinges on every swinging door.
   1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
   2. Provide ball-bearing hinges at all doors having closers.
   3. Provide hinges in the quantities indicated.
   4. Provide non-removable pins on exterior out-swinging doors.

B. Butt Hinges: Comply with BHMA A156.1 and A156.7; standard weight, unless otherwise indicated.
   1. Provide hinge width required to clear surrounding trim.

C. Quantity of Hinges Per Door:
   1. Three (3) hinges per leaf to ninety (90") inches height. Add one (1) for each additional thirty (30") inches in height or any fraction thereof.

D. Approved manufacturers:
   1. Ives: www.ives.allegion.com 4.0”x4.0” 652

2.3 DOOR CLOSERS - NA

A. Door Closers:
   1. Provide thru-bolts for closer attachments at all exterior public access doors.

2.4 LOCKS

A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
   1. Hardware Sets indicate locking functions required for each door.
   2. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
   3. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.

B. Lock Cylinders: Manufacturer’s full size interchangeable core (FSIC) CORE 23-030.
   1. Provide cams and/or tailpieces as required for locking devices required.

C. Keying: Grand master keyed per Owners approval.

2.5 CYLINDRICAL LOCKSETS

A. Locking Functions: As defined in BHMA A156.2, and as selected by Owner.

B. Approved manufacturers:

2.6 STOPS AND HOLDERS

A. Stops/ Holders: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.
1. Provide wall mounted stops and floor mounted where wall mounted is impractical. Where no stop can be installed provide closer with cushion type arm. Anvils to be sufficient length to permit closers to be mounted on the pull side of door.

2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.

3. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.

B. Approved Manufacturers:

1. Ives: www.ives.allegion.com
2. Glynn-Johnson: www.glynn-johnson.com
3. Trimco: www.trimcobbw.com
4. Everbilt

2.7 GASKETING AND THRESHOLDS

A. Gaskets: Comply with BHMA A156.22 - By Door Supplier

1. On each exterior door, provide weatherstripping gaskets, unless otherwise indicated; top, sides and meeting stiles of pairs.
   a. Where exterior door is also required to have fire or smoke rating, provide gaskets functioning as both smoke and weather seals.

2. On each exterior door, provide door bottom sweep, unless otherwise indicated.

B. Thresholds:

1. As specified in Section 081613 Fiberglass Entry Doors

C. Silencers:

1. Quantity: Furnish three (3) for each single door frame

D. Approved manufacturers:

1. Therma-Tru: www.thermatru.com

2.8 PROTECTION PLATES AND ARCHITECTURAL TRIM

A. Kick-plates, Flat Goods & Trim:

1. Kickplate: Provide on push side of every door with closer, except storefront and all-glass doors.

2. Trim: Per Section 062000 - Interior Finish Carpentry and Section 062013 - Exterior Finish Carpentry

B. Approved manufacturers:

1. Ives: www.ives.allegion.com – 8400 Series
   8” x 34”  630 Stainless Steel
   10” x 34”  630 at ADA units

2.9 KEYING REQUIREMENTS

A. All keyed cylinders shall be subject to the existing Schlage Grand Masterkey system, coordinate with Owner.

B. Furnish cylinders with construction cores. Following construction supply permanent keyed cores.

C. Cylinders to be furnished with visual key control with key code. Stamped on the face of the keys and marked on the back or side of the cylinders.
D. Key Quantities
   3 EA Master Keys
   4 EA Control Keys
   2 EA Construction Control Keys
   10 EA Construction Keys
   3 EA Change Keys per keyed alike group

2.10 FIRE DEPARTMENT LOCK BOX
   A. Reinstall Salvaged Fire Department Lock Box

2.11 PANIC HARDWARE - NA
   A. As required under Hardware Schedule.
   B. Pair Openings: Furnish two Panic Devices for paired openings.
   C. Rated Openings: Provide UL listed Fire Exit Hardware at rated openings.
   D. Sizes: Provide Panic Hardware sized in accordance with manufacturer’s recommendations.

2.12 KEYLESS ENTRY - NA
   A. Reinstall Salvaged Keyless Entry

2.13 POWER DOOR ASSIST - NA
   A. Reinstall Salvaged Power Door Assist

2.14 DOOR KNOCKER
   A. Trimco 621V

PART 3 EXECUTION

3.1 EXAMINATION
   A. Verify that field conditions are acceptable and are ready to receive work.
   B. In the event of any discrepancies between job site conditions and the drawings, stop work immediately.
      Immediately call the Owner and report the nature, extent and impact of the discrepancy. Do not proceed with any and all work relating to the discrepancy until a resolution has been attained.
   C. Commencement of construction or installation means acceptance of existing conditions by contractor as suitable for construction or installation.
   D. Any work which is not acceptable due to a discrepancy which has not been called to the attention of the Owner shall be repaired or replaced to conform to the original intent of the drawings at no additional cost to the owner.
   E. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as instructed by the manufacturer.

3.2 INSTALLATION
   A. Install hardware in accordance with manufacturer's instructions and applicable codes.
   B. Use templates provided by hardware item manufacturer.
   C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.
D. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:

1. For wood, fiberglass or composite doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3.3 ADJUSTING

A. See Division 1 Project Administration regarding adjustment work under provisions of Owner. Refer to BID PACKAGE for these GENERAL REQUIREMENTS.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.4 CLEANING

A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost

3.5 PROTECTION

A. Do not permit adjacent work to damage hardware or finish.

B. Adjust gasketing for complete, continuous seal; replace if unable to make unable to make complete seal.

PART 4 HARDWARE SETS

4.1 GENERAL

A. These Hardware Sets indicate requirements for single doors of that type, with conditional requirements for pairs and other situations.

4.2 GROUPS:

(Product are for listed for design intent)

HW 01 – UNIT ENTRY DOORS

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item</th>
<th>Description</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>5BB1 4.0&quot; x 4.0&quot;</td>
<td>652 Ives</td>
</tr>
<tr>
<td>1</td>
<td>PASSAGE SET</td>
<td>F10ELA</td>
<td>626 Schlage</td>
</tr>
<tr>
<td>1</td>
<td>SGL CYL DEADBOLT</td>
<td>B660R</td>
<td>626 Schlage</td>
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<tr>
<td>1</td>
<td>CONVENTIONAL CORE</td>
<td>23-030</td>
<td>626 Schlage</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
<td>630 Ives</td>
</tr>
<tr>
<td>1</td>
<td>DOOR STOP</td>
<td>060</td>
<td>652 Ives</td>
</tr>
<tr>
<td>1</td>
<td>GASKETS</td>
<td>BY DOOR SUPPLIER</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DOOR BOTTOM SWEEP</td>
<td>BY DOOR SUPPLIER</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SILL / THRESHOLD</td>
<td>BY DOOR SUPPLIER</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DOOR KNOCKER</td>
<td>621V (UNIT DOORS ONLY)</td>
<td>626 Trimco</td>
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HW 02 – INTERIOR PASSAGE DOORS

<table>
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<td>1</td>
<td>DOOR STOP</td>
<td>060</td>
<td>652 Schlage</td>
</tr>
</tbody>
</table>
HW 03 – INTERIOR BIFOLD DOOR

1 EA SLIDING DOOR SET 14969 (60” OPENING) 652 EVERBILT

END OF SECTION
SECTION 092100 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior soffit gypsum board
   2. Interior gypsum board and finishing texture.
   3. Interior trims.
   4. Joint treatment materials
   5. Auxiliary materials

B. Related Requirements:
   1. Section 061000 "Rough Carpentry" for non-structural framing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 EXTERIOR SOFFIT GYPSUM BOARD

A. Exterior Soffit Gypsum Wallboard, Type X: ASTM C 1396 section 8 (C 931)
   1. Thickness: 5/8 inch
   2. Long Edges: Tapered.

2.4 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
   1. Thickness: 5/8 inch (15.9 mm).
   2. Long Edges: Tapered.
   3. Finish: USG Beadex 'FasTex' or sim.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
   2. Shapes:
      a. Cornerbead.
      b. Bullnose bead.
      c. LC-Bead: J-shaped; exposed long flange receives joint compound.
      d. L-Bead: L-shaped; exposed long flange receives joint compound.
      e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      f. Expansion (control) joint.

   1. Material: Hot-dip galvanized steel sheet, plastic, or rolled zinc.
   2. Shapes:
      a. Cornerbead.
      b. LC-Bead: J-shaped; exposed long flange receives joint compound.
      c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
   1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
   a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

   1. Surface-Burning Characteristics: 0/0 (flame spread/smoke developed)
   2. Color: Off-white
   3. Solids: 73% ± 3%
   4. Weight: 12.0–12.8 lbs./gal. (in container)

D. Adhesive: Provide one of the following:
   1. SikaBond® Construction Adhesive
   2. Loctite® Power Grab® Heavy Duty Clear Exterior Construction Adhesive
   3. Liquid Nails Drywall Adhesive (DWF-24)
   4. < or approved equal by Architect >

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.
B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-(6.4- to 9.5-mm)-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-(6.4- to 12.7-mm)-wide spaces at these locations and trim edges with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Type X: At ceilings and walls per drawings

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels 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 panels.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. F-Reveal Molding: Use Where gypsum board abuts adjacent wood, masonry or concrete construction as indicated on drawings.
3. Control Joints: as indicated on drawings.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

   a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900
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.

1.2 SUMMARY

A. Section Includes:

1. Resilient base and accessories.

1.3 RELATED SECTIONS

A. See Gypsum Wallboard, 092100

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 3” inches long.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.
PART 2 - PRODUCTS

2.1 RUBBER BASE (noted as Rubber Base, Base or Wall Base on drawings)
   
   A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include:
      
      1. Roppe
   
   B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
      
      1. Style: Standard Toe
   
   C. Thickness: 0.125 inch (3.2 mm).
   
   D. Height: 4” typical
   
   E. Lengths: Coils in manufacturer's standard length.
   
   F. Outside Corners: Preformed.
   
   G. Inside Corners: Preformed.
   
   H. Basis-of-Design & Color: TBD from manufacturer standard colors

2.2 INSTALLATION MATERIALS

   A. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

   A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
      
      1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
   
   B. Proceed with installation only after unsatisfactory conditions have been corrected.
      
      1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

   A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
B. Do not install resilient products until they are the same temperature as the space where they are to be installed.
   1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

C. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes modular carpet and accessories

B. Related Requirements:

1. 096513 Resilient Base and Accessories

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet: 2’x2’ sample.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI (Carpet and Rug Institute – current edition) 104.
1.7 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.8 WARRANTY

A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.

2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, loss of face fiber, and delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET SCHEDULE

A. CPT-1
   1. Manufacturer: ShawContract
   2. Product/Number: Rainstorm / 5T263
   3. Collection: Kindred
   4. Backing: EcoWorx Tile

2.2 INSTALLATION ACCESSORIES

A. pH Blocker / liquid latex floor primer: As approved by selected carpeting manufacturer.

B. Solvent-free, polymer-based sealer for existing floor adhesives: As approved by selected carpeting manufacturer. Basis-of-Design product: Shaw 6200.

C. Floorshield adhesive sealer: As approved by selected carpeting manufacturer.

D. Premium grade pressure sensitive adhesive: As approved by selected carpeting manufacturer.

E. Trowelable Leveling and Patching Compounds: cement-based, repair mortar, allowing thin or feather edged cross sections. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following: “DURATHIN PATCH” by L&M Construction Chemicals, Inc. Prepare concrete in accordance with ICRI 03732.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.

B. Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
2. Subfloors are free of cracks, ridges, abandoned penetrations, depressions, scale, and foreign deposits.
3. Prep existing concrete subfloors with manufacturer recommended installation accessories as noted in section 2.2.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

B. Use trowelable leveling and patching compounds, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use methods recommended in writing by carpet manufacturer.

D. Clean substrates of grease, oil and soil and prime if directed by adhesive manufacturer. Rough sand painted surfaces and remove loose paint.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet manufacturer's written installation instructions.

B. Installation Method: Glue down; install with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:

1. Remove yarns that protrude from carpet surface.
2. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet 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 manufacturer.

END OF SECTION 096813
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.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on exterior substrates. the following exterior substrates:

1. Fiber–cement siding and trim
2. Exterior Gyp Soffit
3. Wood trim
4. Metal

B. Related Requirements:
1. Section 074646 “Fiber-Cement Siding” for siding and flashing products.
2. Section 099123 "Interior Painting" for surface preparation and the application of paint
3. Section 092900 “Gypsum Board”

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Label each coat of each Sample.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.
1.6 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Benjamin Moore & Co.
2. Rodda Paint Co.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: To match existing or per drawing designations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION
A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulates.

1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

3. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

4. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

5. Where abutting siding components of varying colors occur (ex: trim abutted to shingles or lap siding), the trim color is to extend and cut into the staggering line of the lap/shingles where the two components abut.

6. Apply primer to each cut end of siding and trim boards.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Owner, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

A. Fiber-Cement Siding, Associated Trim and Flashings, Gypsum Soffits
1. Latex System MPI EXT 9.2A:
   a. Prime Coat: Factory Primer
   c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1), MPI #10.

B. Wood Trim
1. Latex System MPI EXT 9.2A:
   a. Prime Coat: Primer, latex for exterior wood (reduced), MPI #6.
   c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1), MPI #10.

C. Concrete Substrates, Nontraffic Surfaces:
1. Latex System MPI EXT 3.1A:
   a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
   c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15.

D. Metal Surfaces
1. Epoxy System MPI EXT 5.1F:
   a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
   b. Intermediate Coat: Epoxy, high build, low gloss, MPI #108.
   c. Topcoat: Epoxy, gloss, MPI #77.

END OF SECTION 09 91 13
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.

1.2 SUMMARY
   A. Section includes surface preparation and the application of paint systems on interior substrates. the following interior substrates:
      1. Gypsum board
      2. Wood trim
   B. Related Requirements:
      1. Section 092900 “Gypsum Board” for gypsum board
      2. Section 099113 “Exterior Painting” for surface preparation and the application of paint systems on exterior substrates.

1.3 ACTION SUBMITTALS
   A. Product Data:  For each type of product.  Include preparation requirements and application instructions.
   B. Samples for Verification:  For each type of paint system and in each color and gloss of topcoat.
      1. Submit Samples on rigid backing, 8 inches (200 mm) square.
      2. Label each coat of each Sample.

1.4 MAINTENANCE MATERIAL SUBMITTALS
   A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
      1. Maintain containers in clean condition, free of foreign materials and residue.
      2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS
A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Benjamin Moore & Co.
2. Cloverdale Paint.
5. Rodda Paint Co.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. South Coast Air Quality Management District (SCAQMD) Rule 1113: All interior paints and primers must have VOC levels less than or equal to the thresholds established by SCAQMD Rule 1113.

C. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

D. Colors: to match existing and per schedule on drawings.

2.3 PRIMERS/SEALERS

A. Non-Vapor Barrier Primer, Interior, Institutional Low Odor/VOC: MPI #149.
   1. For gypsum board

B. Primer, Latex, for Interior Wood, Low Odor/VOC: MPI #39.

2.4 WATER-BASED PAINTS

   1. For gypsum board
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Wood: 15 percent.
   2. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" for "MPI Maintenance Repainting Manual".

B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulates.

C. Wood Substrates:
   1. Sand surfaces that will be exposed to view, and dust off.
   2. Prime edges, ends, faces, undersides, and backsides of wood.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
   1. Use applicators and techniques suited for paint and substrate indicated.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION
A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE
A. Wood Substrates:
   1. Institutional Low-Odor/VOC Latex System. Basis-of-design: Sherwin Williams Pro Classic
      c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 5), MPI #147.

B. Gypsum Board Substrates:
   1. Institutional Low-Odor/VOC Latex System with non-vapor barrier primer: Typical Finish unless noted otherwise. Basis-of-Design: BEHR i300
      c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 3), MPI #145
SECTION 104413 - FIRE PROTECTION CABINETS

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.

1.2 SUMMARY
   A. Section Includes:
      1. Fire-protection cabinets for the following:
         a. Portable fire extinguishers.
   B. Related Requirements:
      1. Section 061600, “Rough Carpentry”
      2. Section 078413, "Penetration Firestopping"
      3. Section 092100, “Gypsum Wallboard”.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semi-recessed, or surface-mounting method and relationships of box and trim to surrounding construction.
   B. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

1.4 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION
   A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
   B. Coordinate sizes and locations of fire-protection cabinets with wall depths.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET: noted as FEC on drawings.

A. Cabinet Type: Suitable for fire extinguisher.

1. Basis-of-Design Product: Subject to compliance with requirements, provide [Larsen, Vertical Duo, or equal.

B. Cabinet Material: Cold-rolled steel sheet.

C. Semi-recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.

D. Cabinet Trim Material: Stainless-steel sheet.

E. Door Material: Steel sheet.

F. Door Style: Vertical duo panel with frame.

G. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

H. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.

3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.

I. Materials:

1. Stainless Steel: ASTM A 666, Type 304.

   a. Finish: No. 4 directional satin finish.

2. Clear Float Glass: ASTM C 1036, Type I, Class 1, Quality q3.

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
   1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
   2. Fabricate door frames of one-piece construction with edges flanged.
   3. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS


   B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

   C. Finish fire-protection cabinets after assembly.

   D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

   A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

   A. Prepare recesses for semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

   A. General: Install fire-protection cabinets in locations and at mounting heights indicated [or, if not indicated, at heights indicated below.]
      1. Fire-Protection Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.
B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
   1. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification: Apply decals to cabinet face.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413
PART 1   GENERAL

1.1 GENERAL REQUIREMENTS

A. Conform to General Conditions, Supplementary Conditions, the modifications thereto and Division 1 - General Requirements for all work.

1.2 SUMMARY

A. Design Intent:
   1. System to provide coverage for entire building.
   2. Provide dry-pipe sprinkler coverage for ground level parking and crawl space areas.
   3. Provide heat trace on wet-pipe sprinkler system piping on ground level.
   4. Provide wet-pipe sprinkler coverage for a warm attic.
   5.Visit site and review existing stairwell standpipes, provide modification as needed to meet current Code.
   6. Provide hydraulically designed (or pipe schedule only if acceptable by authorities having jurisdiction) system to NFPA 13 \ NFPA 13R occupancy requirements.
   7. Determine volume and pressure of incoming water supply from water flow test data.
   8. Interface system with building fire and smoke alarm systems.
   9. Piping from the site connection to the flange at the base of the sprinkler riser is specifically included in Division 21 00 00.

B. This is a design/build specification. Provide all required design, permits, labor, materials and installation of fire protection work, complete and operable in accordance with these specifications and drawings. Work of Division 21 includes, but is not limited to, that as delineated in conceptual information shown on the drawings and the following specification sections:

21 00 00   Fire Suppression General Conditions
21 05 00   Common Work Results for Fire Suppression
21 12 00   Fire-Suppression Standpipes
21 13 13   Wet-Pipe Sprinkler Systems
21 13 16   Dry-Pipe Sprinkler Systems

1.3 CODES AND STANDARDS

A. Conform to following code and agency requirements having jurisdictional authority over fire protection installation.
   1. International Building Code (IBC) with local amendments.
   3. Requirements of OSHA.
   5. ASTM, ASME, ANSI and NEMA standards, as referenced in subsequent sections.
   6. Local Water District Requirements.
   7. Local Health Department Requirements.
1.4 SUBMITTALS

A. See Division 01 - Submittal Procedures.

B. Field Test Reports: Include results of hydrostatic and flow tests with hydraulic calculations.

C. Design Data: Submit design calculations signed and sealed by NICET Level III Certified Designer.

D. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” of Division 21 and all additional products noted on drawings or required for completion of project.

E. **Submittals shall be complete in one PDF file with bookmarks for each Division. Multi-part submittals will be returned without review.**
   1. First Page: Name of Project, Owner, Location & Contracting Company.
   2. Index Page: List of specification sections with contents by Tag or item.
   3. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

F. Clearly indicate on each page the equipment schedule designation (Tag) and/or specification section, as applicable. Indicate model and all accessories intended for use.

G. Equipment vendor cover page with contact information shall precede submittal by that vendor.

H. Submitted product information shall include (as applicable) but not be limited to the following information:
   1. Product description
   2. Manufacturer and model
   3. Dimensions
   4. Performance Ratings (i.e. capacity, rpm, HP, temperature)
   5. Construction Materials
   6. Ratings (i.e. UL, FM, NEMA, etc)
   7. Electrical data
   8. Vibration Isolation
   9. Controls and wiring diagrams
   10. Accessories
   11. Engineering technical data (i.e. pressure drops, leakage rates, pump curves)

1.5 SHOP DRAWINGS

A. Prepare Shop Drawings stamped and signed by a NICET Class III Certified designer. Develop in accordance with NFPA 13, NFPA 13R, NFPA 14 and the State and Local Fire Marshals. Submit PDF copies of these drawings for approval prior to beginning work.

B. Submit shop drawings to Architect, Local Fire Marshal, and all other approving authorities. Drawings shall be approved by all agencies prior to fabrication or installation. **Drawings submitted for Architect's approval shall have been stamped approved by the Fire Department.**

C. The Contractor shall draw the design team’s attention to any areas in which they contemplate deviations from the conceptual information shown on the contract documents (e.g., due to site conditions).

D. These drawings and diagrams shall show all pipe sizes as well as the manufacturer’s name and catalog number of each piece of equipment used.
E. The Architect’s review of such drawings shall not relieve the Contractor of responsibility for deviations from the Contract drawings or specifications, nor shall it relieve him from responsibility for errors or omission in such drawings.

F. Fire Sprinkler shop drawings shall indicate all relevant pipe, ceiling, and structural elevations and clearances. All elbows, offsets, and turns shall be clearly identified. All required access doors shall be shown. By submission of sheet fire sprinkler shop drawings, the Contractor acknowledges that coordination has been done to ensure that all ductwork and piping fits and no conflicts exist.

G. Indicate layout of piping and sprinkler locations coordinated with ceiling type, lighting, structural and mechanical. Conform to symmetrical spacing of heads and integrate into locations of lights and other ceiling devices. Center heads on ceiling tiles (± 1") and align in straight rows.

H. Indicate detailed pipe layout, hangers and supports, sprinklers, components and accessories. Include building sections and a plot plan showing location of underground supply connections, outside control valves, fire department connections and other equipment to be used.

I. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation layout, mounting and support details, and piping connections.

J. Indicate layout of flexible connectors, expansion joints, expansion compensators, loops, offsets and swing joints.

K. Indicate inertia bases and locate vibration isolators, with static and dynamic load on each.

L. Indicate layout of finished ceiling areas indicating sprinkler locations coordinated with ceiling installation.

M. Indicate system controls.

1.6 FIRE SPRINKLER PERMIT

A. Fire Sprinkler contractor shall prepare all documents for permit application, submit and obtain the permit from reviewing authority. All costs and fees to obtain the permit shall be paid by the Fire Sprinkler Contractor.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 13, NFPA 13R, NFPA 14 and Local and/ or State Fire Marshal.

B. Perform work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.

C. CPVC fire sprinkler piping located in plenums: Peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet when tested in accordance with UL 1887.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of continuous representation, a stocking distributor and service representative in the State of Washington.
B. Contractor: Licensed and regularly engaged in the specialized design and installation of automatic sprinkler equipment as listed by UL or other nationally recognized testing laboratories. Minimum three years’ experience and have installed at least five systems of comparable size.

C. Bids by wholesalers, suppliers or any firm whose principal business is not that of manufacturing and/or installing fire protection systems are not acceptable.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Furnish cast iron and steel valves with temporary protective coating with end caps and closures on piping and fittings. Maintain in place until installation.

C. Accept expansion joints on site in factory packing with shipping bars and positioning devices intact. Inspect for damage.

1.10 FIELD MEASUREMENTS

A. Where the word ‘verify’ is used on the documents, the contractor shall field verify the existing conditions and modify the scope of the installation as required to meet the verified conditions without additional cost to the Owner.

B. Existing systems and utility lines indicated on drawings are in accordance with information furnished to the Architect and may not be complete. Contractor is responsible for locating, uncovering, disposing of or maintaining existing systems.

1.11 COORDINATION

A. Visit the site and become familiar with existing conditions affecting work.

B. Verify locations of any overhead or buried utilities on or near site. Determine such locations in conjunction with all public and private utility companies and with all authorities having jurisdiction.

C. Mechanical drawings are diagrammatic and do not indicate all possible site conditions. The contractor shall verify all measurements, dimensions and connections on site and coordinate between trades to preclude interferences. The contractor shall provide adjustments to piping as necessary to fit conditions including but is not limited to relocation, offsets, and transitions.

D. In the event of a conflict with other trades of work, the following priority from highest to lowest shall be followed: Structural, lighting, HVAC, plumbing/piping and sprinklers. Starting with the lowest priority, the HVAC, plumbing, and sprinkler contractors shall provide whatever materials, offsets, labor etc. is required to resolve the conflict.

E. When discrepancies occur between plans and specifications, the Architect will determine which takes precedence and the Contractor shall perform the selected requirement at no additional cost.

F. Prior to ordering equipment cross-check mechanical and electrical drawings and specifications to assure proper location and electrical characteristics of connections serving mechanical and electrical equipment.

G. Advise the Architect of any modifications required to suit equipment furnished. Costs for modifications due to equipment substitution will be borne by the contractor.
H. Wherever conflicts occur between different parts of the Contract Documents the greater quantity, the better quality, or larger size shall prevail unless the Architect informs the Contractor otherwise in writing.

I. The scale of each drawing is relatively accurate, but the Contractor is warned to obtain the necessary dimensions for any exact takeoffs from the Architect. No additional cost to the Owner will be considered for failure to obtain exact dimensions where not clear or in error on the drawings. Any device of fixture roughed in improperly and not positioned on implied centerlines or as required by good practice must be repositioned at no cost to the Owner.

1.12 CUTTING, FITTING, REPAIRING AND PATCHING

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where necessary for installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, where possible, by setting sleeves, frames, etc., and by coordinating for openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for ducts and piping.

C. Cut all holes neatly and as small as possible to admit work. Perform cutting in manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

1.13 SALVAGE

A. Remove excess piping and plug or cap any unused branch connections. Remove scrap pipe and all other excess materials from the site.

B. Comply with contractor’s Construction Waste Management Plan.

1.14 EXTRA MATERIALS

A. Provide extra sprinklers under provisions of NFPA 13 \ NFPA 13R.

B. Furnish suitable wrenches for each sprinkler type.

C. Furnish metal storage cabinet adjacent to alarm valve. Lettered "Automatic Sprinklers - Reserve Supplies."

1.15 FINAL APPROVAL

A. Completion and approval of the following is required for final approval of systems.
   1. Execution of Architect's and Engineer’s final observation reports
   2. Operation and maintenance instruction
   3. Operation and maintenance manuals submitted
   4. Equipment cleaning
   5. Record drawings submitted

B. See Division 01.

1.16 OPERATING AND MAINTENANCE INSTRUCTIONS

A. General: In addition to requirements of Division 01, following initial operation of mechanical systems and prior to acceptance by the Architect, perform the following services.
B. At least two weeks prior to each instruction period, give written notification of readiness to proceed to the Architect and Owner, and obtain mutually acceptable dates.

C. Conduct demonstrations and instructions for the Owner's representatives, pointing out requirements for operating, servicing and maintaining equipment and systems. Describe general system operation and specific equipment functions. Cover all equipment calibration, setpoint adjustment, safeties and alarms.

D. Furnish qualifications of Contractor's personnel in charge of the instruction; foreman position is minimum acceptable. Where equipment startup is performed by supplier's or manufacturer’s personnel, those personnel should also provide training on that equipment.

E. During demonstrations and instructions include and reference information from maintenance manuals and contract drawings.
   1. Provide documentation of all instruction which includes:
      a. Date and time of instruction
      b. Name, affiliation and qualifications of the instructor
      c. Name and affiliation of the attendees
      d. Topics, systems, and equipment covered
      e. Length of instruction

F. Minimum duration of instruction period is 2 hours.

1.17 OPERATING AND MAINTENANCE MANUALS

A. Contents: Furnish, in accord with Division 1, one PDF and one bound copy of operating and maintenance manuals to include the following:
   1. Manufacturers, suppliers, contractor names, addresses and phone numbers.
   2. Warranty service contractors' names, address and phone numbers (if different from above).
   3. Schedule and description of routine maintenance for each component to include oiling, lubrication and greasing data.
   4. Test data log.
   5. Manufacturer's cuts and rating tables, including brochures for all submittal items.
   6. Part numbers of all replaceable items.
   7. Control diagrams and operation sequence.
   8. Written guarantees.
   9. Record drawings corrected and completed.
   10. Completed equipment start-up forms and checklists.

B. Binders:
   1. Furnish typewritten or printed index and tabbed dividers between principal categories.

C. Imprint on cover:
   1. Name of project.
   2. Owner.
   3. Location of project.
   5. Contractor.
   6. Year of completion.

D. Imprint on backing:
   1. Name of project.
   2. Year of completion.
E. Submittals:
   1. Preliminary Copies: Prior to scheduled completion of the project, provide one PDF copy for review by the Architect.
   2. Final Copies: After approval of the preliminary copy, submit one PDF and one bound copy to the Owner.

1.18 EQUIPMENT AND PIPE CLEANING

A. Clean interior and exterior of all equipment. Equipment shall be free of dirt, construction debris, corrosion, etc.

B. Adequate provisions shall be made during construction to eliminate dirt, debris or other material from entering and collecting inside of pipe. Any collection of material shall be thoroughly cleaned before equipment startup and if necessary before owner occupancy.

C. Clean exterior of all exposed pipe.

D. Flush entire piping system of foreign matter.

1.19 RECORD DRAWINGS

A. See Division 1.

B. Submit two digital files with all drawings in PDF and AutoCAD format.

C. Show location of equipment and size of piping. Where appropriate provide tag or label identification for all valves and similar equipment. Indicate locations and elevations of exterior pipe and utility connections. Maintain continuously updated drawings during progress of project.

1.20 TESTING

A. Provide completed start-up forms and checklists.

1.21 WARRANTIES AND CONTRACTOR'S GUARANTEE

A. Furnish one year warranty from date of substantial completion for all systems unless specifically noted otherwise.

B. All work, material and equipment shall be free of defect, complete and in perfect operating order at time of delivery to Owner.

C. Without cost to Owner, correct all defects and failures discovered within one year from date of final acceptance, except when in the opinion of the Architect such condition is due to neglect or carelessness of the Owner.

D. The guarantee of the Contractor is independent of shorter time limits by any manufacturer of equipment he has furnished. Submit with Operation and Maintenance Manual all guarantees which exceed one year.

E. Make all necessary adjustments during first year of operation.

F. The presence of any inspector or observer during any construction does not relieve the Contractor from responsibility for defects discovered after completion of the work.
PART 3  EXECUTION

3.1  DOCUMENTATION

A. Additional plan submittals to Local Fire Marshal: If additional drawing submittals are required at any time during construction contractor shall prepare and submit drawings, review with Fire Marshal, and pick up subsequent approved drawings.

3.2  INSPECTION

A. Do not allow any work to be covered up or enclosed until inspected, tested and approved by the Architect and all authorities having jurisdiction over the work.

B. Should any work be enclosed or covered up before such inspection and test, Contractor shall at his own expense uncover work, and after it has been inspected, tested and approved, make all repairs as necessary to restore all work disturbed by him to its original condition.

3.3  INTERFACE WITH OTHER PRODUCTS

A. Verify devices are installed and connected to fire alarm system.

END OF SECTION
PART 1  GENERAL

1.1  SUMMARY

A.  Section Includes:
   1.  Pipe
   2.  Valves
   3.  Hangers and Support
   4.  Expansion Fittings and Loops
   5.  Seismic Controls
   6.  Identification

1.2  EXPANSION AND SEISMIC DESIGN REQUIREMENTS

A.  Provide structural work and equipment required for expansion and contraction of piping. Verify anchors, guides, and expansion joints provide and adequately protect system.

B.  Expansion Compensation Design Criteria:
   1.  Installation Temperature:  50 degrees F.
   2.  Fire Protection System Temperature:  90 degrees F.
   3.  Safety Factor:  30 percent.

C.  Seismic performance:  Provide seismic restraint in compliance with local jurisdiction and IBC 1613 requirements.

1.3  QUALITY ASSURANCE

A.  Through penetration firestopping of fire rated assemblies: ASTM E814 with 0.10” w.g. minimum positive pressure differential.  Minimum 1-hour protection.

B.  Installed products shall have surface Burning Characteristics: 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.

C.  Perform work in accordance with local jurisdiction’s requirements and AWS D1.1 for welding hanger and support attachments to building structure.

D.  Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

PART 2  PRODUCTS

2.1  BURIED PIPING

A.  Note that piping from the combination meter to the RPBP must be in piping suitable for domestic water (i.e., stainless steel).

   1.  Steel Fittings:  ASME B16.9, wrought steel, butt welded; ASTM A234, wrought carbon steel and alloy steel; with half-lapped 10 mil polyethylene tape.
4. Protection: ASME C105 polyethylene jacket with heat shrink sleeves or double layer, half-lapped 10 mil polyethylene tape to 6” above grade.

1. Fittings: Cast copper alloy ASME B16.18; wrought copper and bronze, ASME B16.22. Pressure type solder joint.
2. Joints: Silver braze, AWS A5.8 Classification BCuP-3 or BCuP-4; Solder, ASTM B32 Grade 95TA.
3. Protection: ASME C105 polyethylene jacket with heat shrink sleeves or double layer, half-lapped 10 mil polyethylene tape to 6” above grade.

2.2 ABOVE GROUND PIPING

A. Note that piping from the combination meter to the RPBP must be in piping suitable for domestic water (i.e., stainless steel).

B. Steel Pipe: ASTM A53 Grade B, ASTM A135, ASTM A795 Schedule 40 black; Schedule 10 UL listed light wall; ASTM A-795 Type E, Grade A Eddy-Flow or Dyna-Flow UL listed thin wall flow pipe.
5. Mechanical Grooved Couplings: Ductile iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers. ASTM A449. Victaulic, Gruvlok or approved equal.
   a. Rigid Type: Housings cast with offsetting, angle-pattern, bolt pads to provide system rigidity and support and hanging in accordance with NFPA-13, fully installed at visual pad-to-pad offset contact. (Couplings that require exact gapping at specific torque ratings are not permitted.). Basis of Design: Victaulic Style 009N and 107N.
   b. Flexible Type: For use in locations where vibration attenuation and stress relief are required: Basis of Design: Victaulic Style 177 or Style 77.
6. Installation-Ready™ fittings for Schedule 40/10 grooved end steel piping in fire protection applications sizes 1-¼ thru 2½ inches. Ductile iron housing conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready™ ends, pre-lubricated Grade “E” EPDM Type ‘A’ gasket, and ASTM A449 electroplated steel bolts and nuts. UL listed for a working pressure of 300 psi and FM approved for working pressure 365 psi.

C. Steel Pipe: ASTM A53 Grade B, ASTM A135, ASTM A795 Schedule 40 galvanized. Use only for dry-pipe sprinkler system and dry standpipes.
5. Mechanical Grooved Couplings: Malleable galvanized housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers. ASTM A449. Victaulic, Gruvlok or approved equal.
   a. Rigid Type: Housings cast with offsetting, angle-pattern, bolt pads to provide system rigidity and support and hanging in accordance with NFPA-13, fully installed at visual pad-to-pad offset contact. (Couplings that require exact gapping at specific torque ratings are not permitted.). Basis of Design: Victaulic Style 009N and 107N.
   b. Flexible Type: For use in locations where vibration attenuation and stress relief are required: Basis of Design: Victaulic Style 177 or Style 77.

6. Installation-Ready™ fittings for Schedule 40 grooved end steel piping in fire protection applications sizes 1-¼ thru 2½ inches. Ductile iron housing conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready™ ends, pre-lubricated Grade "E" EPDM Type 'A' gasket, and ASTM A449 electroplated steel bolts and nuts. UL listed for a working pressure of 300 psi and FM approved for working pressure 365 psi.

D. Steel Pipe: ASTM A135 Grade A, UL threadable thin wall, black.

E. CPVC Pipe: Harvel “Blazemaster” or approved, 175 psi at 150 degrees F, UL and FM, ASTM F442, SDR 13.5.
   1. Fittings: ASTM F438 schedule 40, or ASTM F439 schedule 80, CPVC.

2.3 VALVES

A. Manufacturers: UL & FM approved by Nibco, Stockham, Milwaukee or approved equal.

B. Gate Valves:
   1. Over 2 inches: Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, hand wheel, OS&Y, solid bronze or cast iron wedge, flanged or grooved ends. Basis of Design: Victaulic Series 771.
   2. Over 2 inches: Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged or grooved ends. Basis of Design: Victaulic Series 772, for use with Series 773 (wall) or 774 (upright) post.

C. Ball Valves:
   1. Up to and including 2 inches: Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle, threaded or sweat fitting ends.

D. Butterfly Valves:
   1. Bronze Body: Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, hand wheel and gear drive and integral indicating device, and built-in tamper proof switch where required.
   2. Cast or Ductile Iron Body: Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable pressure-responsive EPDM seat, stainless steel stem (offset from the disc centerline to provide complete 360-degree circumferential seating), wafer, lug, or grooved ends. With extended neck, weatherproof actuator housing with hand wheel and gear drive and integral indicating device where required. Basis of Design: Victaulic Series 705.
E. Check Valves:
1. Up to 2 inches: Bronze body and swing disc, rubber seat, threaded ends.
2. 2 to 4 inches: Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, grooved or flanged ends.
3. 2 inches and over: Ductile iron body, stainless steel or bronze disc with resilient seal, or elastomer coated ductile iron disc with welded-in nickel seat. Stainless steel spring. Wafer, grooved or flanged ends. Basis of Design: Victaulic Series 717.

F. Drain Valves:
1. Compression Stop: Bronze with hose thread nipple and cap.
2. Ball Valve: Brass with cap and chain, 3/4 inch hose thread.

2.4 BACKFLOW ASSEMBLY
A. Double check valve, detector check or as jurisdiction requires. FDA approved epoxy coated cast iron check valve bodies with bronze seats. Furnish with bronze body ball valve test cocks. Suitable for supply pressures to 175 psi and water temperatures to 140 degrees. Tamper switches on gate valves for monitoring. Ames, Watts, Apollo, FEBCO, Wilkins or approved.

2.5 PIPE HANGERS AND SUPPORTS
A. Conform to NFPA 13 and NFPA 14.
B. Hangers for Pipe Sizes 1 to 6 inch: Carbon steel, adjustable swivel, band hanger. Tolco Fig 200 or equal.
C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
F. Vertical Support: Steel riser clamp.
G. Floor Support: Cast iron pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.6 FLEXIBLE PIPE CONNECTORS
A. Manufacturers: Metraflex, Mason or approved equal.
B. Steel Piping:
1. UL Listed
2. Inner Hose: Stainless Steel.
4. Joint: Flanged, threaded with union or welded, as specified for pipe joints.

2.7 FLEXIBLE SPRINKLER HOSE CONNECTIONS
A. Manufacturers: Vic-Flex, FlexHead or approved equal.
B. The drop system shall consist of a braided type 304 stainless steel flexible tube, zinc plated steel Male threaded nipple or Victaulic FireLock IGS Groove Style 108 coupling for connection to branch-line piping, and a zinc plated steel reducer with a female thread for connection to the sprinkler head.
C. Performance:
1. FM Approved for its intended use pursuant to FM 1637 Approval Standard for Flexible Sprinkler Hose with Threaded End Fittings.
2. UL Listed for its intended use pursuant to UL 2443 Standard for Flexible Sprinkler Hose with Fittings for Fire Protection Service.

D. Flexible Hose Assemblies and End Fittings:
1. 100% Type 304 Stainless Steel.
2. Straight Hose Assembly or Elbow Hose Assembly.
3. ½ inch or ¾ inch outlet.
4. 175 psi / 300 psi maximum rated pressure.
5. Fully welded non-mechanical fittings, braided, leak-tested with minimum 1 inch true-bore internal corrugated hose diameter.
6. Union joints shall be provided for ease of installation.

E. Ceiling Bracket:
1. Type G90 Galvanized Steel.
2. The bracket shall allow installation before the ceiling tile is in place.
3. Direct attachment type, having integrated snap-on clip ends positively attached to the ceiling using tamper-resistant screws.
4. Flexible Hose Attachment: Removable hub type with set screw.

2.8 EXPANSION JOINTS

A. Manufacturers: Metraflex, Mason or approved equal.

B. Flexible Expansion Loop (seismic joint):
1. UL listed
2. Stainless steel hose & double stainless steel braid, carbon steel fittings.
3. Two flexible sections of hose and braid, two 90° elbows and a 180° return, assembled.
4. Support nut and drain plug at bottom of 180° return.
5. Provide nesting for multiple pipe runs.

C. Stainless Steel Bellows (expansion):
1. Low corrugation, non-controlled, two ply, 304 stainless steel.
2. ANSI class 150/300 flanges, grooved or welded ends.
3. 150/300 psi rated, maximum working temperature of 850 F.

D. External Ring Controlled Stainless Steel Bellows (expansion):
1. High Corrugation, self-equalizing, ring controlled, single ply, 304 stainless steel.
2. ANSI class 150/300 flanges, grooved or welded ends.
4. 300 psi rated, 500 F working.

2.9 FIRESTOPPING-APPLIED

A. Manufacturers: RectorSeal, Dow Corning, 3M Fire Protection or approved equal.
B. General:
1. Fire stopping materials shall conform to Flame (F) and Temperature (T) ratings as required by applicable building codes and tested by nationally accepted test agencies per ASTM E 814 or UL 1479 fire tests for through penetrations, and ASTM E 1966 or UL 2079 for construction joints, and UL 2307 for perimeter edge joints.
2. Fire stopping material shall be free of asbestos, PCBs, ethylene glycol, and lead.
3. Do not use any product containing solvents or that requires hazardous waste disposal.
4. Fire stopping shall be performed by a contractor trained or approved by firestop manufacturer.
5. Select products with rating not less than rating of wall or floor being penetrated.

C. Single Source Responsibility: Provide firestop systems for all conditions from a single supplier.

D. Product Description: Provide Latex caulk/sealant, Silicone caulk/sealant, Intumescent Wrap Strip, Firestop Putty, Firestop Collar or Intumescent Sleeve to meet each specific application and performance requirement.

E. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

F. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
1. Forming/Damming Materials: Mineral fiberboard, backer rod or other type recommended by Manufacturer’s tested system.

2.10 MECHANICAL SLEEVE SEALS
A. Manufacturers: Metraflex Metraseal, Thunderline Link-Seal or approved equal.
B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.11 PIPING ACCESSORIES
A. Manufacturers: Grinnell, EMCO Wheaton, OPW or approved equal.
B. Pipe Alignment Guides: Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.
C. Swivel Joints: Fabricated steel, bronze, ductile Iron or cast steel body, double ball bearing race, field lubricated, with rubber or Buna-N o-ring seals.

2.12 ELECTRIC HEAT TRACE (Freeze Protection)
A. Manufacturers: Raychem XL-Trace or approved equal.
B. General: Provide a complete UL listed and FM approved system of heating cables, components and control for preventing pipes from freezing.
C. **Cable:** Self-regulating cable with nickel-copper bus wires embedded in conductive polymer core with dielectric polyolefin jacket, braided tinned copper ground and outer jacket of polyolefin. Cable shall vary power output in response to temperature all along its length with a self-regulating factor of at least 90%.

D. **Components:** Control enclosures shall be NEMA 4X rated. Connection system shall not require stripping of wires.

E. **Control:** Thermostatic control with ambient sensor set at 40 F.

F. **Installation:**
   1. Apply "Electric Traced" labels to outside of insulated pipe.
   2. Attached cable to metal pipe with glass cloth tape and plastic pipe with aluminum tape.
   3. Adjust pipe insulation size to accommodate maintenance tape.
   4. Follow manufacturer's installation instructions.
   5. Provide alarm as an addressable point in the fire alarm system. Coordinate with fire alarm contractor.

### 2.13 PIPE MARKERS

A. **Color and Lettering** shall conform to ASME A13.1.

B. **Fire service piping labels** shall be red background with white lettering. Legend shall indicate service of pipe.

C. **Plastic Pipe Markers:** Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

D. **Plastic Tape Pipe Markers:** Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

### PART 3 EXECUTION

#### 3.1 PREPARATION - PIPING

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges, unions or grooved couplings.

#### 3.2 INSTALLATION - PIPING

A. Install piping in accordance with NFPA 13 \ NFPA 13R for sprinkler systems.

B. Install piping in accordance with NFPA 14 for standpipe and hose systems.

C. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

D. Install piping to conserve building space, to not interfere with use of space and other work.

E. Group piping whenever practical at common elevations.
F. Install pipe sleeve at piping penetrations through footings, partitions, walls, and floors. Seal pipe and sleeve penetrations to maintain fire resistance equivalent to fire separation.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Pipe Hangers and Supports:
   1. Install in accordance with NFPA 13 and NFPA 14.
   2. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
   3. Place hangers within 12 inches of each horizontal elbow.
   4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Where installing several pipes in parallel and at same elevation, provide multiple or trapeze hangers.
   7. Install copper plated hangers and supports for copper piping.
   8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

I. Slope piping and arrange systems to drain at low points.

J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

K. Do not penetrate building structural members unless indicated.

L. Where more than one piping system material is specified, install compatible system components and joints. Install flanges, union, and couplings at locations requiring servicing.

M. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

N. Install valves with stems upright or horizontal, not inverted. Remove protective coatings after installation.

O. Install gate, ball, or butterfly valves for shut-off or isolating service.

P. Install drain valves at main shut-off valves, low points of piping and apparatus.

3.3 INSTALLATION – HEAT TRACE

A. Provide electric heat trace and insulation on wet piping subject to freezing.

B. Heat trace failure is an alarm point in the building fire alarm system. Provide control point(s) and coordinate with the alarm system subcontractor.

3.4 INSTALLATION – EXPANSION FITTINGS AND LOOPS

A. Install Work in accordance with ASME B31.9.

B. Provide structural work and equipment required for expansion and contraction of piping. Verify anchors, guides, and expansion joints provide and adequately protect system.
C. Provide support and anchors for controlling expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

D. Provide grooved piping systems with minimum one joint per inch pipe diameter instead of flexible connector supported by vibration isolation. Grooved piping systems need not be anchored.

3.5 INSTALLATION – SEISMIC CONTROLS

A. Provide seismic restraints and hangers in compliance with NFPA 13.

B. Seismic Bracing: Follow NFPA 13 and the following.
   1. Bracing shall be bidder designed to resist seismic loading.
   2. Provide seismic calculations as required for Ip = 1.5.

3.6 INSTALLATION – FIRESTOPPING AND SEALS AT PARTITIONS

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. Primers must comply with VOC limits per Green Seal standards GS-03 (1997), GS-11 (1993), or SCAQMD Rule #1113 (2004).

C. Place intumescent coating in sufficient coats to achieve rating required.

D. Clean adjacent surfaces of firestopping materials.

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.

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.

   2. Install escutcheons where piping penetrates non-fire rated surfaces in occupied spaces.

   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 air tight. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.7 INSTALLATION - IDENTIFICATION

A. Identification is not required on sprinkler branch lines and run-outs to heads.
B. Identification is required on:
   1. Bulk mains
   2. Incoming fire service
   3. FDC piping
   4. Standpipe (not in stairwell)

C. Identify service and flow direction (and pressure where more than one pressure is used). Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction. Install a minimum of one label for each story traversed by piping.

D. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

E. Install labels with sufficient adhesive for permanent adhesion.

3.8 INTERFACE WITH OTHER PRODUCTS

A. Inserts:
   1. Install inserts for placement in concrete forms.
   2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Install hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

3.9 MANUFACTURER'S FIELD SERVICES

A. Furnish inspection services by flexible pipe manufacturer's representative for final installation and certify installation is in accordance with manufacturer's recommendations and connectors are performing satisfactorily.

END OF SECTION
SECTION 21 12 00
FIRE SUPPRESSION STANDPIPES

PART 1  GENERAL

1.1  SUMMARY

A. Section includes design and installation of entire standpipe system from fire department connection to fire hose connection.

B. Provide Class I, Class II, or Class III standpipe systems in compliance with NFPA 13, NFPA 14, and local jurisdiction.

1.2  QUALITY ASSURANCE

A. Perform work in accordance with NFPA 14, FM approval guide, state and local municipality having jurisdiction.

PART 2  PRODUCTS

2.1  VALVES

A. Manufacturers: Potter Roemer, Nibco, Milwaukee or approved equal.

B. Hose Connection Valve: Angle type; brass finish; 2-1/2 inch size, thread to match fire department hardware, 300 psi working pressure, with threaded cap and chain of brass finish.

2.2  FIRE DEPARTMENT CONNECTION

A. Manufacturer: Potter-Roemer or approved equal.

B. Wall Type: Cast brass flush mounted wall type with brass finish.

C. Threaded Inlets: Two-way 2-1/2" connections with fire department threads. Threaded cast brass plug and chain of matching material and finish.

D. Storz Inlet: Hard coated aluminum with blind cap and chain.

E. Drain: 3/4 inch automatic drip, outside or connected to drain.

F. Label: "Standpipe - Fire Department Connection".

PART 3  EXECUTION

3.1  INSTALLATION

A. Install in accordance with NFPA 14.

3.2  FIELD QUALITY CONTROL

A. Test entire system in accordance with NFPA 14.
B. Test must be witnessed by Authority having jurisdiction.

3.3 CLEANING

A. Flush entire piping system of foreign matter.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
   A. Section includes wet-pipe sprinkler system design, installation, and certification.

1.2 SYSTEM DESCRIPTION
   A. This section requires design and installation of wet pipe sprinkler systems for building fire protection. For areas subject to freezing, see Section 21 13 16 for design and installation of dry pipe sprinkler systems.
   B. Perform work in accordance with NFPA 13 \ NFPA 13R, state and local municipality having jurisdiction.
   C. Determine volume and pressure of incoming water supply from water flow test data. Revise design when test data become available prior to submittals.
   D. Interface system with building fire and smoke alarm system.
   E. Provide fire department connections. Note if location(s) are indicated on Drawings.
   F. Fire suppression system shall not contain ozone depleting substances such as halons, CFC’s and HCFC’s.

PART 2 PRODUCTS

2.1 SPRINKLERS
   A. Manufacturers: Tyco, Reliable, Viking or approved equal.
   B. Provide “quick response” heads in all residential occupancies.
   C. Provide “quick response” heads in all light hazard occupancies.
   D. Suspended T-bar Ceiling Type:
      1. Type: Semi-recessed pendant type with matching escutcheon plate.
      2. Sprinkler and escutcheon plate finish: White enamel factory finish.
      3. Fusible link: Glass bulb type temperature rated for specific area hazard.
   E. GWB Ceiling Type:
      1. Type: Semi-recessed pendant type with matching escutcheon plate.
      2. Sprinkler and escutcheon plate finish: White enamel factory finish.
      3. Fusible link: Glass bulb type temperature rated for specific area hazard.
   F. Exposed Area Type:
      1. Type: Standard upright type.
      2. Finish: Brass
      3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
G. Side wall Type:
   1. Type: Standard / Semi-recessed horizontal side wall type.
   2. Sprinkler and escutcheon plate finish: White enamel factory finish.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

H. Guards: Finish matching sprinkler finish.

2.2 PIPING SPECIALTIES

A. Electric Alarm: Electrically operated red enameled gong with pressure alarm switch.
B. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts.

2.3 FIRE DEPARTMENT CONNECTION

A. Manufacturer: Potter-Roemer or approved equal.
B. Wall Type: Cast brass flush mounted wall type with brass finish.
C. Threaded Inlets: Two-way 2-1/2" connections with fire department threads. Threaded cast brass plug and chain of matching material and finish.
D. Storz Inlet: Hard coated aluminum with blind cap and chain.
E. Drain: 3/4 inch automatic drip, outside or connect to drain.
F. Label: “Sprinkler - Fire Department Connection".

2.4 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Controls: Supervisory switches. Coordinate with fire alarm section of work.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with NFPA 13 / NFPA 13R.
B. Install buried shut-off valves in valve box. Furnish post indicator.
C. Install pressure gauges on each side of sprinkler alarm valve.
D. Install approved backflow assembly at sprinkler system water source connection.
E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handle.
F. Locate outside alarm on building exterior wall.
G. Place pipe runs to minimize obstruction to other work.
H. It shall be a specific requirement that insofar as possible, all sprinkler system mains and branches shall be installed as close as possible to the structural members, not the ceiling.
I. Install main piping in concealed spaces above finished ceilings or soffits; branch piping in joist space or other concealed space to sprinkler heads.

J. Center sprinklers in two directions in ceiling tile and install piping offsets.

K. Install guards on sprinklers exposed to potential damage.

L. Provide drains at system low points.

M. Hydrostatically test entire system.

N. Testing must be witnessed by Authorities having jurisdiction.

3.2 CLEANING

A. Flush entire piping system of foreign matter.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

A. Apply masking tape or paper cover to protect concealed sprinklers, cover plates, and sprinkler escutcheons not receiving field paint finish. Remove after painting. Replace painted sprinklers with new.

END OF SECTION
SECTION 21 13 16
DRY-PIPE SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SUMMARY
A. Section includes dry-pipe sprinkler system design, installation, and certification.

1.2 SYSTEM DESCRIPTION
A. Determine volume and pressure of incoming water supply from water flow test data. Revise design when test data become available prior to submittals.
B. Interface system with building fire and smoke alarm system.
C. Provide fire department connections. Note if location(s) are indicated on Drawings.
D. Fire suppression system shall not contain ozone depleting substances such as halons, CFC’s and HCFC’s.

1.3 QUALITY ASSURANCE
A. Perform work in accordance with NFPA 13 \ NFPA 13R, state and local municipality having jurisdiction.

PART 2 PRODUCTS

2.1 SPRINKLERS
A. Manufacturers: Tyco, Reliable, Viking or approved equal.
B. Suspended T-bar Ceiling Type:
   1. Type: Semi-recessed pendant type with matching escutcheon plate.
   2. Sprinkler and escutcheon plate finish: White enamel factory finish.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
C. GWB Ceiling Type:
   1. Type: Semi-recessed pendant type with matching escutcheon plate.
   2. Sprinkler and escutcheon plate finish: White enamel factory finish.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
D. Exposed Area Type:
   1. Type: Standard upright type.
   2. Finish: Brass
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
E. Side wall Type:
   1. Type: Standard \ Semi-recessed horizontal side wall type with matching escutcheon plate.
   2. Sprinkler and escutcheon plate finish: Brass \ White enamel factory finish.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
F. Guards: Finish matching sprinkler finish.
2.2 PIPING SPECIALTIES

A. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, bronze main seat and mechanism to automatically actuate electric alarm with test and drain. Pressure gauges each side of valve. Viking or approved equal.

B. Electric Alarm: Electrically operated red enameled gong with pressure alarm switch.

C. Pressure Switch: Two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

2.3 AIR COMPRESSOR

A. Manufacturers:
   1. Bell & Gossett
   2. Quincy
   3. Ingersoll Rand
   4. Jenny
   5. Gast

B. Compressor: Single unit, electric motor driven, motor, motor starter, safety valves, check valves, air maintenance device incorporating electric pressure switch and unloading valve.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with NFPA 13 \ NFPA 13R.

B. Install buried shut-off valves in valve box. Install with post indicator.

C. Install approved backflow assembly at sprinkler system water source connection.

D. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handle.

E. Install outside alarm on exterior building wall.

F. Install piping to minimize obstruction with other work.

G. It shall be a specific requirement that insofar as possible, all sprinkler system mains and branches shall be installed as close as possible to the structural members, not the ceiling.

H. Install main piping in concealed spaces above finished ceilings or soffits; branch piping in joist space or other concealed space to sprinkler heads.

I. Center sprinklers in two directions in ceiling tile and install piping offsets.

J. Install guards on sprinklers exposed to potential damage.

K. Install air compressor on vibration isolators.

L. Provide drains at system low points.

M. Hydrostatically test entire system.
N. Test must be witnessed by Authority having jurisdiction.

3.2 CLEANING
A. Flush entire piping system of foreign matter.

3.3 PROTECTION OF INSTALLED CONSTRUCTION
A. Apply masking tape or paper cover to protect concealed sprinklers, cover plates, and sprinkler escutcheons not receiving field paint finish. Remove after painting. Replace painted sprinklers with new.

END OF SECTION
PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Conform to General Conditions, Supplementary Conditions, the modifications thereto and Division 01 - General Requirements for all work in Division 22.

1.2 SUMMARY

A. Design Intent: Install additional residential unit water heaters. Separate shared hot water service into individual units. Provide new T&P, drain pan and condensate drainage.

B. Provide labor, materials and appliances necessary for satisfactory installation of mechanical work ready to operate in strict accordance with these specifications and drawings. Work of Division 22 includes, but is not limited to, that as delineated in the following specification sections:

22 00 00 Plumbing General Conditions
22 05 00 Common Work Results for Plumbing
22 07 00 Plumbing Insulation
22 11 00 Facility Water Distribution
22 13 00 Facility Sanitary Sewerage
22 30 00 Plumbing Equipment

C. TEST AND BALANCE: Provided by 23 05 93. Provide all necessary coordination, assistance and documentation.

1.3 CODES AND STANDARDS

A. Conform to following code and agency requirements having jurisdictional authority over mechanical installations.

1. Uniform Plumbing Code (UPC) with local amendments.
2. International Mechanical Code (IMC) with local amendments.
6. Requirements of OSHA and EPA.
8. ASME code for construction of pressure vessels.
10. ASTM, ANSI and NEMA standards, as referenced in subsequent sections.
11. Local Sewer District Requirements.
12. Local Water District Requirements.
13. Local Health Department Requirements.
1.4 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to International Building Code with local amendments, FM and UL for fire resistance ratings and surface burning characteristics.

1.5 PRODUCT SUBSTITUTIONS:

A. Manufacturers and models of equipment and material indicated herein and on drawings are those upon which mechanical design is based. Other manufacturers with products considered equal in general quality may be listed without specific model designation. Manufacturers not listed must be submitted for approval.

B. Substitutions will be evaluated based on product manufacturer only. Specific product model, specifications, options and accessories will be evaluated during submittals. Approval of a manufacturer substitution does not constitute approval of the submitted product.

C. Any equipment other than the basis of design is considered a substitution.

D. In selecting substitute equipment, the Contractor is responsible for and must guarantee equal performance and fit. Cost of redesign and all additional costs incurred to accommodate the substituted equipment shall be borne by the Contractor.

E. Unless indicated otherwise, "or approved" may be assumed for all products in Division 22.

1.6 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” of Division 22 and all additional products noted on drawings or required for completion of sequence of operations.

B. Submittals shall be complete in one PDF file with bookmarks for each Division. Multi-part submittals will be returned without review.

1. First Page: Name of Project, Owner, Location & Contracting Company.
2. Index Page: List of specification sections with contents by Tag or item.
3. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

C. Clearly indicate on each page the equipment schedule designation (Tag) and/or specification section, as applicable. Indicate selected model and all accessories intended for use.

D. Equipment vendor cover page with contact information shall precede submittal by that vendor.

E. Submitted product information shall include (as applicable) but not be limited to the following information:

1. Product description
2. Manufacturer and model
3. Dimensions
4. Performance Ratings (i.e. capacity, rpm, HP, temperature)
5. Construction Materials
6. Ratings (i.e. UL, ASTM, NEMA, etc)
7. Electrical data
8. Sound level data (corresponding to scheduled values)
9. Vibration Isolation
10. Controls and wiring diagrams
11. Accessories
12. Engineering technical data (i.e. pressure drops, leakage rates, pump curves)
F. If requested by Architect or Engineer, submit Manufacturer's Installation Instructions on any equipment, procedures, or certifications so requested.

G. Do no ordering, fabrication or manufacturing of products until return of approved submittals.

1.7 SHOP DRAWINGS

A. The Contractor shall also submit drawings and/or diagrams for review and for job coordination in all cases where deviation from the Contract Drawings are contemplated because of job conditions, interference or substitution of equipment, or when requested by the Engineer for purposes of clarification of the Contractor’s intent. Also submit detailed drawings, rough-in sheets, etc., for all special or custom-built items or equipment. Drawings and details under the section shall include (but not be limited to) the following, where applicable to this project:
   1. Electrical interlock wiring diagrams.
   2. Piping layout plans and interference details.
   3. Custom sink layout.

B. By submission of plumbing shop drawings, the Contractor acknowledges that coordination has been done to ensure that all piping fits and no conflicts exist.

C. The Architect’s review of shop drawings shall not relieve the Contractor of responsibility for deviations from the Contract drawings or specifications, unless he has, in writing, called the attention of the Architect to such deviations at the time of the submission, nor shall it relieve him from responsibility for errors or omission in such shop drawings.

1.8 PLUMBING PERMIT

A. Plumbing contractor shall prepare all documents for plumbing permit application, submit for and obtain the permit. All costs and fees to obtain the permit shall be paid by the Plumbing Contractor.

B. Contractor shall not commence work until permit is obtained. Contractor is solely responsible to insure that the permit application and any revisions are submitted in a timely manner so as not to impact project schedule.

1.9 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.9 – Building Services Piping for installation of piping systems and ASME Section IX – Welding and Brazing Qualifications for welding materials and procedures.

B. Perform Work in accordance with the Uniform Plumbing Code including State and local amendments.

C. Provide products requiring electrical connections listed and classified by UL as suitable for purpose specified and indicated.

D. Perform Work in accordance with Washington State Energy Code.

1.10 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years’ experience.

B. Installer: Company specializing in performing Work of this section with minimum three years’ experience.
1.11 SEQUENCING

A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect all equipment, materials, and insulation from weather, construction traffic, dirt, water, chemicals, and damage by storing in original packaging and under cover. Where original packaging is insufficient, provide additional protection. Maintain protection in place until installation.

C. Inspect all products and materials for damage prior to installation.

D. Protect piping from all entry of foreign materials by providing temporary end caps or closures on piping and fittings. Furnish temporary protective coating on cast iron and steel valves.

E. Protect heat exchangers and tanks with temporary inlet and outlet caps. Maintain caps in place until installation.

F. Protect materials and finishes during handling and installation to prevent damage.

G. Comply with manufacturer's installation instruction for rigging, unloading and transporting units.

H. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.13 ENVIRONMENTAL REQUIREMENTS

A. Do not apply fire stopping materials when temperature of substrate material and ambient air is below 60 degrees F. Maintain this minimum temperature before, during, and for minimum 3 days after installation of fire stopping materials.

B. Provide ventilation in areas to receive solvent cured materials.

C. Do not install underground piping or valves when bedding is wet or frozen.

D. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer. Maintain temperature during and after installation for minimum period of 24 hours.

E. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

1.14 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

B. Verify by field measurements, sizes and configurations are compatible with wall construction and layout.

C. Existing systems and utility lines indicated on drawings are in accordance with information furnished to the Architect and may not be complete. Contractor is responsible for locating, uncovering, disposing of or maintaining existing systems.
1.15 COORDINATION

A. Visit the site and become familiar with existing conditions affecting work.

B. Verify locations of any overhead or buried utilities on or near site. Determine such locations in conjunction with all public and private utility companies and with all authorities having jurisdiction.

C. Existing systems and utility lines indicated on drawings are in accordance with information furnished to the Architect and may not be complete. Contractor is responsible for locating, uncovering, disposing of or maintaining existing systems.

D. Plumbing drawings are diagrammatic and do not indicate all possible site conditions. The contractor shall verify all measurements, dimensions and connections on site and coordinate between trades to preclude interferences. The contractor shall provide adjustments to piping as necessary to fit conditions including but is not limited to relocation, offsets, and transitions.

E. In the event of a conflict with other trades of work, the following priority from highest to lowest shall be followed: Structural, lighting, HVAC, plumbing/piping and sprinklers. Starting with the lowest priority, the HVAC, plumbing, and sprinkler contractors shall provide whatever materials, offsets, labor etc. is required to resolve the conflict.

F. When discrepancies occur between plans and specifications, the Architect will determine which takes precedence and the Contractor shall perform the selected requirement at no additional cost.

G. Prior to ordering equipment cross-check plumbing and electrical drawings and specifications to assure proper location and electrical characteristics of connections serving mechanical and electrical equipment.

H. Advise the Architect of any modifications required to suit equipment furnished. Costs for modifications due to equipment substitution will be borne by the contractor.

I. Wherever conflicts occur between different parts of the Contract Documents the greater quantity, the better quality, or larger size shall prevail unless the Architect informs the Contractor otherwise in writing.

J. The scale of each drawing is relatively accurate, but the Contractor is warned to obtain the necessary dimensions for any exact takeoffs from the Architect. No additional cost to the Owner will be considered for failure to obtain exact dimensions where not clear or in error on the drawings. Any device or fixture roughed in improperly and not positioned on implied centerlines or as required by good practice must be repositioned at no cost to the Owner.

K. Where the word ‘verify’ is used on the documents, the contractor shall field verify the existing conditions and modify the scope of the installation as required to meet the verified conditions without additional cost to the Owner.

L. Coordinate trenching, excavating, bedding, backfilling of buried systems with requirements of this specification.

M. Coordinate wall openings, piping rough-in locations, concrete housekeeping pads, and electrical rough-in locations to accommodate Work of this Section.
1.16 CUTTING, FITTING, REPAIRING AND PATCHING

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where necessary for installation of plumbing work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, where possible, by setting sleeves, frames, etc., and by coordinating for openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for piping.

C. Cut all holes neatly and as small as possible to admit work. Perform cutting in manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

1.17 SALVAGE

A. Remove excess piping and plug or cap any unused branch connections. Remove scrap pipe and all other excess materials from the site.

B. Comply with contractor’s Construction Waste Management Plan.

1.18 ELECTRICAL

A. Motors:
   1. Temperature Rating: Rated for 40 degree C environment with maximum 50 degree C temperature rise for continuous duty at full load.
   2. Starting Capability: Not less than 12 starts per hour.
   3. Phase Characteristics: Squirrel-cage induction poly-phase motors for 3/4 HP and larger, and capacitor-start single-phase motors for 1/2 HP and smaller. At equipment manufacturer's option, 1/6 HP and smaller may be split-phase type.
   4. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors.
   5. Enclosure Type: Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation, and guarded drip-proof motors where exposed to contact by employees or building occupants. Weather-protected Type I for outdoor use, Type II, where not housed.
   7. Name Plate: Indicate full identification of manufacturer, ratings, characteristics, construction, special features and similar information.
   8. All motor efficiencies shall conform to Washington State Energy Code and NEMA MG-1.

B. Motor Starters: By plumbing equipment manufacturer where factory mounted controls are provided. Variable frequency drives by Division 22, all other starters provided by Electrical Contractor.

C. Power Wiring: By Electrical Contractor.

D. Control Wiring: Responsibility of Division 22, including all line and low voltage control wiring. Owner will not entertain additional cost due to lack of coordination between Plumbing Contractor and Electrical Contractor.

1.19 EXTRA MATERIALS

A. Furnish one set of mechanical seals for each pump where such seals exist.
1.20 PROJECT CLOSEOUT

A. Completion, submission and approval of the following is required for final project closeout.
   1. Execution of Architect's and Engineer’s final observation reports (punchlist)
   2. Operating and Maintenance Instructions
   3. Operating and Maintenance Manual
   4. Equipment and Pipe Cleaning
   5. Record Drawings
   6. Testing
   7. Commissioning
   8. Warranty

B. See Division 01 for additional requirements.

1.21 OPERATING AND MAINTENANCE INSTRUCTIONS

A. General: In addition to requirements of Division 01, following initial operation of plumbing systems and prior to acceptance by the Architect, perform the following services.

B. At least two weeks prior to each instruction period, give written notification of readiness to proceed to the Architect and Owner, and obtain mutually acceptable dates.

C. Conduct demonstrations and instructions for the Owner's representatives, pointing out requirements for operating, servicing and maintaining equipment and systems. Describe general system operation and specific equipment functions. Cover all equipment calibration, setpoint adjustment, safeties and alarms.

D. Furnish qualifications of Contractor's personnel in charge of the instruction; foreman position is minimum acceptable. Where equipment startup is performed by supplier’s or manufacturer’s personnel, those personnel should also provide training on that equipment.

E. During demonstrations and instructions include and reference information from maintenance manuals and contract drawings.
   1. Provide documentation of all instruction which includes:
      a. Date and time of instruction
      b. Name, affiliation and qualifications of the instructor
      c. Name and affiliation of the attendees
      d. Topics, systems, and equipment covered
      e. Length of instruction

F. Minimum duration of instruction periods:
   1. Plumbing Systems 2 hours

1.22 OPERATING AND MAINTENANCE MANUALS

A. Contents: Furnish, in accord with Division 1, one PDF and one bound copy of operating and maintenance manuals to include the following:
   1. Manufacturers, suppliers, contractor names, addresses and phone numbers.
   2. Warranty service contractors' names, address and phone numbers (if different from above).
   3. Schedule and description of routine maintenance for each component to include oiling, lubrication and greasing data.
   4. Test data log.
   5. Manufacturer's cuts and rating tables, including brochures for all submittal items.
   6. Part numbers of all replaceable items.
7. Control diagrams and operation sequence.
8. Written guarantees.
9. Record drawings corrected and completed.
10. Completed equipment start-up forms and checklists.

B. Operation and Maintenance Data:
1. Submit frequency of treatment required for interceptors. Include, spare parts lists, exploded assembly views for pumps and equipment.
2. Submit fixture, trim, exploded view and replacement parts lists.
3. Submit replacement part numbers and availability, and nearest service depot location and telephone number.

C. Binders:
1. Furnish typewritten or printed index and tabbed dividers between principal categories.

D. Imprint on cover:
1. Name of project.
2. Owner.
3. Location of project.
5. Contractor.
6. Year of completion.

E. Imprint on backing:
1. Name of project.
2. Year of completion.

F. Submittals:
1. Preliminary Copies: Prior to scheduled completion of the project, submit one PDF copy for review by the Architect.
2. Final Copies: After approval of the preliminary copy, submit one PDF and one bound copy to the Owner.

1.23 EQUIPMENT AND PIPE CLEANING

A. Clean interior and exterior of all equipment. Equipment shall be free of dirt, construction debris, corrosion, etc.

B. Adequate provisions shall be made during construction to eliminate dirt, debris or other material from entering and collecting inside of pipe and equipment. Any collection of material shall be thoroughly cleaned before equipment startup and if necessary again before owner occupancy.

C. Clean exterior of all exposed pipe and equipment.

1.24 RECORD DRAWINGS

A. Submit one digital file with all drawings in PDF format.

B. Show location of equipment, location and size of piping. Locate all valves and similar equipment with tag or label identification. Indicate locations and elevations of exterior pipe and utility connections. Maintain continuously updated drawings during progress of project.

C. Record actual locations of equipment, clean-outs, controlling devices, and all above grade, under-floor, and buried piping.
1.25 TESTING
   A. Provide completed start-up forms and checklists.
   B. Coordinate Test and Balance with Division 23 05 93. Provide all necessary assistance and documentation.

1.26 WARRANTIES AND CONTRACTOR'S GUARANTEE
   A. All work, material and equipment shall be free of defect, complete and in perfect operating order at time of delivery to Owner.
   B. Furnish one year warranty from date of substantial completion for all systems unless specifically noted otherwise.
   C. Without cost to Owner, correct all defects and failures discovered within one year from date of final acceptance, except when in the opinion of the Architect a failure is due to neglect or carelessness of the Owner.
   D. The guarantee of the Contractor is independent of shorter time limits by any manufacturer of equipment furnished. Submit with Operation and Maintenance Manual all guarantees that exceed one year (e.g.: water heaters).
   E. Make all necessary balancing and control adjustments during first year of operation.
   F. The presence of any inspector or observer during any construction does not relieve the Contractor from responsibility for defects discovered after completion of the work.

PART 2 NOT USED

PART 3 EXECUTION

3.1 DOCUMENTATION
   A. Additional plan submittals to reviewing authority: If additional drawing submittals are required at any time during construction contractor shall submit drawings, review with authority, and pick up subsequent approved drawings. Engineer will revise and/or prepare drawings for submittal.

3.2 INSPECTION
   A. Do not allow any work to be covered up or enclosed until inspected, tested and approved by the Architect and all authorities having jurisdiction over the work.
   B. Should any work be enclosed or covered up before such inspection and test, Contractor shall at his own expense uncover work, and after it has been inspected, tested and approved, make all repairs as necessary to restore all work disturbed by him to its original condition.

3.3 FIELD QUALITY CONTROL
   A. Inspect installed fire stopping for compliance with specifications and submitted schedule.
   B. Inspect isolated equipment after installation for proper movement clearance.
C. Test domestic water piping system in accordance with applicable code and local authority having jurisdiction.

D. Test sanitary waste and vent piping system in accordance with applicable code and local authority having jurisdiction.

3.4 CLEANING

A. Clean adjacent surfaces of fire stopping materials.

B. Clean plumbing fixtures and equipment.

C. Use acceptable cleaning products per IAQ Management Plan.

3.5 MANUFACTURER’S FIELD SERVICES

A. Where PEX tubing or seismic joints are installed, furnish inspection services by manufacturer's representative and certify installation is in accordance with manufacturer's recommendations and equipment is performing satisfactorily.

3.6 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

B. Do not permit use of plumbing fixtures before final acceptance.

END OF SECTION
SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

BELLEVUE MANOR APARTMENTS
BELLEVUE, WA
JANUARY 17TH, 2020

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. General Plumbing Valves.
   2. Hangers and Supports.
   3. Firestopping.
   4. Access Panels
   5. Tags and Identification.
   6. Execution

1.2 GENERAL REQUIREMENTS

A. Comply with requirements and recommendations of Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58 and SP-69.

B. Comply with Federal ”Reduction of Lead in Drinking Water Act“ – 2011. Pipes, pipe fittings, plumbing fittings and fixtures shall be ”Lead Free“ meaning not more than a weighted average of 0.25% lead in wetted surfaces.

1.3 SCOPE

A. This section includes products, assemblies and methods applicable to more than one of the systems specified in the following sections of Division 22.

1.4 MATERIALS AND EQUIPMENT

A. Where two or more units of same class of equipment are required, use products of a single manufacturer. All equipment shall be new and free from damage.

B. Provide major equipment components with manufacturer's name, address, catalog number and capacity indicated on a nameplate, securely affixed in a conspicuous place.

C. Furnish standard and fabricated hangers and supports complete with necessary inserts, bolts, nuts, rods, washers and other accessories.

1.5 QUALITY ASSURANCE

A. Installed products shall have surface Burning Characteristics: 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Perform work in accordance with local jurisdiction’s requirements and AWS D1.1 for welding hanger and support attachments to building structure.
PART 2 PRODUCTS

2.1 GENERAL VALVE REQUIREMENTS

A. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted. Brass valves are not permitted.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

2.2 GATE VALVES

A. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham or approved equal.

B. 4 inches and Smaller: Use ball valve or butterfly valve in lieu of gate valve.

2.3 BALL VALVES

A. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham or approved equal.

B. 2 inches and Smaller: Lead-Free, NSF-61-8, UPC-IGC-157, MSS SP 110, 600 psi WOG, two piece silicon performance bronze body, bronze trim, bronze ball, full port, PTFE seats, blow-out proof stem, solder or threaded ends with union, lever handle. For insulated piping provide 2" extended handles of non-thermal conductive material. Nibco Model T/S-585-80-LF.

2.4 CHECK VALVES

A. Swing Check Valves:
   1. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham or approved equal.
   2. 2 inches and Smaller: Lead-Free, NSF-61-8, MSS SP 80, 200 psi CWP, silicone performance bronze body and cap, bronze disc with PTFE seat, Y-pattern design, solder or threaded ends. Nibco Model T/S-413-Y-LF.

B. Spring Loaded Check Valves:
   1. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham, Titan or approved equal.
   2. 2 inches and Smaller: Lead-Free, NSF-61-8, MSS SP 80, 250 psi CWP, silicone performance bronze body, in-line spring lift check, silent closing, PTFE disc, integral seat, solder or threaded ends. Nibco Model T/S-480-Y-LF.

2.5 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports with incompressible insulation inserts and shields for all piping to be insulated per 220700.
   1. Manufacturer: Pipe Shields, INC or approved equal.
   2. Material: Calcium Silicate or Uretherne per temperature application.
   3. Thickness: Insert thickness shall match required insulation thickness per 220700.

B. Plumbing Piping - DWV: Cast-iron or PVC
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
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.
7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
8. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.

C. Plumbing Piping - Water: Copper
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring, with rigid insulation inserts.
2. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
3. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
5. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
6. Floor Support for Hot Pipe Sizes 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
7. Copper Pipe Support: Copper-plated, Carbon-steel ring.

D. Secondary Pipe Positioning and Supports:
1. Makeshift, field devised methods of plumbing pipe support, such as with the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42-96. Hubbard "HOLDRITE" support systems or approved equal.
2. For vertical mid-span supports of piping 4” and under, use HOLDRITE Stout Brackets™ with HOLDRITE Stout Clamps or two-hole pipe clamps (MSS Type 26).
3. For plenum applications use pipe supports that meet ASTM E-84 25/50 standards, such as the HOLDRITE Flame Fighter™ or approved equal.

2.6 HANGER ACCESSORIES
A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.7 INSERTS
A. Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.8 ACCESS PANELS
A. Milcor or approved equal.
B. Include an allowance for a minimum of 12 access panels.
C. Architectural grade, 14 guage frame and door, painted steel or stainless steel based on application.

2.9 UNIONS AND FLANGES
A. Unions for Pipe 2 inches and Smaller:
1. Ferrous Piping: Class 150, 300 psi CWP, malleable iron, threaded.
2. Copper Piping: Class 150, 300 psi CWP, bronze unions.
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
B. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or Schedule 80 threaded PVC pipe (ASTM D2464).

2.10 FLASHING
A. Metal Flashing: 26 gage galvanized steel.
B. Metal Counterflushing: 22 gage galvanized steel.
C. Lead Flashing:
   1. Waterproofing: 5 lb./sq. ft sheet lead.
   2. Soundproofing: 1 lb./sq. ft sheet lead.
D. Flexible Flashing: 47 mil sheet butyl; compatible with roofing.
E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.11 SLEEVES
A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage galvanized steel.
B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.
C. Sealant: Acrylic
D. Size large enough to allow for movement due to expansion and to provide for continuous insulation or installation of fire sealant at fire-rated walls. Note that insulation is discontinuous at fire walls.

2.12 FORMED STEEL CHANNEL
A. Manufacturers: Allied Tube & Conduit, B-Line Systems, Unistrut or approved equal.
B. Product Description: Galvanized 12 gage steel with holes 1-1/2 inches on center.

2.13 SUPPORT ACCESSORIES
A. Pipe Alignment Guides: Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.
B. Swivel Joints: Bronze body, double ball bearing race, field lubricated, with rubber (Buna-N) o-ring seals.

2.14 FIRESTOPPING-APPLIED
A. Manufacturers: RectorSeal, Dow Corning, 3M Fire Protection or approved equal.
B. General:
   1. Fire stopping materials shall conform to Flame (F) and Temperature (T) ratings as required by applicable building codes and tested by nationally accepted test agencies per ASTM E 814 or UL 1479 fire tests for through penetrations, and ASTM E 1966 or UL 2079 for construction joints, and UL 2307 for perimeter edge joints.
   2. Fire stopping material shall be free of asbestos, PCBs, ethylene glycol, and lead.
3. Do not use any product containing solvents or that requires hazardous waste disposal.
4. Fire stopping shall be performed by a contractor trained or approved by firestop manufacturer.
5. Select products with rating not less than rating of wall or floor being penetrated.

C. Single Source Responsibility: Provide firestop systems for all conditions from a single supplier.

D. Product Description: Provide Latex caulk/sealant, Silicone caulk/sealant, Intumescent Wrap Strip, Firestop Putty, Firestop Collar or Intumescent Sleeve to meet each specific application and performance requirement.

E. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

F. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
1. Forming/Damming Materials: Mineral fiberboard, backer rod or other type recommended by Manufacturer’s tested system.

2.15 TAGS
A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches high.
B. Metal Tags: Brass, Aluminum or Stainless Steel with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges. Plain English designations.
C. Information Tags: Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.
D. Tag Chart: Plain English designations so no chart or index is required.

2.16 PIPE MARKERS
A. Color and Lettering shall conform to ASME A13.1 and UPC. Specific examples are noted in the table below.

<table>
<thead>
<tr>
<th>Service</th>
<th>Background Color</th>
<th>Letter Color</th>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Cold Water</td>
<td>Green</td>
<td>White</td>
<td>DOMESTIC COLD WATER</td>
</tr>
<tr>
<td>Domestic Hot Water</td>
<td>Green</td>
<td>White</td>
<td>DOMESTIC HOT WATER</td>
</tr>
<tr>
<td>Waste</td>
<td>Black</td>
<td>White</td>
<td>SANITARY SEWER</td>
</tr>
<tr>
<td>Vent</td>
<td>Black</td>
<td>White</td>
<td>SANITARY VENT</td>
</tr>
<tr>
<td>Condensate Drain</td>
<td>Black</td>
<td>White</td>
<td>CONDENSATE</td>
</tr>
</tbody>
</table>

B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
2.17 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color-coded head.

B. Color code plumbing valves green.

2.18 LOCKOUT DEVICES

A. Lockout Hasps: Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

B. Valve Lockout Devices: Nylon device preventing access to valve operator, accepting lock shackle.

PART 3 EXECUTION

3.1 EXISTING WORK

A. Provide access to existing piping and equipment and other installations remaining active and requiring access.

B. Extend existing piping installations using materials and methods compatible with existing installations.

3.2 SURFACE 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 of adhesives or firestopping.

C. Install backing or damming materials to arrest liquid material leakage.

D. Obtain permission from Architect/Engineer before drilling or cutting structural members.

E. Degrease and clean surfaces to receive adhesive for identification materials.

3.3 INSTALLATION-CLEARANCE

A. Appliances and equipment shall be accessible for inspection, service, repair and replacement.

B. A minimum of 36” of clearance shall be provided in front of the control side of appliances and equipment. Provide additional space when required by NEC.

3.4 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.5 INSTALLATION – ACCESS PANELS

A. Furnish access panels for installation at all concealed equipment which requires service, maintenance or adjustment to include but not limited to equipment, valves, open drains, control valves and controls.

B. Provide location layout and required size for all access panels to general contractor. Layout shall be regular and consistent, maintain a uniform wall panel height of 24” centerline above finished floor, unless noted otherwise.

C. Provide fire rated access panels where installed in fire rated assembly.

D. Provide stainless steel access panels where installed in tile surfaces.

E. Furnish access panels to general contractor for installation.

F. Paint installed access panels to match wall or ceiling. Verify that panels are not painted shut.

3.6 INSTALLATION - VALVES

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.

D. Install valves with clearance for installation of insulation and allowing access.

E. Provide access panels where valves and fittings are not accessible.

F. Insulate valves according to application in Section 22 07 00.

G. For installation of valves in domestic water systems refer to Section 22 11 00.

3.7 VALVE APPLICATIONS

A. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

B. Install globe valves for throttling, bypass, or manual flow control services.

C. Install spring loaded check valves on discharge of pumps.

3.8 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.
E. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

F. Where piping is parallel and at same elevation, provide multiple pipe or trapeze hangers.

G. Adjust hangers and supports as required to bring system to proper line and grade. Piping shall be plumb with floor and parallel/perpendicular to building structure.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping, or sheet lead packing between pipe and hanger.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

3.9 INSTALLATION – SEISMIC CONTROLS

A. Provide seismic restraints and hangers in compliance with IBC 1613 and ASCE 7.

B. Seismic Bracing: Follow IBC 1613, ASCE 7, SMACNA Seismic Restraint Manual and the following.
   1. Bracing shall be bidder designed to resist seismic loading in accord with Chapter 16 of the International Building Code, ASCE 7 or the SMACNA guideline.
   2. Provide seismic calculations as required for Ip = 1.5.

3.10 INSTALLATION-PIPING PROTECTION

A. Provide protective shield plates in concealed locations where piping, other than cast-iron or steel, is installed in studs, joists or rafters. Plates shall be 16 gage steel and cover the pipe area plus 2”. Shields may be omitted if piping is more than 1-1/2” from nearest edge of structural member.

B. Prevent contact between dissimilar metals, such as copper tubing and steel, by use of copper-plated, plastic coated, or flexible materials. All supports which contact copper tubing shall be copper plated.

3.11 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
C. Construct supports of steel members, formed steel channel or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

E. When water heaters and similar equipment are installed in a suspended application, an engineered and manufactured platform, such as the Hubbard Enterprises/HOLDRITE Suspended Water Heater Platform shall be used. Weight loading capability shall include a minimum safety factor of 2.

3.12 INSTALLATION - FLASHING

A. Provide flexible flashing and metal counterflashing where piping penetrates weather or waterproofed walls, floors, and roofs.

B. Provide acoustical lead flashing around pipes penetrating equipment rooms for sound control.

C. 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.

D. 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.

E. Seal drains watertight to adjacent materials.

F. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.13 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 insulation and caulk or fireproof airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

3.14 INSTALLATION – FIRESTOPPING AND SEALS AT PARTITIONS

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 and to uniform density and texture. Remove dam material after firestopping material has cured.
D. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

E. Place intumescent coating in sufficient coats to achieve rating required.

F. Clean adjacent surfaces of firestopping materials.

G. 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.

H. 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.
   2. Install escutcheons where piping penetrates non-fire rated surfaces in occupied spaces.
   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 air tight. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.15 INSTALLATION - IDENTIFICATION

A. Install identifying devices after completion of coverings and painting.

B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

C. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

D. Identify nonpotable water outlets with plastic permanent mounted sign in uppercase lettering which reads, “CAUTION: NONPOTABLE WATER, DO NOT DRINK.” Signage shall be black lettering on yellow background.

E. Nameplates: Identify plumbing equipment (water heaters, pumps, heat transfer equipment, tanks, and water treatment devices) with plastic nameplates.
   1. Identify in-line pumps and other small devices with name tags.
   2. Identify control panels and major control components outside panels with plastic nameplates.
   3. Identity description should be as numbered on drawings or plain English description. i.e. “WH-1” or “Rain Water Storage Tank”.
   4. Label automatic controls, instruments, and relays. Key to control schematic.
   5. Label wall controls and switches with associated equipment designation and control function, i.e. “DCP, Timer”.
F. Valve Tags: Identify valves in main and branch piping with tags.
   1. Do not provide numbered tags.
   2. Provide tags with plain English description of service and function. i.e. “Domestic Hot Water, Kitchen”

G. Pipe Labels: Identify piping, concealed or exposed, with plastic tape pipe markers.
   1. Identify service, flow direction, and pressure.
   2. Install in clear view and align with axis of piping.
   3. Locate identification on straight runs including risers and drops with spacing not to exceed 20 feet.
   4. Locate adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

H. Provide ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

I. Equipment and Valve Tag Index: Plain English designations so no chart or index is required.

3.16 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by firestop ping material installation.

3.17 SCHEDULES

A. Pipe Hanger Spacing

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM HANGER SPACING (Feet)</th>
<th>HANGER ROD DIAMETER (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS (All sizes)</td>
<td>4</td>
<td>3/8</td>
</tr>
<tr>
<td>Cast Iron (All Sizes)</td>
<td>5</td>
<td>3/8</td>
</tr>
<tr>
<td>Cast Iron (All Sizes) with 10 foot length of pipe</td>
<td>10</td>
<td>3/8</td>
</tr>
<tr>
<td>Copper Tube, 1-1/4 inches and smaller</td>
<td>6</td>
<td>1/2</td>
</tr>
<tr>
<td>Copper Tube, 1-1/2 inches and larger</td>
<td>10</td>
<td>1/2</td>
</tr>
<tr>
<td>PVC (All Sizes)</td>
<td>4</td>
<td>3/8</td>
</tr>
<tr>
<td>Steel, 3 inches and smaller</td>
<td>6</td>
<td>1/2</td>
</tr>
<tr>
<td>Steel, 4 inches and larger</td>
<td>12</td>
<td>3/8</td>
</tr>
</tbody>
</table>

B. Pipe Isolation Schedule:

<table>
<thead>
<tr>
<th>Pipe Size Inch</th>
<th>Isolated Distance from Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>120 diameters</td>
</tr>
<tr>
<td>2</td>
<td>90 diameters</td>
</tr>
<tr>
<td>3</td>
<td>80 diameters</td>
</tr>
<tr>
<td>4</td>
<td>75 diameters</td>
</tr>
</tbody>
</table>
C. Equipment isolation schedule:

<table>
<thead>
<tr>
<th>ISOLATED EQUIPMENT</th>
<th>BASE TYPE</th>
<th>THICKNESS</th>
<th>ISOLATOR TYPE</th>
<th>DEFLECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Heater</td>
<td></td>
<td></td>
<td>Copper Flex</td>
<td></td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 22 07 00
PLUMBING INSULATION

PART 1  GENERAL

1.1  SUMMARY

A.  Section Includes:
   1.  Piping system insulation.
   2.  Pipe insulation jackets.
   3.  Insulation accessories including vapor retarders and accessories.

1.2  QUALITY ASSURANCE

A.  Provide insulation tested for maximum flame spread index of 25 and maximum smoke developed
    index of not exceeding 50 in accordance with ASTM E84.

B.  All systems components subject to heat loss or gain, such as, piping, storage tanks, vessels, valves
    etc. shall be insulated to conform with the Washington State Energy Code and Evergreen
    Standards (as minimum).

1.3  IDENTIFICATION

A.  Insulation shall bear a manufacturer’s mark indicating the product R-value or K-value and
    thickness.  This mark shall be visible after installation and shall be repeated at an interval of no
    more than 10 feet.

PART 2  PRODUCTS

2.1  GLASS FIBER, RIGID

A.  Manufacturers:  Johns Manville Micro-Lok AP-T Plus or equal by Owens-Corning, Knauf,
    Manson or approved equal.

B.  Insulation:  Rigid, noncombustible.  ASTM C547.
    1.  ‘K’ factor: 0.23 at 75 degrees F.
    2.  Fiberglass or Earthwool with ECOSE
    3.  Maximum Service Temperature: 850 degrees F.
    4.  Maximum Moisture Absorption: 0.2 percent by volume.
    5.  Density: 3.0 lb/cu ft.

C.  Vapor Retarder Jacket:  ASJ+ or Type I, reinforced facing, paintable.  Longitudinal acrylic
    adhesive closure system with factory supplied butt strips.  ASTM C1136.

D.  Rigid clamp/hanger insert: Preformed, incompressible (Calcium Silicate or similar), matching pipe
    size and insulation thickness.

2.2  GLASS FIBER, BLANKET

A.  Manufacturers:  Johns Manville Micro-Flex or equal by Owens-Corning, Knauf, Manson or
    approved equal.
B. Insulation: Semi-rigid, shot-free, continuous fiber, noncombustible. ASTM C1393.
   1. ‘K’ factor: 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.
   4. Density: 2.5 lb/cu ft.

C. Vapor Retarder Jacket: Type I, reinforced facing, will accept paint. Seal with pressure sensitive tape. ASTM C1136.

2.3 POLYOLEFIN INSULATION

A. Manufacturers: IMCOA or similar.

B. Polyolefin or Polyethylene pipe insulation is NOT ACCEPTABLE for any application.

2.4 ELASTOMERIC CELLULAR FOAM

A. Manufacturers: Armacell AP/Armaflex, Aeroflex Aerocel or approved equal.

B. Preformed flexible, closed-cell, elastomeric thermal insulation: Type I, Tubular form, self-seal or continuous, 25/50-rated, CFC free, low VOC, ‘K’ factor: 0.27 at 75 degrees F. ASTM C534.


2.5 PIPE INSULATION AND EQUIPMENT JACKETS

A. PVC Plastic Pipe Jacket:
   1. Product Description: One piece molded type fitting covers and sheet material, off-white color. ASTM D1784.
   2. Thickness: 15 mil indoor, 30 mil outdoor.

B. Canvas Equipment Jacket:
   2. Composite of insulation, jacket and laces.

C. Aluminum Pipe Jacket:
   1. Thickness: 0.016 inch thick sheet. ASTM B209.
   2. Finish: Embossed
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

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. Apply insulation when building is thoroughly dry to prevent shrinkage.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulate entire piping system including fittings, valves, unions, flanges, strainers, flexible connections, pump fittings, connections to equipment and expansion joints. Use canvas jackets for valves and other irregular shapes.

D. Insulate flanges and unions with removable sections and jackets.

E. Piping Inserts and Shields:
   1. Insulation shall be continuous through supports and hangers with incompressible inserts and shields. Do not directly clamp/support pipe scheduled to be insulated.
   2. Shields: Galvanized steel saddle between pipe clevis hangers or pipe rollers and insulation. Minimum 6 inches long, of contour matching adjoining insulation; may be factory fabricated.
   3. Inserts: Between pipe clamps, hangers or rollers and piping.
   4. Insert material: Compression resistant insulating material suitable for insulation type and planned temperature range and service.
   5. Glue insulation to both sides of insert.
   6. Shields without inserts may be used at clevis hangers on refrigerant piping 5/8” and smaller with continuous insulation.

F. 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.

G. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

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. Finish insulation at supports, protrusions, and interruptions.

K. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

L. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.
3.3 SCHEDULES

A. Piping: Provide on piping as listed below. Exception: In residential units only, the water piping downstream of the submeters can be insulated per the minimum Washington State/Seattle Energy Code requirements and ESDS.

<table>
<thead>
<tr>
<th>Service</th>
<th>Insulation Type</th>
<th>PIPE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt;1”</td>
</tr>
<tr>
<td>Domestic Cold Water</td>
<td>Glass Fiber RIGID</td>
<td>1/2”</td>
</tr>
<tr>
<td>Domestic Hot Water</td>
<td>Glass Fiber RIGID</td>
<td>1”</td>
</tr>
<tr>
<td>Condensate Drains</td>
<td>RIGID / FOAM</td>
<td>1/2”</td>
</tr>
</tbody>
</table>

B. Equipment: Provide on equipment as listed below.

<table>
<thead>
<tr>
<th>Service</th>
<th>Insulation Type</th>
<th>Thickness</th>
<th>Jacket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expansion Tank</td>
<td>Glass Fiber BLANKET</td>
<td>2”</td>
<td>Reinforced White-Kraft Paper</td>
</tr>
</tbody>
</table>
SECTION 22 11 00
FACILITY WATER DISTRIBUTION

PART 1  GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Domestic water piping.
   2. Piping Accessories.

1.2 SCOPE
A. This section includes hot and cold water supply, equipment and accessories.

1.3 GENERAL REQUIREMENTS
A. Comply with Federal "Reduction of Lead in Drinking Water Act" – 2011. Pipes, pipe fittings, plumbing fittings and fixtures shall be "Lead Free" meaning not more than a weighted average of 0.25% lead in wetted surfaces.

1.4 SITE MAINS
A. Provide connections to Site water mains as indicated on drawings.

1.5 QUALITY ASSURANCE
A. The grooved coupling manufacturer’s factory trained representative shall provide on-site training for contractor’s field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review installation. (A distributor’s representative is not considered qualified to conduct the training or jobsite visit(s.).)

B. The mechanical press fitting manufacturer’s factory trained representative shall provide on-site training for contractor’s field personnel in the use of press fittings and crimping tools. The representative shall periodically visit the jobsite and review installation. (A distributor’s representative is not considered qualified to conduct the training or jobsite visit(s.).)

PART 2  PRODUCTS

2.1 DOMESTIC WATER PIPING, ABOVE GRADE
A. Copper Tubing: Type L hard drawn seamless. ASTM B88.
   1. Fittings:
   2. Joints:
      a. Solder, lead free, 95-5 tin-antimony, or tin and silver. ASTM B32.
      b. Press connection, Viega ProPress or approved equal.

B. Copper Tubing: Type L hard drawn, rolled grooved ends. ASTM B88.
   1. Copper Grooved-End Fittings: ASME B75 copper tube or bronze ASTM B584 bronze castings, with copper tube dimensioned grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted).
2. Joints: Grooved mechanical couplings meeting ASTM F1476. Victaulic or approved equal.
   a. Housing Clamps: ASTM A395 and ASTM A536 ductile iron cast with offsetting, angle-pattern bolt pads, copper-colored enamel coated, compatible with copper tubing sizes, to engage and lock designed to permit some angular deflection, contraction, and expansion.
   b. Gasket: Grade “EHP” EPDM.
   c. Accessories: Steel bolts, nuts, and washers.
   d. Design: “Installation Ready” designed for direct ‘stab’ installation onto roll grooved copper tube without prior field disassembly and no loose parts. Victaulic Style 607 QuickVic™.

C. PEX Pipe: See Section 22 11 16.

2.2 STEM TYPE THERMOMETERS

A. Manufacturers: Marsh, Trerice, Weiss or approved equal.

B. Thermometer: Blue appearing organic, lens front tube, cast aluminum case with epoxy finish, adjustable angle. ASTM E1. Trerice AX/BX.
   1. Size: 7-inch scale within 7′ of floor, 9-inch scale mounted over 7′.
   2. Window: Clear.
   4. Accuracy: 2 percent.
   5. Calibration: Degrees F.

2.3 STRAINERS

A. Manufacturers: Apollo/Conbraco, Metraflex, Titan, Nibco or approved equal.

B. 4 inch and Smaller: Threaded or Solder, 400 PSI CWP, lead-free bronze body, Y-pattern with 20 mesh stainless steel perforated screen. Apollo 59LF.

2.4 WATER HAMMER ARRESTORS

A. Manufacturers: Wade, PPP or approved equal.

B. ASSE 1010; stainless steel or copper construction, pre-charged, bellows or piston type sized in accordance with PDI WH-201.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with groove couplings, flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION - ABOVE GROUND PIPING

A. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

C. Group piping whenever practical at common elevations.

D. Install piping on interior side of building insulation.

E. Provide heat tape for all piping in unheated areas.

F. Sleeve pipe passing through partitions, walls and floors.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Protection: Where piping, other than cast iron or steel, is installed in a concealed location through holes or notches in framing (i.e. studs, joists, rafters, etc.), less than 1-1/2 from framing edge, provide shield plates. Shield plates shall be 16 gauge steel and cover the piping area within framing plus 2” on each side along framing.

I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 00.

J. Provide access panel where valves and fittings are not accessible.

K. Install non-conducting dielectric connections wherever jointing dissimilar metals.

L. Slope piping and arrange systems to drain at low points. Provide hose bibb if low point is not at a plumbing fixture.

M. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

N. Insulate piping. Refer to Section 22 07 00.

O. Install pipe identification in accordance with Section 22 05 00.

3.3 INSTALLATION - DOMESTIC WATER PIPING SYSTEMS

A. Install domestic water piping system in accordance with ASME B31.9.

B. Grade piping to drain at low points. Provide hose bibb if low point is not at plumbing fixture.

C. Install water piping on interior side of building insulation. Provide heat tape for all piping in unheated areas.

D. Install water hammer arrestors on hot and cold water of each fixture group (e.g.: one arrestor may serve each service to a toilet). Select unit sizes and install in accord with PDI Standard WH-201.

3.4 VALVES

A. Use ball valves for up to 4” piping. Gate valves are not approved for use up to 4” piping. Gate valves are for 6” piping and larger only.

B. Gate valves which are part of a valve assembly are acceptable.
3.5 INSTALLATION - THERMOMETERS AND GAUGES

A. Install gauge taps in piping.

B. Install pressure gauges with pulsation dampers. Provide needle valve or ball valve to isolate each gauge.

C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.

D. Provide instruments with scale ranges selected according to service with largest appropriate scale.

E. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

F. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.6 FIELD QUALITY CONTROL

A. Test domestic water piping system at 100 psig minimum for a period of not less than 4 hours.

3.7 CLEANING

A. Flush system with water for minimum of 60 minutes to remove all dirt and foreign materials. Use minimum of 80 psi flushing pressure.

B. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain residual from 50 to 80 mg/L.

C. Bleed water from outlets to obtain distribution and test for disinfectant residual at a minimum of 15 percent of outlets.

D. Maintain disinfectant in system for 24 hours.

E. Flush disinfectant from system until residual concentration is equal to incoming water or 1.0 mg/L.

END OF SECTION
PART 1  GENERAL

1.1  SECTION INCLUDES

A. PEX-a pipe and fittings for domestic water piping.

1.2  RELATED SECTIONS

A. Section 22 11 00 – Facility Water Distribution

1.3  REFERENCES

A. ASTM International (ASTM):
   1. ASTM D 2765 - Test Methods for Determination of Gel Content and Swell Ratio of
      Crosslinked Ethylene Plastics.
   3. ASTM F 877 - Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot-
      and Cold-Water Distribution Systems.
      Reinforcing Rings for Use with Crosslinked Polyethylene (PEX) Tubing.

B. Uponor, Inc.

1.4  QUALITY ASSURANCE

A. Installer Qualifications: Installer shall have demonstrated experience on projects of similar size
   and complexity with documentation proving successful completion of plumbing system
   installation and/or training by the PEX tubing manufacturer.

1.5  DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with
   identification labels intact.

B. Storage and Protection: Store materials protected from exposure to harmful environmental
   conditions and at temperature and humidity conditions recommended by the manufacturer.
   1. Store PEX tubing in original packaging to avoid dirt or foreign material from entering the
      tubing.
   2. Do not store PEX tubing or EP fittings outdoors or in direct sunlight. Do not use PEX
      tubing or EP fittings which has be exposed to direct sunlight for more than 30 days.

1.6  WARRANTY

A. Manufacturer's Warranty: PEX-a manufacturer system warranty shall cover piping and fittings for
   a duration of 25 years from the date of installation. Piping system warranty shall apply to potable
   water distribution and water service systems constructed of pipe and fitting products sourced from
   the same manufacturer.
PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Uponor AquaPEX Or equal by Viega

2.2 PEX PIPE AND FITTINGS


B. ProPEX Ring: Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping manufacturer and marked ASTM F1960.

C. PEX-a Fittings: elbows, adapters, couplings, plugs, tees and multi-port tees (1/2 inch through 3 inch nominal pipe size): ASTM F1960 cold-expansion fitting manufactured from the following material types:

1. UNS No. C69300 Lead-free (LF) Brass, NSF/ANSI 61.

D. (Below Grade) Pre-Sleeved Ecoflex Potable Piping (3/4 inch through 3 inch nominal pipe size): PEX-a piping, multilayered closed-cell insulation and a corrugated seamless high-density polyethylene (HDPE) jacket.

E. (Hot Water) Pre-Insulated Piping (1/2 inch through 1-1/4 inch nominal pipe size): PEX-a piping, with 1” closed-cell polyethylene foam insulation.

F. (Hot Water) Pre-Insulated Piping (1-1/2 inch through 2 inch nominal pipe size): PEX-a piping, with 1-1/2” closed-cell polyethylene foam insulation.

G. Multi-Port Tees: Multiple-outlet fitting complying with ASTM F 877; with ASTM F 1960 inlets and outlets.

1. Engineered polymer branch multi-port tee.
2. Engineered polymer flow-through multi-port tee.
5. Engineered polymer commercial flow-through multi-port tee.

H. Manifolds: Multiple-outlet assembly complying with ASTM F 877; with ASTM F 1960 outlets.

1. Engineered polymer valved manifold.
2. Engineered polymer valveless manifold.
3. Lead-free copper branch manifold.
4. Lead-free copper valved manifold.

2.3 TRANSITION FITTINGS

A. PEX-to-Metal Transition Fittings:

1. Manufacturers: Provide fittings from the same manufacturer of the piping.
2. Threaded Brass to PEX-a Transition: one-piece brass fitting with male or female threaded adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
3. Brass Sweat to PEX-a Transition: one-piece brass fitting with sweat adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
4. PEX-a to Flange Transition: Two-piece brass fitting with lead-free ProPEX adapter and steel flange conforming to ASME B 16.5.
B. PEX-to-Thermoplastic Transition Fittings: CPVC to PEX-a Transition: Thermoplastic fitting with one spigot or socket end and one ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

2.4 VALVES
A. PEX-to-PEX (1/2 inch through 2 inch nominal pipe size):
   1. Manufacturers: Provide ball valve(s) from the same manufacturer as the piping system.
   3. Lead Free (LF) Brass Ball Valve with a positive stop shoulder manufactured from C69300 brass.
B. All other valves per section 22 05 00.

2.5 PIPE SUPPORT
A. Horizontal Pipe Support: 23 ga galvanized-steel channel half-round, self-gripping for continuous, uninterrupted support of PEX pipe. Provide with nylon-coated, stainless-steel strapping with minimum 300-lb tensile strength.
B. 90-degree bend support: Snap-on metal or glass-reinforced nylon bend support sleeve for ½” and ¾” piping.
C. Drop ear bend support: Snap-on metal or glass-reinforced nylon bend support sleeve and stud wall mounting plate for ½” piping.
E. Drop Ear Elbow: 90-degree brass elbow for showerhead.
F. Makeshift, field devised methods of plumbing pipe support, such as with the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42-96. Hubbard "HOLDRITE" support systems or approved equal.

PART 3 EXECUTION
3.1 EXAMINATION
A. Site Verification of Conditions: Verify that site conditions are acceptable for installation of the domestic water piping. Do not proceed with installation until unacceptable conditions are corrected.

3.2 SCHEDULE
A. Do not use PEX tubing smaller than ½”.
B. PEX piping up to 2” may be used on this project.
C. ½” and ¾” piping may be run through framing with appropriate isolators. 1” and larger piping shall be supported with hangers.
D. Domestic Cold Water: Use Blue PEX tubing.
E. Domestic Hot Water: Use Red PEX tubing, pre-insulated.

F. Domestic Hot Water Recirculation: Use White PEX tubing, pre-insulated.

3.3 INSTALLATION

A. Install plumbing system according to approved shop drawings and coordination drawings.

B. Comply with manufacturer's product data, including product technical bulletins, installation instructions and design drawings.

C. Water velocity in piping for hot water recirculating systems shall not exceed 2 ft/sec.

D. Penetrations of tubing through framing members shall be make with engineered isolators.

E. Piping Installation:
   1. Install PEX-a Pipe Supports in compliance with Chapter 5 - "System Design and Layout" and Chapter 6 - "Installation Methods" in the Uponor Plumbing Design Assistance Manual (PDAM).
   2. Install piping in compliance with manufacturer's Plumbing Installation Guide.

F. Hangers and Supports:
   1. Horizontal PEX-a Piping Hangers: Install CTS hangers suitable for PEX-a piping in compliance with Chapter 6 - "Installation Methods" of the Uponor Plumbing Design Assistance Manual (PDAM) and local codes, with the following maximum spacing:
      a. 1 inch and below: Maximum span, 32 inches.
      b. 1-1/4 inch and above: Maximum span, 48 inches.
      c. Note: The above maximum hanger spacing requirements may be extended with the use of a continuous support channel such as Uponor PEX-a Pipe Support.
   2. Horizontal PEX-a Piping with PEX-a Pipe Channel: Install hangers for PEX-a piping with horizontal support channel in accordance with local jurisdiction and manufacturer's recommendations, with the following maximum spacing:
      a. 3/4 inch and below: Maximum span, 6 feet.
      b. 1 inch and above: Maximum span, 8 feet.
   3. Provide pipe support channel for all horizontal piping to control linear thermal expansion. Provide fix transverse and longitudinal support struts every 65 ft for hot water piping and every 150 ft for cold water piping.
   4. Vertical PEX-a Piping (<1”): Support PEX-a piping with maximum spacing of 5 feet.
   5. PEX-a Riser Supports (1” and larger): Install CTS riser clamps at the base of each floor and at the top of every other floor for domestic hot-water systems. Install mid-story guides between each floor. Install CTS riser clamps at the base of each floor and at the top of every fourth floor for domestic cold-water systems. Install mid-story guides.

G. Piping Schedule:
   1. Underground / under-building slab, domestic water piping (3 inch and below) shall be the following:
      a. 1/2 inch through 3 inch - PEX-a piping with engineered polymer (EP) or lead-free brass F1960 cold-expansion fittings. Insulate in compliance with Section - 9 "Plumbing Piping Insulation." Use the fewest possible joints and install per manufacturer's recommendations.
      b. 1/2 inch through 2 inch - Pre-insulated PEX-a piping with PEX-foam insulation with engineered polymer (EP) or lead-free brass ASTM F 1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer's recommendations.
c. 3/4 inch through 2 inch - Pre-insulated PEX-a piping with multi-layer, closed-closed cell PEX-foam insulation and a corrugated HDPE jacket with engineered polymer (EP) or lead-free brass ASTM F 1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer's recommendations.

2. In-slab, domestic water piping (3 inch and below) shall be the following: Bare PEX-a piping, pre-sleeved PEX-a piping, or pre-insulated PEX-a piping with engineered polymer (EP) or lead-free brass F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer's recommendations.

3. Aboveground domestic water piping (3 inch and below) shall be the following: PEX-a piping, with engineered polymer (EP) or lead-free brass F1960 cold-expansion fittings.


I. Field Quality Control: Do not expose PEX piping or EP fittings to direct sunlight for more than 30 days.

3.4 CLEARANCES AND WARNINGS

A. Do not weld, glue or use adhesives or adhesive tape on PEX tubing.

B. Do not apply open flame to PEX tubing or EP fittings.

C. Do not install PEX tubing within 6” of any gas appliance vent.

D. Do not install PEX tubing within the first 18” of a connection to a water heater.

E. Do not install PEX tubing within 12” of any recessed light fixture.

F. Do not solder within 18” of any PEX tubing or EP fittings.

G. Do not install PEX tubing between the tub/shower valve and tub spout.

H. Do not install PEX tubing in direct view of fluorescent lighting.

I. Do not install PEX tubing within five feet of UV light.

J. Prevent direct contact between urethane foam and EP fittings.

K. Do not reuse EP fittings. Brass fitting may be disconnected and reused.

3.5 PIPE LABELS

A. Use permanent, flexible, vinyl stickers with pressure-sensitive acrylic as approved by piping manufacturer.
3.6  MANUFACTURER'S FIELD SERVICES

A. Where PEX tubing or seismic joints are installed, furnish inspection services by manufacturer's representative and certify installation is in accordance with manufacturer's recommendations and equipment is performing satisfactorily.

END OF SECTION
PART 1  GENERAL

1.1  SUMMARY

A.  Section Includes:
   1.  Sanitary sewer piping, buried within 5 feet of building.
   2.  Sanitary sewer piping, above grade.
   3.  Condensate drains.
   4.  Floor drains.
   5.  Cleanouts.

PART 2  PRODUCTS

2.1  SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A.  Cast Iron Pipe & Fittings: ASTM A888, CISPI 301, hub-less. Made in USA by AB&I, Charlotte or Tyler marked with collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.
   1.  Fittings: ASME B16.45 or ASSE 1043, long pattern cast iron, hubless.
   2.  Joints: Heavy-Duty, Shielded, Stainless-Steel coupling with all type 304 stainless steel shield and band assembly, 80 in/lbs worm drive. ASTM C-564 Neoprene gasket. CISPI 310 and certified by NSF international. Minimum 4 clamps up to 4”, 6 clamps for 5” and larger. Husky SD 4000, Clamp-All 125 or approved equal.

B.  ABS Pipe: Schedule 40, ABS material, DWV, Cellular Core, bell and spigot style solvent sealed ends. NSF Standard 14, ASTM F628, ASTM D3965.
   1.  Fittings: ABS, DWV, ASTM D2661.


2.2  SANITARY SEWER PIPING, ABOVE GRADE

A.  Cast Iron Pipe & Fittings: ASTM A888, CISPI 301, hub-less. Made in USA by AB&I, Charlotte or Tyler marked with collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.
   1.  Fittings: ASME B16.45 or ASSE 1043, long pattern cast iron, hubless.
   2.  Joints: Heavy-Duty, Shielded, Stainless-Steel coupling with all type 304 stainless steel shield and band assembly, 80 in/lbs worm drive. ASTM C-564 Neoprene gasket. CISPI 310 and certified by NSF international. Minimum 4 clamps up to 4”, 6 clamps for 5” and larger. Husky SD 4000, Clamp-All 125 or approved equal.
B. Copper Tube (Use only for short piping sections where dimensional constraints require thin wall pipe): ASTM B306 DWV.
   2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver.

C. Steel Pipe (water closet connections only): Schedule 40, galvanized. ASTM A53.
   1. Fittings: Cast Iron, ASME B16.4, threaded fittings.

   1. Fittings: ABS, DWV, ASTM D2661.


2.3 NO-HUB TRANSITION COUPLING FOR JOINING CAST IRON AND PVC PIPE

A. Coupling shall be Tested and Certified to ASTM C 1460 and be constructed with type 304 stainless steel shield, thickness 0.015, gasket material to meet ASTM C564, 1-1/2" - 4" will be 3" wide with four (4) 304 stainless steel bands and 6" - 10" will be 4" wide with six (6) 304 stainless steel bands and 3/8" 305 stainless steel hex head screws torqued to 80 inch pounds. Husky SD 4000 PVC x CI or approved equal.

2.4 EQUIPMENT DRAINS (CONDENSATE)

A. Copper Tubing: Type L, hard drawn. ASTM B88.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
   2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

   1. Fittings: Schedule 40 CPVC. ASTM D2846.

2.5 FLOOR DRAINS

A. Manufacturers: Zurn, Josam, J.R. Smith, Wade or approved equal.

B. General Service: Cast iron body, membrane clamp, adjustable collar, polished nickel bronze strainer, trap primer connection. Provide funnel where scheduled.

C. Garage: Square top heavy duty parking deck drain with coated cast iron body, gasketed drain support flange, heavy duty slotted grate, underdeck clamp.

2.6 CLEANOUTS

A. Manufacturers: Zurn, J.R. Smith, Josam, Wade or approved equal.

B. Exterior or interior vehicle areas: Heavy-Duty round coated cast iron body and cover with bronze plug.
C. Exterior Surfaced Areas: Round cast nickel bronze access frame with bronze gasket threaded plug and non-skid cover.

D. Exterior Unsurfaced Areas: Line type with lacquered cast iron body and bronze gasket threaded plug.

E. Interior Finished Floor Areas: Type of ferrule, top and cover as required for the type of floor construction, finish surface and traffic conditions. Cleanout construction material to match waste piping with anchor flange, threaded top assembly, and round scored cover with gasket in service areas and round depressed cover with gasket to accept floor finish in finished floor areas. For carpet provide marker. For cast iron construction provide bronze gasket threaded plug.

F. Interior Finished Wall Areas: Cleanout construction material to match waste piping, line type with round gasket threaded plug, and round stainless steel access cover secured with machine screw. For cast iron construction provide bronze gasket threaded plug.

G. Interior Unfinished Accessible Areas: Threaded type. Provide bolted stack cleanouts on vertical waste stacks.

2.7 FLASHING AND COUNTERFLASHING

A. 3lb. lead soldered joints and seams, 24 x 24 base pad and counterflashed into pipe.

2.8 TRAP PRIMER

A. Manufacturers: PPP, Wade, J.R. Smith, Josam, Watts, Zurn or approved equal.

B. Construction: Automatic, bronze body, integral vacuum breaker.

2.9 TRAP SEAL MAINTENANCE DEVICE

A. Manufacturers: Sure-Seal, Jay R Smith or approved equal.

B. Inline floor drain trap sealer, commercial grade, neoprene rubber diaphragm and rubber sealing gaskets.

2.10 AIR GAP FITTING

A. Manufacturers: Zurn Z-1025 or equal by J.R. Smith or approved equal.

B. Construction: Inline, fixed air gap, coated cast iron.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove scale and dirt, on inside and outside, before assembly.

B. Prepare piping connections to equipment with flanges or unions.

C. Verify and provide required extensions, clamps and drain styles to match floor construction and finish.
3.2 INSTALLATION

A. Coordinate location of floor drains in mechanical spaces with mechanical contractor equipment layout.

B. Protect floor drain strainer during construction.

C. TRAPS:
   1. Install trap seal maintenance devices only where called for on plans or approved by engineer; at all other drain locations provide automatic trap primers.
   2. Install automatic trap primers throughout at site drains and floor drains except those located in showers or provided with trap seal maintenance devices.
   3. Provide access panels for automatic trap primers.
   4. Adjust automatic trap primer pressure setting for proper operation.

D. Align square floor drains with floor tiles or parallel with walls.

E. Install interceptors with top flush with adjacent surface or grade. Provide quantity and size of vents as indicated in manufacturer’s literature. Terminate vents minimum 10 feet above grade or through roof at a location determined by the architect.

3.3 CONDENSATE PIPING

A. Provide condensate piping for air-conditioning and high-efficiency gas fired equipment. Coordinate quantity required with mechanical contractor. Provide minimum 3” deep p-trap at equipment.

B. Determine best routing to nearest indirect waste using minimum 3/4” piping with minimum 1/8” per foot slope. Acceptable indirect waste locations are service sink, laundry sink, floor drain or air gap fitting into waste pipe. Provide open drain box or access panel for air gap fitting as approved by local authority. Discharge onto roof or at grade is acceptable if allowed by local code, provide splash block.

C. If proper slope cannot be achieved advise Mechanical Contractor to provide condensate pump.

3.4 INSTALLATION - BURIED PIPING SYSTEMS

A. Verify connection to existing piping system size, location, and invert are as indicated on Drawings.

B. Provide connections to site mains as indicated on drawings.

C. Grade piping at 1/4” per foot where possible, but in no case less than 1/8” per foot. Install all main vertical soil and waste stacks with provisions for expansion and extend full size to roof line as vents.

D. Install buried ABS piping per ASTM D2321 and ASTM F1668.

E. Backfill trenching with pea-gravel if available at site for other purposes. If pea-gravel is unavailable, native soil may be used for backfill if all the following conditions are met.
   1. All broken concrete and sharp stones (+1” dia.) to be removed from backfill soil.
   2. All large stones (3’ dia. or bigger) to be removed from backfill soil.
   3. Piping shall be bedded on min. 2” thickness of replaced “rock free” soil and then checked for grade.

F. Establish elevations of buried piping with not less than 3 ft of cover.
G. Establish minimum separation from other services piping in accordance with Code.

H. Provide piping layout to satisfy the UPC requirements for suds relief.

I. Route pipe in straight line.

J. Install pipe to allow for expansion and contraction without stressing pipe or joints.

K. Install plastic ribbon tape continuous over top of pipe.

L. Install trace wire continuous over top of pipe.

3.5 INSTALLATION - ABOVE GROUND PIPING

A. Route piping in orderly manner and maintain gradient at 1/4” per foot where possible, but in no case less than 1/8” per foot. Route parallel and perpendicular to walls.

B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

C. Group piping whenever practical at common elevations.

D. Install piping on interior side of building insulation.

E. Provide heat tape for all p-traps in unheated areas.

F. Sleeve pipe passing through partitions, walls and floors.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Protection: Where piping, other than cast iron or steel, is installed in a concealed location through holes or notches in framing (i.e. studs, joists, rafters, etc.), less than 1-1/2 from framing edge, provide shield plates. Shield plates shall be 16 gauge steel and cover the piping area within framing plus 2” on each side along framing.

I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

J. Provide access panel where valves and fittings are not accessible.

K. Install non-conducting dielectric connections wherever jointing dissimilar metals.

L. Establish invert elevations, slopes for drainage to 1/4 inch per foot minimum. Provide 1/8 inch per foot only where necessary and allowed by local jurisdiction. Maintain gradients.

M. Provide piping layout to satisfy the UPC requirements for suds relief.

N. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

O. Install piping penetrating roofed areas to maintain integrity of roof assembly.

P. Insulate piping. Refer to Section 22 07 00.

Q. Install pipe identification in accordance with Section 22 05 00.
3.6 INSTALLATION - SANITARY WASTE AND VENT SYSTEMS

A. Install sanitary waste and vent piping systems in accordance with ASME B31.9 and local plumbing code.

B. Support cast iron drainage piping at every joint.

C. Flash and counterflash. Install vents passing through roof with roof flashing and counterflashing assemblies. 3lb. lead soldered joints and seams, 24 x 24 base pad and counterflashed into pipe.

D. Install automatic trap primers throughout at floor drains except those located in showers. Provide access panel for trap primers.

E. Provide piping layout to satisfy the UPC requirements for suds relief.

F. Provide cleanouts every 50 feet and install at all locations required by code and to permit cleaning of all waste piping. Provide cleanouts full size of pipe, but no larger than 4”. Coordinate with Architect when cleanouts are located in finished rooms. Install cleanout threads with graphite. Locate cleanouts to clear cabinet work and to be easily accessible.

3.7 FIELD QUALITY CONTROL

A. Obtain written approval of local Plumbing Authority prior to covering or concealing any work.

B. Test sanitary waste and vent piping system to hydrostatic test of 10 feet head of water.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Water heaters.
   2. Diaphragm-type expansion tanks.

1.2 QUALITY ASSURANCE

A. Water Heater Performance Requirements: Equipment efficiency not less than prescribed by Washington State Energy Code and scheduled on drawings.

PART 2 PRODUCTS

2.1 RESIDENTIAL ELECTRIC WATER HEATERS

A. Manufacturers: Laars, Bradford White, or approved equal.
B. Type: Automatic, electric, vertical storage.
C. Tank: Glass lined welded steel, minimum 2-1/2” thermal insulation, encased in corrosion-resistant steel jacket with baked-on enamel finish. Minimum energy factor 0.90, minimum 6 year warranty.
D. Controls: UL 174, automatic water thermostat with temperature range from 120 to 170 degrees F, flanged or screw-in copper or incoloy steel elements, enclosed controls and electrical junction box. Wire double element units so elements do not operate simultaneously.
E. Accessories: Brass water connections and dip tube, drain valve, aluminum/stainless steel or magnesium anode and ASME temperature and pressure relief valve.

2.2 DIAPHRAGM-TYPE EXPANSION TANKS

A. Manufacturers: Amtrol, Armstrong or approved equal.
B. Construction: Welded steel, tested and stamped in accordance with ASME Section VIII; with pre-charged flexible EPDM diaphragm sealed into tank; steel ring base (vertical) or saddles (horizontal)
C. Accessories: Pressure gage and air-charging fitting, tank drain.
D. Installation: Before installation, charge tank with Nitrogen gas to equal domestic water line pressure at tank. Permanently mark fill pressure on tank.

PART 3 EXECUTION

3.1 INSTALLATION – WATER HEATER

A. Maintain manufacturer's recommended clearances around and over water heaters.
B. Install water heater on concrete housekeeping pad, minimum 4 inches high and 6 inches larger than water heater base on each side. For electric water heaters include incompressible insulated surface (R-10 min).

C. Anchor or strap to structure to resist horizontal displacement due to earthquake. IAPMO listed, galvanized steel, double body straps, Hubbard Quick Strap or approved equal.

D. Connect domestic hot water and domestic cold water piping to water heater connections.

E. Install the following piping accessories. Refer to Section 22 11 00.
   1. On cold water:
      a. Thermometer well and thermometer.
      b. Strainer.
      c. Pressure gage.
      d. Shutoff ball valve.
   2. On hot water:
      a. Thermometer well and thermometer.
      b. Shutoff ball valve.

F. Install discharge piping from relief valves and drain valves to nearest floor drain or indirect waste location. Determine best routing.

G. Provide pan where required or specified.

H. Install water heater trim and accessories furnished loose for field mounting.

I. Install electrical devices furnished loose for field mounting.

J. Install control wiring between water heater control panel and field mounted control devices.

END OF SECTION
PART 1   GENERAL

1.1   GENERAL REQUIREMENTS

A. Conform to General Conditions, Supplementary Conditions, the modifications thereto and Division 01 - General Requirements for all work in Division 23.

1.2   SUMMARY

A. Design Intent: Provide cabinet unit heaters for corridor ventilation. Provide multi-zone split-system heat pumps for corridor conditioning.

B. Provide labor, materials and appliances necessary for satisfactory installation of mechanical work ready to operate in strict accordance with these specifications and drawings. Work of Division 23 includes, but is not limited to, that as delineated in the following specification sections:

- 23 00 00 HVAC General Conditions
- 23 05 00 Common Work Results for HVAC
- 23 05 93 Testing, Adjusting and Balancing
- 23 07 00 HVAC Insulation
- 23 09 00 Instrumentation and Control for HVAC
- 23 23 00 Refrigerant Piping
- 23 31 00 HVAC Ducts and Casings
- 23 37 00 Air Outlets and Inlets
- 23 40 00 HVAC Filters
- 23 81 26 Split-System Air-Conditioners & Heat Pumps
- 23 83 23 Electrical Terminal Heating Units

1.3   CODES AND STANDARDS

A. Conform to following code and agency requirements having jurisdictional authority over mechanical installation.

1. Uniform Plumbing Code (UPC) with local amendments.
2. International Mechanical Code (IMC) with local amendments.
6. Requirements of OSHA and EPA.
8. ASME code for construction of pressure vessels.
10. ASTM, ANSI and NEMA standards, as referenced in subsequent sections.
11. Local Sewer District Requirements.
12. Local Water District Requirements.
13. Local Health Department Requirements.

1.4 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to International Building Code with local amendments, FM, and UL for fire resistance ratings and surface burning characteristics.

1.5 PRODUCT SUBSTITUTIONS

A. Manufacturers and models of equipment and material indicated herein and on drawings are those upon which mechanical design is based. Other manufacturers with products considered equal in general quality may be listed without specific model designation. Manufacturers not listed shall be submitted for approval, see Division 01.

B. Substitutions will be evaluated based on product manufacturer only. Specific product model, specifications, options and accessories will be evaluated during submittals. Approval of a manufacturer substitution does not constitute approval of the submitted product.

C. Any equipment other than the basis of design is considered a substitution.

D. In selecting substitute equipment, the Contractor is responsible for and shall guarantee equal performance and fit. Cost of redesign and all additional costs incurred to accommodate the substituted equipment shall be borne by the Contractor.

E. Unless indicated otherwise, “or approved” may be assumed for all products in Division 23.

1.6 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” of Division 23 and all additional products noted on drawings or required for completion of sequence of operations.

B. Electronic: 
   Submittals shall be complete in one PDF file with bookmarks for each Division. 
   Multi-part submittals will be returned without review.
   1. First Page: Name of Project, Owner, Location & Contracting Company.
   2. Index Page: List of specification sections with contents by Tag or item.
   3. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

C. Clearly indicate on each page the equipment schedule designation (Tag) and/or specification section, as applicable. Indicate selected model and all accessories intended for use.

D. Equipment vendor cover page with contact information shall precede submittal by that vendor.

E. Submitted product information shall include (as applicable) but not be limited to the following information:
   1. Product description
   2. Manufacturer and model
   3. Dimensions
   4. Performance Ratings (i.e. capacity, rpm, HP, temperature)
5. Construction Materials
6. Ratings (i.e. UL, ASTM, NEMA, etc)
7. Electrical data
8. Sound level data (corresponding to scheduled values)
9. Vibration Isolation
10. Controls and wiring diagrams
11. Accessories
12. Engineering technical data (i.e. pressure drops, leakage rates, pump curves, fan curves)

F. If requested by Architect or Engineer, submit Manufacturer's Installation Instructions on any equipment, procedures, or certifications so requested.

G. Do no ordering, fabrication or manufacturing of products until return of approved submittals.

1.7 SHOP DRAWINGS

A. The Contractor shall submit drawings and/or diagrams for review and for job coordination in all cases where deviation from the Contract Drawings are contemplated because of job conditions, interference or substitution of equipment, or when requested by the Engineer for purposes of clarification of the Contractor’s intent.

B. Submit detailed drawings, rough-in sheets, etc., for all special or custom-built items or equipment. Drawings and details under the section shall include (but not be limited to) the following, where applicable to this project:
   1. Electrical interlock wiring diagrams.
   2. Piping layout plans and interference details.

C. By submission of piping and ductwork shop drawings, the Contractor acknowledges that coordination has been done to ensure that all piping and ductwork fits and that no conflicts exist.

D. The Architect’s review of shop drawings shall not relieve the Contractor of responsibility for deviations from the Contract drawings or specifications, unless he has, in writing, called the attention of the Architect to such deviations at the time of the submission, nor shall it relieve him from responsibility for errors or omission in such shop drawings.

1.8 HVAC PERMIT

A. HVAC contractor shall obtain the Mechanical Permit. The Mechanical Permit has been submitted and paid for by the Owner. HVAC contractor is responsible to submit, pay for and obtain any additional permits required.

B. Contractor shall not commence work until permit is obtained. Contractor is solely responsible to insure that the permit application and any revisions are submitted in a timely manner so as not to impact project schedule.

C. Permit documents may include (but are not limited to) the following:
   1. Mechanical Site Plan, Vicinity Map and Elevations.
   2. Mechanical Load Calculations (Mechanical Consultant will provide load calculations to the Contractor).
   3. Energy Compliance Forms.

D. Contractor shall retain services of a third party structural engineer to provide support, anchoring and seismic calculations for all applicable equipment.
1.9 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.9 – Building Services Piping for installation of piping systems and ASME Section IX – Welding and Brazing Qualifications for welding materials and procedures.

B. Perform Work in accordance with the International Mechanical Code including State and local amendments.

C. Provide products requiring electrical connections listed and classified by UL as suitable for purpose specified and indicated.

D. Perform Work in accordance with Washington State Energy Code.

1.10 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years’ experience.

B. Installer: Company specializing in performing Work of this section with minimum three years’ experience.

1.11 SEQUENCING

A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect all equipment, materials, and insulation from weather, construction traffic, dirt, water, chemicals, and damage by storing in original packaging and under cover. Where original packaging is insufficient, provide additional protection. Maintain protection in place until installation.

C. Inspect all products and materials for damage prior to installation.

D. Protect piping from all entry of foreign materials by providing temporary end caps or closures on piping and fittings. Furnish temporary protective coating on cast iron and steel valves.

E. Protect heat exchangers and tanks with temporary inlet and outlet caps. Maintain caps in place until installation.

F. Protect dampers from damage to operating linkages and blades.

G. Protect materials and finishes during handling and installation to prevent damage.

H. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors. Protect coils from entry of dirt and debris with pipe caps or plugs.

I. Comply with manufacturer’s installation instruction for rigging, unloading and transporting units.

J. Comply with contractor’s construction Indoor Air Quality (IAQ) Plan.
1.13 ENVIRONMENTAL REQUIREMENTS

A. Do not apply fire stopping materials when temperature of substrate material and ambient air is below 60 degrees F. Maintain this minimum temperature before, during, and for minimum 3 days after installation of fire stopping materials.

B. Provide ventilation in areas to receive solvent cured materials.

C. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer. Maintain temperature during and after installation for minimum period of 24 hours.

D. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

E. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers. Maintain temperatures during and after installation of duct sealant.

F. Maintain water integrity of roof during and after installation of chimney or vent.

G. Do not install condensing unit foundation pad when ground is frozen or muddy.

1.14 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

B. Verify by field measurements, sizes and configurations are compatible with wall construction and layout.

C. Existing systems and utility lines indicated on drawings are in accordance with information furnished to the Architect and may not be complete. Contractor is responsible for locating, uncovering, disposing of or maintaining existing systems.

1.15 COORDINATION

A. Visit the site and become familiar with existing conditions affecting work.

B. Verify locations of any overhead or buried utilities on or near site. Determine such locations in conjunction with all public and private utility companies and with all authorities having jurisdiction.

C. Existing systems and utility lines indicated on drawings are in accordance with information furnished to the Architect and may not be complete. Contractor is responsible for locating, uncovering, disposing of or maintaining existing systems.

D. HVAC drawings are diagrammatic and do not indicate all possible site conditions. The contractor shall verify all measurements, dimensions and connections on site and coordinate between trades to preclude interferences. The contractor shall provide adjustments to piping or ductwork as necessary to fit conditions including but is not limited to relocation, offsets, and transitions.

E. In the event of a conflict with other trades of work, the following priority from highest to lowest shall be followed: Structural, lighting, HVAC, plumbing/piping and sprinklers. Starting with the lowest priority, the HVAC, plumbing, and sprinkler contractors shall provide whatever materials, offsets, labor etc. is required to resolve the conflict.
When discrepancies occur between plans and specifications, the Architect will determine which takes precedence and the Contractor shall perform the selected requirement at no additional cost.

Prior to ordering equipment cross-check mechanical and electrical drawings and specifications to assure proper location and electrical characteristics of connections serving mechanical and electrical equipment.

Advise the Architect of any modifications required to suit equipment furnished. Costs for modifications due to equipment substitution will be borne by the contractor.

Wherever conflicts occur between different parts of the Contract Documents the greater quantity, the better quality, or larger size shall prevail unless the Architect informs the Contractor otherwise in writing.

The scale of each drawing is relatively accurate, but the Contractor is warned to obtain the necessary dimensions for any exact takeoffs from the Architect. No additional cost to the Owner will be considered for failure to obtain exact dimensions where not clear or in error on the drawings. Any device or equipment roughed in improperly and not positioned on implied centerlines or as required by good practice shall be repositioned at no cost to the Owner.

Where the word ‘verify’ is used on the documents, the contractor shall field verify the existing conditions and modify the scope of the installation as required to meet the verified conditions without additional cost to the Owner.

Coordinate trenching, excavating, bedding, backfilling of buried systems with requirements of this specification.

Coordinate wall openings, piping rough-in locations, concrete housekeeping pads, and electrical rough-in locations to accommodate Work of this Section.

Coordinate all equipment with building control work.

Coordinate installation of
1. Condensing units with concrete pad and roof structure.
2. Air handling units with building structure.
3. Unit installation with roof structure, piping systems, and ceiling for unit access.
4. Roof curbs with roof structure, roof deck and roof membrane installation.

Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where necessary for installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

Avoid cutting, where possible, by setting sleeves, frames, etc., and by coordinating for openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for ducts and piping.

Cut all holes neatly and as small as possible to admit work. Perform cutting in manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

Remove excess piping and ductwork, plug or cap any unused branch connections. Remove scrap pipe and all other excess materials from the site.
B. Comply with contractor’s Construction Waste Management Plan. Retain and submit all trip and tip tickets for all construction debris and waste hauling, indicating material content, tonnage, date hauled and facility to where materials were hauled.

1.18 ELECTRICAL

A. Short-Circuit Current Rating (SCCR): All HVAC and refrigeration equipment with multi-motor or combination electrical loads shall comply with NEC 110.10 & 440.4 and must include a SCCR greater than the Available Interrupting Current (AIC) of the electrical circuit serving the equipment. See electrical drawings for required AIC kA rating. Equipment SCCR may be presented in writing from the manufacturer or shown on the unit nameplate. Refrigeration or air-conditioning equipment over 60 Amps MOCP must list the SCCR on the unit nameplate. If the AIC rating is unavailable or cannot be determined provide equipment with a minimum SCCR of 10kA.

B. Motors:
   1. Temperature Rating: Rated for 40 degree C environment with maximum 50 degree C temperature rise for continuous duty at full load.
   2. Starting Capability: Not less than 12 starts per hour.
   3. Phase Characteristics: Squirrel-cage induction poly-phase motors for 3/4 HP and larger, and capacitor-start single-phase motors for 1/2 HP and smaller. At equipment manufacturer's option, 1/6 HP and smaller may be split-phase type.
   4. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors.
   5. Enclosure Type: Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation, and guarded drip-proof motors where exposed to contact by employees or building occupants. Weather-protected Type I for outdoor use, Type II, where not housed.
   7. Name Plate: Indicate full identification of manufacturer, ratings, characteristics, construction, special features and similar information.
   8. All motor efficiencies shall conform to Washington State Energy Code and NEMA MG-1.

C. Motor Starters: By mechanical equipment manufacturer where factory mounted controls are provided. Variable frequency drives by Division 23, all other starters provided by Electrical Contractor.

D. Power Wiring: By Electrical Contractor.

E. Control Wiring: Responsibility of Division 23, including all line and low voltage control wiring. Owner will not entertain additional cost due to lack of coordination between HVAC Contractor and Electrical Contractor.

1.19 EXTRA MATERIALS

A. Furnish
   1. Two refrigerant oil test kits each containing everything required for conducting one test.
   2. Three sets of disposable filters for each unit.
   3. One set of fan belts for each unit.

1.20 PROJECT CLOSEOUT

A. Completion, submission and approval of the following is required for final project closeout.
   1. Execution of Architect's and Engineer’s final observation reports (punchlist)
   2. Operating and Maintenance Instructions
3. Operating and Maintenance Manual
4. Equipment and Pipe Cleaning
5. Record Drawings
6. Testing
7. Commissioning
8. Warranty

B. See Division 01 for additional requirements.

1.21 OPERATING AND MAINTENANCE INSTRUCTIONS

A. General: In addition to requirements of Division 01, following initial operation of HVAC systems and prior to acceptance by the Architect, perform the following services.

B. At least two weeks prior to each instruction period, give written notification of readiness to proceed to the Architect and Owner, and obtain mutually acceptable dates.

C. Conduct demonstrations and instructions for the Owner's representatives, pointing out requirements for operating, servicing and maintaining equipment and systems. Describe general system operation and specific equipment functions. Cover all equipment calibration, setpoint adjustment, safeties and alarms.

D. Furnish qualifications of Contractor's personnel in charge of the instruction; foreman position is minimum acceptable. Where equipment startup is performed by supplier’s or manufacturer’s personnel, those personnel should also provide training on that equipment.

E. During demonstrations and instructions include and reference information from maintenance manuals and contract drawings.

1. Provide documentation of all instruction which includes:
   a. Date and time of instruction
   b. Name, affiliation and qualifications of the instructor
   c. Name and affiliation of the attendees
   d. Topics, systems, and equipment covered
   e. Length of instruction

F. Minimum duration of instruction periods:

1. HVAC Systems 3 hours
2. Control Systems 2 hours

1.22 OPERATING AND MAINTENANCE MANUALS

A. Contents: Furnish, in accord with Division 1, one PDF and one bound copy of operating and maintenance manuals to include the following:

1. Manufacturers, suppliers, contractor names, addresses and phone numbers.
2. Warranty service contractors' names, address and phone numbers (if different from above).
3. Schedule and description of routine maintenance for each component to include oiling, lubrication and greasing data.
4. Manufacturer's cuts and rating tables, including brochures for all submittal items.
5. Part numbers of all replaceable items.
6. Control diagrams and operation sequence.
7. Written guarantees.
8. Record drawings corrected and completed.
9. Completed equipment start-up forms and checklists.
10. Final copy of testing, adjusting, and balancing report.
B. Operation and Maintenance Data:
   1. Include, spare parts lists, exploded assembly views for all equipment.
   2. Submit installation instructions, adjustment instructions, spare parts lists, exploded assembly views for all equipment.
   3. Submit inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
   4. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data. Include directions for resetting constant volume regulators.

C. Filters: Operation and Maintenance Data: Submit instructions for operation, changing, and periodic cleaning.

D. Binders:
   1. Furnish typewritten or printed index and tabbed dividers between principal categories.

E. Imprint on cover:
   1. Name of project.
   2. Owner.
   3. Location of project.
   5. Contractor.
   6. Year of completion.

F. Imprint on backing:
   1. Name of project.
   2. Year of completion.

G. Submittals:
   1. Preliminary Copies: Prior to scheduled completion of the project, submit one PDF copy for review by the Architect.
   2. Final Copies: After approval of the preliminary copy, submit one PDF and one bound copy to the Owner.

1.23 EQUIPMENT AND PIPE CLEANING
   A. Clean interior and exterior of all equipment. Equipment shall be free of dirt, construction debris, corrosion, etc.
   B. Adequate provisions shall be made during construction to eliminate dirt, debris or other material from entering and collecting inside of pipe, ductwork and equipment. Any collection of material shall be thoroughly cleaned before equipment startup and if necessary again before owner occupancy.
   C. Clean exterior of all exposed pipe and ductwork.

1.24 RECORD DRAWINGS
   A. Submit one digital file with all drawings in PDF format.
   B. Make all notes and revisions on PDF set in red.
   C. Show location of equipment, location and size of piping, location and size of ductwork. Locate all valves, control dampers and similar equipment with tag or label identification. Indicate locations and elevations of exterior pipe and utility connections. Maintain continuously updated drawings during progress of project.
D. Record actual locations of tagged valves and control dampers; include valve tag numbers. Record actual locations of flexible connectors and expansion joints.

E. Record actual locations of equipment, clean-outs, controlling devices, and all above grade, under-floor, and buried piping and ductwork. Provide dimensions from gridline or walls to indicate specific locations.

1.25 TESTING

A. Provide completed start-up forms and checklists.

B. Perform testing and balancing of HVAC systems as described in this Division and as required by applicable codes and ordinances.

C. Provide changes in sheaves, belts, and dampers as required for correct balance.

D. Provide commissioning of Control System, and all mechanical components in compliance with the applicable Energy Code, the commissioning notes on the drawings and commissioning specifications of this Division. Written verification of test to be signed by Owner's Representative.

1.26 WARRANTIES AND CONTRACTOR’S GUARANTEE

A. All work, material and equipment shall be free of defect, complete and in perfect operating order at time of delivery to Owner.

B. Furnish one year warranty from date of substantial completion for all systems unless specifically noted otherwise.

C. Without cost to Owner, **correct all defects and failures discovered within one year from date of final acceptance**, except when in the opinion of the Architect a failure is due to neglect or carelessness of the Owner.

D. The guarantee of the Contractor is independent of shorter time limits by any manufacturer of equipment furnished. Submit with Operation and Maintenance Manual all guarantees which exceed one year.

E. Make all necessary balancing and control adjustments during first year of operation.

F. The presence of any inspector or observer during any construction does not relieve the Contractor from responsibility for defects discovered after completion of the work.

PART 2  NOT USED

PART 3  EXECUTION

3.1 DOCUMENTATION

A. Additional plan submittals to reviewing authority: If additional drawing submittals are required at any time during construction contractor shall submit drawings, review with authority, and pick up subsequent approved drawings. Engineer will revise and/or prepare drawings for submittal.
3.2  INSPECTION

A. Do not allow any work to be covered up or enclosed until inspected, tested and approved by the Architect and all authorities having jurisdiction over the work.

B. Should any work be enclosed or covered up before such inspection and test, Contractor shall at his own expense uncover work, and after it has been inspected, tested and approved, make all repairs as necessary to restore all work disturbed by him to its original condition.

C. Energy Code C104 specifically requires the following inspections.
   1. Mechanical Equipment Efficiency and Economizer: To be made after all equipment and controls required by the Energy Code and this specification are installed and prior to the concealment of such equipment or controls.
   2. Mechanical Pipe and Duct Insulation: To be made after all pipe and duct insulation is in place, but before concealment.
   3. Motor Inspections: To be made after installation of all equipment covered by the Energy Code and this specification but before concealment.

3.3  FIELD QUALITY CONTROL

A. Inspect isolated equipment after installation for proper movement clearance.

3.4  CLEANING

A. Clean adjacent surfaces of fire stopping materials.

B. Clean ductwork and equipment.

3.5  PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION
PART 1   GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Hangers and Supports.
   2. Firestopping.
   3. Condensate Pumps
   4. Access Panels
   5. Tags and Identification.
   6. Execution

1.2 GENERAL REQUIREMENTS
A. Comply with requirements and recommendations of Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58 and SP-69.
B. Comply with requirements and recommendations of Sheetmetal and Air Conditioning Contractors National Association (SMACNA) HVAC Duct Construction Standards.
C. Conform to requirements of IBC 1613 and SMACNA "Seismic Restraint Manual Guidelines for Mechanical Systems".

1.3 MATERIALS AND EQUIPMENT
A. Where two or more units of same class of equipment are required, use products of a single manufacturer. All equipment shall be new and free from damage.
B. Protect stored material and equipment against weather, corrosion and dirt. Protect installed mechanical components, including but not limited to piping, ductwork, and equipment against weather damage, corrosion, dirt and construction dust. Seal equipment and ductwork where and when necessary to be kept clean.
C. Provide major equipment components with manufacturer's name, address, catalog number and capacity indicated on a nameplate, securely affixed in a conspicuous place.
D. Furnish standard and fabricated hangers and supports complete with necessary inserts, bolts, nuts, rods, washers and other accessories.

1.4 REQUIREMENTS
A. Provide incompressible inserts and shields at all piping supports on pipe to be insulated per 23 07 00.
B. Provide vibration isolation on motor driven equipment, plus connected piping.
C. Provide structural work and equipment required for expansion and contraction of piping. Verify anchors, guides, and expansion joints provide and adequately protect system.
D. Firestopping Materials: Provide to achieve fire ratings as noted on architect’s drawings for adjacent construction, but not less than 1 hour fire rating. ASTM and UL.
   1. Ratings may be 3-hours for firestopping in through-penetrations of 4-hour fire rated assemblies unless otherwise required by applicable codes.
   2. Surface Burning: UL 723 with maximum flame spread / smoke developed rating of 25/50.
   3. Firestop interruptions to fire rated assemblies, materials, and components.

E. Prevent contact between dissimilar metals, such as copper tubing and steel, by use of copper-plated, plastic coated, or flexible materials. All supports which contact copper tubing shall be copper plated.

F. Firestop interruptions to fire rated assemblies, materials and components.

1.5 QUALITY ASSURANCE

A. Installed products shall have surface Burning Characteristics: 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Perform work in accordance with local jurisdiction’s requirements and AWS D1.1 for welding hanger and support attachments to building structure.

C. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

PART 2 PRODUCTS

2.1 DUCT HANGERS AND SUPPORTS

A. Hanger straps and rods shall be in accord with SMACNA Duct Construction Standards.

B. Fasten bracing to ductwork, including riveting, bolting, and tack welding per SMACNA.

C. Provide galvanized steel band or fabricated angle iron brackets for wall supports.

D. Exposed ducts shall be supported/anchored to structure at closer spacing and using heavier materials, wherever so indicated on drawings.

E. Hanger Rods: Carbon Steel, with hex nuts and flat washers.

F. Beam Clamps and Attachments as required.

2.2 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports with incompressible insulation inserts and shields for all piping to be insulated per 230700
   1. Manufacturer: Pipe Shields, INC or approved equal.
   2. Material: Calcium Silicate or Uretherne per temperature application.
   3. Thickness: Insert thickness shall match required insulation thickness per 230700.

B. Refrigerant Piping:
   1. Hangers for rigid pipe: Carbon steel, adjustable swivel, split ring with Armacell Armafix insulated rigid insert.
   2. Hangers for flexible pipe: Carbon steel, adjustable, clevis with Armacell Armafix insulated rigid insert and saddle.
3. Hangers for paired flexible pipe: Carbon steel, adjustable, clevis with 1” wide overlapping steel band and saddle.

2.3 HANGER ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.4 INSERTS

A. Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.5 ACCESS PANELS

A. Milcor or approved equal.

B. Include an allowance for a minimum of 12 access panels.

C. Architectural grade, 14 guage frame and door, painted steel or stainless steel based on application.

2.6 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:
   1. Ferrous Piping: Class 150, 300 psi CWP, malleable iron, threaded.
   2. Copper Piping: Class 150, 300 psi CWP, bronze unions.
   3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
   4. PVC Piping: PVC.
   5. CPVC Piping: CPVC.

2.7 FLASHING

A. Metal Flashing: 26 gage thick galvanized steel.

B. Metal Counterflashing: 22 gage thick galvanized steel.

C. Lead Flashing:
   1. Waterproofing: 5 lb./sq. ft sheet lead.
   2. Soundproofing: 1 lb./sq. ft sheet lead.

D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.8 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sleeves for Ductwork: 18 gage thick galvanized steel.

D. Sealant: Acrylic
E. Size large enough to allow for movement due to expansion and to provide for continuous insulation or installation of fire sealant at fire-rated walls. Note that insulation is discontinuous at fire walls.

2.9 FORMED STEEL CHANNEL

A. Manufacturers: Allied Tube & Conduit, B-Line Systems, Unistrut or approved equal.

B. Product Description: Galvanized 12 gage thick steel, with holes 1-1/2 inches on center.

2.10 SUPPORT ACCESSORIES

A. Pipe Alignment Guides: Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.

B. Swivel Joints: Steel / Bronze body, double ball bearing race, field lubricated, with rubber (Buna-N) o-ring seals.

2.11 FIRESTOPPING-APPLIED

A. Manufacturers: RectorSeal, Dow Corning, 3M Fire Protection or approved equal.

B. General:
   1. Fire stopping materials shall conform to Flame (F) and Temperature (T) ratings as required by applicable building codes and tested by nationally accepted test agencies per ASTM E 814 or UL 1479 fire tests for through penetrations, and ASTM E 1966 or UL 2079 for construction joints, and UL 2307 for perimeter edge joints.
   2. Fire stopping material shall be free of asbestos, PCBs, ethylene glycol, and lead.
   3. Do not use any product containing solvents or that requires hazardous waste disposal.
   4. Fire stopping shall be performed by a contractor trained or approved by firestop manufacturer.
   5. Select products with rating not less than rating of wall or floor being penetrated.

C. Single Source Responsibility: Provide firestop systems for all conditions from a single supplier.

D. Product Description: Provide Latex caulk/sealant, Silicone caulk/sealant, Intumescent Wrap Strip, Firestop Putty, Firestop Collar or Intumescent Sleeve to meet each specific application and performance requirement.

E. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

F. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
   1. Forming/Damming Materials: Mineral fiberboard, backer rod or other type recommended by Manufacturer’s tested system.

2.12 PENETRATIONS OF NON-RATED SURFACES

A. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.

B. 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.
2.13 CONDENSATE PUMP
   A. Manufacturer: BlueDiamond MaxiBlue or approved equal.
   B. Rotary elastomer diaphragm technology, 3.7 gal/hr, 23 feet hd, 16.5 feet lift, 21 dba. Thermistor level sensing. Capable of running dry. Provide with reservoir and accessories.

2.14 TAGS
   A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches high.
   B. Metal Tags: Brass, Aluminum or Stainless Steel with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges. Plain English designations.
   C. Information Tags: Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.
   D. Tag Chart: Plain English designations so no tag or valve chart is required.

2.15 PIPE MARKERS
   A. Color and Lettering: Conform to ASME A13.1. Specific examples are noted in the table below.

<table>
<thead>
<tr>
<th>Service</th>
<th>Background Color</th>
<th>Letter Color</th>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerant</td>
<td>Purple</td>
<td>White</td>
<td>R-{TYPE} REFRIGERANT (EXAMPLE: R-410A REFRIGERANT)</td>
</tr>
<tr>
<td>Condensate</td>
<td>Black</td>
<td>White</td>
<td>CONDENSATE</td>
</tr>
</tbody>
</table>

   B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.
   C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.16 CEILING TACKS
   A. Description: Steel with 3/4 inch diameter color-coded head.
   B. Color code as follows:
      1. HVAC equipment: Yellow.
      2. Fire dampers/smoke dampers: Red.

2.17 LOCKOUT DEVICES
   A. Lockout Hasps: Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches.
   B. Valve Lockout Devices: Nylon device preventing access to valve operator, accepting lock shackle.
2.18 PAINT
A. Factory Finished Equipment: See individual equipment specification.
B. Ductwork: Paint interior of ductwork visible through grilles and diffusers with a flat black paint. Prepare and paint surfaces in accord with Division 9.

2.19 SEISMIC SUPPORTS
A. Provide seismic support as required by IBC 1613 and local authorities.
B. Sway bracing for ductwork, piping, and equipment shall consist of steel angles, rods or pipes. Shapes, lengths and methods of attachment shall be in accord with SMACNA “Guidelines for Seismic Restraints of Mechanical Systems”.

PART 3 EXECUTION

3.1 EXISTING WORK
A. Provide access to existing piping, ductwork, equipment and other installations remaining active and requiring access.
B. Extend existing piping and ductwork installations using materials and methods compatible with existing installations.

3.2 SURFACE PREPARATION
A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopped material.
B. Remove incompatible materials affecting bond of adhesives or firestopping.
C. Install backing or damming materials to arrest liquid material leakage.
D. Obtain permission from Architect/Engineer before drilling or cutting structural members.
E. Degrease and clean surfaces to receive adhesive for identification materials.

3.3 INSTALLATION-CLEARANCE
A. Appliances and equipment shall be accessible for inspection, service, repair and replacement.
B. Clearance shall be provided for the replacement of filters.
C. A minimum of 30” of clearance shall be provided in front of the control side of appliances and equipment. Provide additional space when required by NEC.
D. All control components shall be accessible for inspection and replacement.

3.4 INSTALLATION - INSERTS
A. Install inserts for placement in concrete forms.
B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.5 INSTALLATION - PIPE HANGERS AND SUPPORTS
A. Support horizontal piping as scheduled.
B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
C. Place hangers within 12 inches of each horizontal elbow.
D. Use hangers with 1-1/2 inch minimum vertical adjustment.
E. Support vertical piping at every floor.
F. Where piping is parallel and at same elevation, provide multiple pipe or trapeze hangers.
G. Support riser piping independently of connected horizontal piping.
H. Provide copper plated hangers and supports for copper piping.
I. Design hangers for pipe movement without disengagement of supported pipe.
J. Adjust hangers and supports as required to bring system to proper line and grade. Piping shall be plumb with floor and parallel/perpendicular to building structure.
K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
L. Provide clearance in hangers and from structure and other equipment for installation of insulation. Insulated piping shall have insulation run continuous through hangers and supports with use of rigid inserts. Insulation shall be glued to both sides of insert at hangers and supports, no insulation gaps are allowed. Refer to Section 23 07 00.
M. Support of pipe, tubing and equipment shall be accomplished by means of engineered products, specific to each application. Makeshift, field devised methods shall not be allowed.

3.6 INSTALLATION-PIPE PROTECTION
A. Provide protective shield plates in concealed locations where piping, other than cast-iron or steel, is installed in studs, joists or rafters. Plates shall be 16 gage steel and cover the pipe area plus 2”. Shields may be omitted if piping is more than 1-1/2” from nearest edge of structural member.

3.7 INSTALLATION – DUCTWORK
A. Locate hangers, supports and accessories to handle loads imposed by ductwork, and air distribution devices and with maximum spacing noted.
B. Support all ductwork to prevent sag, undue play and swing.
C. Maximum support spacing per SMACNA standards. Spacing shall not exceed 10 feet.
D. Before concrete is placed, install embedded inserts and secure firmly to form work.

E. Assemble and install hangers and supports on ductwork.

F. All supports and attachments for exposed ducts shall have non-removable fasteners.

G. Attachments to fireproofed steel structure shall be made prior to spraying of fireproofing material. If necessary to disturb fireproofing after initial spraying, provide respraying or repairs necessary to restore the integrity of the fireproofing.

H. Adjust hangers and supports as required to bring system to proper line and grade. Ductwork shall be plumb with floor and parallel/perpendicular to building structure.

3.8 INSTALLATION – SEISMIC CONTROLS

A. Provide seismic restraints and hangers in compliance with IBC 1613 and ASCE 7.

B. Seismic Bracing: Follow IBC 1613, ASCE 7, SMACNA Seismic Restraint Manual and the following.
   1. Bracing shall be bidder designed to resist seismic loading in accord with Chapter 16 of the International Building Code, ASCE 7 or the SMACNA guideline.
   2. Provide seismic calculations as required for Ip = 1.5.
   3. Transverse bracing shall occur at a maximum interval of 30 feet, at each duct turn and at the end of a duct run.
   4. Longitudinal bracing shall occur at a maximum interval of 60 feet.
   5. Bracing may be omitted where duct hangers are less than 12 inches in length.

3.9 INSTALLATION - FLASHING

A. Provide flexible flashing and metal Counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms for sound control.

C. Provide curbs for roof installations 14 inches minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach Counterflashing to equipment and lap base flashing on roof curbs. Flatten and solder joints.

D. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.10 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 or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with insulation and caulk or fireproof airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
3.11 INSTALLATION – ACCESS PANELS

A. Furnish access panels for installation at all concealed equipment which requires service, maintenance or adjustment to include but not limited to equipment, dampers, control valves, filters and controls.

B. Provide location layout and required size for all access panels to general contractor. Layout shall be regular and consistent, maintain a uniform wall panel height of 24” center line above finished floor, unless noted otherwise.

C. Furnish fire rated access panels where installed in fire rated assembly.

D. Provide stainless steel access panels where installed in tile surfaces.

E. Furnish access panels to general contractor for installation

F. Paint installed access panels to match wall or ceiling. Verify that panels are not painted shut.

3.12 INSTALLATION – FIRESTOPPING AND SEALS AT PARTITIONS

A. Installation of Firestop shall be performed by either a specialty contractor specializing in firestop application (FM G 4991 or UL Qualified Firestop Contractor), or general or sub-contractors with experience in similar applications and projects with installers qualified, trained, and certified by the firestop manufacturer. Installation shall be performed in strict accordance with manufacturer’s detailed installation procedures.

B. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, and other items, requiring firestopping.

C. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

D. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.

E. Install dams when required to properly contain Fire stopping materials within openings and as required to achieve required fire resistance rating. Combustible damming material must be removed after appropriate curing. Incombustible damming materials may be left as a permanent component of the Firestop system.

F. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

G. Place intumescent coating in sufficient coats to achieve rating required.

H. Clean adjacent surfaces of firestopping materials.

I. Seal openings at surface as follows:
   1. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
   2. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
   3. Pack void with backing material.
   4. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
3.13 INSTALLATION - PENETRATIONS OF NON-RATED SURFACES

A. Seal opening through non-fire rated wall, partition, floor, ceiling, and/or roof opening as follows:
   1. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
   2. Size sleeve allowing minimum of 1 inch void between sleeve and building element.

B. Install escutcheons where piping penetrates non-fire rated surfaces in occupied spaces.

C. 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.

D. Interior partitions: Seal pipe penetrations air tight. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.14 INSTALLATION – CONDENSATE

A. For all cooling coils, high efficiency gas burners and other equipment requiring condensate drainage, provide appropriately sized condensate pumps where gravity drainage is not possible or where scheduled.

B. Coordinate number and type of condensate pumps required with Plumbing Contractor.

C. Provide condensate overflow switches on cooling coils where damage to building components could occur as a result of overflow as required by IMC.

D. For wall mounted fan coils, condensate pump, reservoir, wiring and piping shall not be exposed to view. Field fabricated concealment is not acceptable.

E. For pumps located in equipment cabinet, above ceiling, fascia kit or unfinished space, obtain power for condensate pump directly from electrical terminal block on unit served. Coordinate with electrical contractor.

F. For wall mount fan coils with pumps located above a ceiling, obtain power from electrical circuit. Coordinate with electrical contractor.

G. Connect condensate pump alarm wiring to unit served power terminals per manufacturer’s installation instructions. Coordinate with electrical contractor.

3.15 INSTALLATION-IDENTIFICATION

A. Install identifying devices after completion of coverings and painting.

B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

C. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

D. Install tags using corrosion resistant chain. Use plain English designations so no index or chart is required.

E. Nameplates: Identify mechanical equipment (air handling units, air terminal units, pumps, heat transfer equipment, tanks, and water treatment devices) with plastic nameplates.
   1. Identify in-line pumps and other small devices with name tags.
   2. Identify control panels and major control components outside panels with plastic nameplates.
3. Identity description should be as numbered on drawings or plain English description. i.e. “EF-1” or “Boiler Controls”.
4. Label automatic controls, instruments, and relays. Key to control schematic.
5. Label wall controls and switches with associated equipment designation and control function, i.e. “EF-1 Switch”.

F. Valve Tags: Identify valves in main and branch piping and radiator valves with tags.
   1. Do not provide numbered tags.
   2. Provide tags with plain English description of service and function. i.e. “Hot Water Supply, 2nd Floor”

G. Pipe Labels: Identify piping, concealed or exposed, with plastic tape pipe markers.
   1. Identify service, flow direction, and pressure.
   2. Install in clear view and align with axis of piping.
   3. Locate identification on straight runs including risers and drops with spacing not to exceed 20 feet.
   4. Locate adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

H. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

I. Equipment and Valve Tag Index: Plain English designations so no chart or index is required.

3.16 CLEANING
   A. Contractor shall make all mechanical components free of dust and dirt prior to startup.

3.17 PROTECTION OF FINISHED WORK
   A. Protect adjacent surfaces from damage by material installation.

3.18 SCHEDULES
   A. Copper and Steel Pipe Hanger Spacing:

<table>
<thead>
<tr>
<th>PIPE SIZE (Inches)</th>
<th>COPPER TUBING MAXIMUM HANGER SPACING (Feet)</th>
<th>STEEL PIPE MAXIMUM HANGER SPACING (Feet)</th>
<th>COPPER TUBING HANGER ROD DIAMETER (Inches)</th>
<th>STEEL PIPE HANGER ROD DIAMETER (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>5</td>
<td>7</td>
<td>3/8</td>
<td>3/8</td>
</tr>
<tr>
<td>3/4</td>
<td>5</td>
<td>7</td>
<td>3/8</td>
<td>3/8</td>
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<tr>
<td>1</td>
<td>6</td>
<td>7</td>
<td>3/8</td>
<td>3/8</td>
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<td>1-1/4</td>
<td>7</td>
<td>7</td>
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<td>1-1/2</td>
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<td>9</td>
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<td>2</td>
<td>8</td>
<td>10</td>
<td>3/8</td>
<td>3/8</td>
</tr>
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</table>
B. Plastic and Ductile Iron Pipe Hanger Spacing:

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM HANGER SPACING</th>
<th>HANGER ROD DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Feet</td>
<td>Inches</td>
</tr>
<tr>
<td>ABS (All sizes)</td>
<td>4</td>
<td>3/8</td>
</tr>
<tr>
<td>FRP (All Sizes)</td>
<td>4</td>
<td>3/8</td>
</tr>
<tr>
<td>Ductile Iron (Note 2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVC (All Sizes)</td>
<td>4</td>
<td>3/8</td>
</tr>
</tbody>
</table>

C. Note 1: Refer to manufacturer’s recommendations for grooved end piping systems.

D. Note 2: 20 feet maximum spacing, minimum of one hanger for each pipe section close to joint behind bell. Provide hanger at each change of direction and each branch connection. For pipe sizes 6 inches and smaller, subjected to loadings other than weight of pipe and contents, limit span to maximum spacing for water service steel pipe.

3.19 SCHEDULES

A. Pipe Isolation Schedule:

<table>
<thead>
<tr>
<th>Pipe Size Inch</th>
<th>Isolated Distance from Equipment diameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>120 diameters</td>
</tr>
<tr>
<td>2</td>
<td>90 diameters</td>
</tr>
</tbody>
</table>
SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 SCOPE
   A. Testing, adjusting and balancing of air systems.
   B. Measurement of final operating conditions of above systems.
   C. Preparation of formal report.

1.2 PERFORMANCE CRITERIA
   A. Work shall be performed by approved independent testing and balancing agency.
   B. Perform testing and balancing in accordance with Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB). All work shall be supervised.
   C. Calibrate instruments used for testing and balancing within a period of six months of start of work.
   D. Mechanical contractor shall assist Balancing Agency in testing and balancing of mechanical system.

1.3 SUBMITTAL
   A. Provide three (3) copies of typed and bound report to be included in Preliminary Commissioning Report.
   B. Provide three (3) additional copies of updated and/or corrected report for Final Commissioning Report.

1.4 FORMAT
   A. Report shall consist of test sheets similar to AABC Standard Forms for Diffusers and Grilles, Air Handling Equipment, Exhaust Fans, and Pumps (i.e., Form 12666 for Diffusers and Grilles).
   B. Report shall include the following.
      1. Preface suggesting abnormalities and problems encountered.
      2. Instrumentation List including type, model, manufacturer, serial number, and calibration dates.
      3. System Identification reporting location of equipment, zones, supply, return, and exhaust openings.
      4. Record following for each piece of air handling equipment.
         a. Manufacturer, model number, and serial number.
         b. Design and manufacturer rated data.
         c. Actual CFM
         d. Suction and discharge static pressure of each fan.
         e. Outside-air and return-air total CFM.
         f. Actual operating current, voltage, and brake horsepower of each fan motor.
         g. Final RPM of each motor.
         h. Fan and motor sheave manufacturer, model, size, number of grooves and center distance.
1.5 QUALIFICATIONS

A. Work of this section shall be performed by independent Air Testing and Balance Agency specializing in testing and balancing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.

B. Agency shall provide proof of having successfully completed at least five years of specialized experience in air and hydronic system balancing. Work by this Agency shall be done under direct supervision of qualified heating and ventilating engineer employed by Agency.

C. Agency shall be approved in writing by Architect.

D. Neither Architect’s engineering consultant nor anyone performing work on this Project under Division 23 shall be permitted to do this work.

1.6 ACCEPTABLE TEST AND BALANCE COMPANIES

A. AIRTEST Co., Inc. 425-313-0172

B. Neudorfer Engineers, Inc. 206-621-1810

C. Hardin & Sons 253-862-6645

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify systems are complete and in good working order before commencing work. Then, put all systems and equipment into operation and continue operation until all adjusting, balancing, testing, demonstrations, instructions and cleaning of systems have been completed. Verify the following:

1. Systems are started and operating in safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place or in normal position.
15. Service and balancing valves are open.
3.2 PREPARATION

A. If requested, conduct tests in presence of Architect.
B. Instruments used by Agency shall be accurately calibrated and maintained in good working order.
C. Furnish instruments required for testing, adjusting, and balancing operations including ladders, scaffolding, additional dampers and clean filters.
D. Make instruments available to Architect/Engineer to facilitate spot checks during testing.
E. During balancing technician's initial test of air handling systems, the Mechanical Contractor shall have his sheetmetal foreman present to assist in any drive changes or dampers necessary.

3.3 INSTALLATION TOLERANCES

A. Diffuser, register and grille air flow rates shall be measured and adjusted to deliver final flow rates within 10% and within 50 cfm of design rates, whichever is less.
B. Fan air flow rates shall be measured and adjusted to deliver final flow rates within 10% and within 100 cfm of design rates, whichever is less.

3.4 ADJUSTING

A. Ensure that clean filters, of the type specified, are installed prior to air balancing.
B. Provide additional volume dampers as necessary to accomplish design balances.
C. Set minimum position of motorized dampers for scheduled minimum outside air.
D. Check motors for proper rotation, coupling and drive alignment, belt tension and freedom from vibration, etc.
E. Provide belt drive/sheave changes to adjust fan rpm as necessary to accomplish design balances.
F. Verify recorded data represents actual measured or observed conditions.
G. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
H. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.
I. Report defects and deficiencies noted during performance of services, preventing system balance.
J. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
K. After completion of testing and balancing, operate systems under normal conditions for at least two days of 8 hours each to demonstrate specified performance.

3.5 AIR SYSTEM PROCEDURE

A. Perform soloing testing and balancing functions in accordance with Associates Air Balance Council National Standards.
B. Adjust air handling and air distribution systems to obtain design supply, return, and/or exhaust air quantities.
   1. Test and adjust total system CFM by adjustment of fan speeds. Provide sheave drive changes as necessary.
   2. Perform tests at high and low speeds of variable speed systems.
   3. Adjust branch air quantities by damper regulation. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open to minimize throttling losses.
   4. Make air quantity measurements in main ducts and for outside air by Pitot tube traverse of entire cross sectional area of duct.
   5. Measure air quantities at air inlets and outlets.

C. Diffusers, Registers and Grilles:
   1. Adjust air distribution to obtain uniform space temperatures free from objectionable drafts.
   2. Use volume control devices to regulate air quantities only to the extent that the adjustments do not create objectionable air motion or sound levels.
   3. Effect volume control by using volume dampers located in ducts.

D. Provide system schematic:
   1. Identify the location and area of each grille, diffuser, register, and terminal box.
   2. Record the required and actual air quantities at each outlet or inlet.
   3. Record size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.

E. Air Temperature:
   1. Measure wet and dry bulb air temperatures on entering and leaving side of each cooling coil and unit in cooling mode.
   2. Measure dry bulb temperatures on entering and leaving side of each heating coil and unit in heating mode.

F. Pressure:
   1. Measure static pressure conditions on air units, including filter and coil pressure drops, and total pressure across fan with suction and discharge pressures.
   2. Make air balancing allowances for 50 percent loading of filters.
   3. Measure building static pressure.

G. Electrical:
   1. Record nameplate motor current and voltage.
   2. Measure actual motor current and voltage at balanced condition.

H. Dampers:
   1. Adjust outside air, return air, and exhaust dampers for design conditions.
   2. At modulating damper locations, take measurements and balance at extreme conditions.

I. Permanently mark all outside air, supply air, and return air damper positions after balancing has been completed.

3.6 FINAL INSPECTION AND ADJUSTMENTS

A. System shall be balanced and reports submitted before substantial completion inspection.

B. Balancing Agency shall be represented at inspection meeting(s) by qualified testing personnel with balancing equipment and two copies of current air balancing test report.
   1. Architect will choose and direct spot balancing. Differences greater than specified tolerance between the spot balance and test report will be justification for requiring repeat
of testing and balancing for entire building and submission of a new test report. In such case a new inspection will be made.

2. Perform rebalancing in presence of Architect/Engineer and subject to their approval.

3. If re-balancing is required, submit revised air test and balance reports to Architect before Substantial Completion.

4. Spot balance and rebalance shall be performed at no additional cost to Owner.

C. Where systems provide over 5 percent more air than schedule requirements, rooms supplied by that system shall have their supply air quantities increased by ratio of actual total air quantity supplied to minimum air quantity required by system schedule.

3.7 SUPPLEMENTAL WARRANTY

A. Test and balance agency shall include an extended warranty of 90 days, after occupancy, during which the Owner's representative, at his discretion, may request a recheck or resetting of any outlet, supply air or exhaust fan, as listed in test report.
PART 1  GENERAL

1.1  SUMMARY

A. Section Includes:
   1. Piping system insulation.
   2. Pipe insulation jackets.
   3. Ductwork insulation.

1.2  QUALITY ASSURANCE

A. Insulation must have maximum flame spread index of 25 and maximum smoke developed index
   of not exceeding 50 in accordance with ASTM E84.

B. All systems components subject to heat loss or gain, such as, piping, storage tanks, vessels, valves
   etc. shall be insulated to conform with the Washington State Energy Code and Evergreen
   Standards (as minimum) and this section.

1.3  IDENTIFICATION

A. Insulation shall bear a manufacturer’s mark indicating the product R-value or K-value and
   thickness. This mark shall be visible after installation and shall be repeated at an interval of no
   more than 10 feet.

B. External duct insulation shall be legibly printed or indentified at intervals not greater than 36
   inches with name of manufacturer, R-value, thickness, flame spread and smoke-developed index.

C. R-values shall be based on insulation only at 75 F mean temperature difference.

D. For rigid or spray foam the aged R-value per inch shall be provided in submittals.

PART 2  PRODUCTS

2.1  POLYOLEFIN INSULATION

A. Manufacturers: IMCOA or similar.

B. Polyolefin or Polyethylene pipe insulation is NOT ACCEPTABLE for any application.

2.2  ELASTOMERIC CELLULAR FOAM (PIPE)

A. Manufacturers: Armacell AP/Armaflex, Aeroflex Aerocel or approved equal.

B. Preformed flexible, closed-cell, elastomeric thermal insulation: Type I, Tubular form, self-seal or
   continuous, 25/50-rated, CFC free, low VOC, ‘K’ factor: 0.27 at 75 degrees F. ASTM C534.

C. Rigid clamp/hanger insert: Armacell Armafix, polyurethane insert and aluminum jacket, single
   piece with self-adhering closure.
2.3 GLASS FIBER DUCT WRAP

A. Manufacturers: Johns Manville Microlite XG 75 or equal by Owens-Corning, Knauf, Manson or approved equal.

B. Description: Formaldehyde-free, flame-attenuated glass fibers bonded with thermosetting acrylic resin, FSK facing.
   1. ASTM E84, UL 723
   2. Installed R Value: 1-1/2" R-4.2, 2" R-5.6, 3" R-8.3.
   3. Maximum Service Temperature: 250 degrees F.
   4. Density: 0.75 lb/cu ft

C. Vapor Retarder Jacket: Reinforced FSK facing. Seal with pressure sensitive 2” tape.

D. Identification: At intervals not greater than 36” print the name of manufacturer, the thermal resistance R-value at insulation thickness, the flame spread and smoke developed indexes.

2.4 PIPE INSULATION AND EQUIPMENT JACKETS

A. PVC Plastic Pipe Jacket:
   1. Product Description: One piece molded type fitting covers and sheet material, white color. ASTM D1784.
   2. Thickness: 15 mil indoor, 30 mil outdoor.

B. Aluminum Pipe Jacket:
   1. Thickness: 0.016 inch thick sheet. ASTM B209.
   2. Finish: Embossed
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

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. Apply insulation when building is thoroughly dry to prevent shrinkage.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulate entire piping system including fittings, valves, unions, flanges, strainers, flexible connections, pump fittings, connections to equipment and expansion joints. Use canvas jackets for valves and other irregular shapes.

D. Insulate flanges and unions with removable sections and jackets.

E. Piping Inserts and Shields:
   1. Insulation shall be continuous through supports and hangers with incompressible inserts and shields. Do not directly clamp/support pipe scheduled to be insulated.
2. Shields: Galvanized steel saddle between pipe clevis hangers or pipe rollers and insulation. Minimum 6 inches long, of contour matching adjoining insulation; may be factory fabricated.

3. Inserts: Between pipe clamps, hangers or rollers and piping.

4. Insert material: Compression resistant insulating material suitable for insulation type and planned temperature range and service.

5. Glue insulation to both sides of insert.

6. Shields without inserts may be used at clevis hangers on refrigerant piping 5/8” and smaller with continuous insulation.

F. 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.

G. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

H. Exterior Piping Applications: Use only elastomeric closed-cell foam insulation. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with sealant. Cover with aluminum jacket with seams located at 3 or 9 o’clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal equipment.

I. Exposed Equipment: Locate insulation and cover seams in least visible locations.

J. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

K. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

L. Finish insulation at supports, protrusions, and interruptions.

3.3 SCHEDULES

A. Piping: Provide on piping as listed below.

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1&quot;</td>
<td>1&quot; to &lt;1-1/2&quot;</td>
</tr>
<tr>
<td>&lt;1&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>1&quot;</td>
<td>1&quot;</td>
</tr>
</tbody>
</table>

1. Note: Insulate Refrigerant Liquid lines same as Suction lines on all Mitsubishi brand equipment, where noted by manufacturer or called for on plans.

2. For all exterior piping applications use only Elastomeric Cellular Foam with Aluminum jacket.
B. Ductwork: Provide on ductwork as listed below. Insulation thickness is provided as reference; each application must meet minimum installed R-Value.

<table>
<thead>
<tr>
<th>Service</th>
<th>Location</th>
<th>Insulation Type</th>
<th>Approx. Thickness</th>
<th>Min. Installed R-Value</th>
<th>Jacket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside Air</td>
<td>Within Building &lt;2800 cfm (4)</td>
<td>Glass Fiber Duct Wrap / Duct Liner</td>
<td>3”</td>
<td>R-7</td>
<td>FSK</td>
</tr>
</tbody>
</table>

1. Secure duct wrap with mechanical fasteners spaced 12” on center, minimum. For horizontal ducts 24” or more in width, duct wrap shall also be secured with mechanical fasteners spaced 18” on center, on centerline of bottom of duct.

2. Concealed space: Any space within the insulated building envelope that is concealed from view, i.e. behind ceiling, wall, shaft, soffit, etc.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Thermostats.
   2. Electric damper actuators.

1.2 SCOPE

A. The mechanical contractor shall install a complete, properly adjusted and effective temperature control system.

B. This section includes field assembled instrumentation and temperature controls for air conditioning, heating, ventilation and exhaust systems.

C. See drawings for Sequence of Operation.

D. See Equipment Schedules and associated specification sections for controls integral to HVAC equipment.

E. Controls shall be electric/electronic systems.

F. Manufacturers of components shall be Honeywell or approved.

G. Any additional parts necessary to or incidental for a complete and operating system shall be the responsibility of the contractor.

1.3 MAINTENANCE SERVICE

A. Furnish service and maintenance of control system for one year from Date of Substantial Completion.

B. Furnish complete service of controls systems, including callbacks and service calls.

C. Furnish two complete inspections per year, one in each season, to inspect, calibrate, and adjust controls. Submit written report after each inspection.

D. Include systematic examination, adjustment, and lubrication of unit, and controls checkout and adjustments. Repair or replace parts in accordance with manufacturer's operating and maintenance data. Use parts produced by manufacturer of original equipment.

E. Perform work without removing units from service during building normal occupied hours.

F. Provide emergency call back service during working hours for this maintenance period.

G. Maintain locally, near Place of the Work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, without unreasonable loss of time.
H. Perform maintenance work using competent and qualified personnel under supervision and in direct employ of manufacturer or original installer.

1.4 QUALITY ASSURANCE

A. Control Air Damper Performance: Test in accordance with AMCA 500.

1.5 SUBMITTALS

A. Provide submittal to include one PDF of control components, control diagrams and operational sequences.

**PART 2 PRODUCTS**

2.1 THERMOSTATS

A. Manufacturers: Honeywell (or as noted below) or approved equal.

B. Bi-metal thermostats are not allowed for any application.

C. Low Voltage Heating/Cooling Commercial Thermostat (Electronic Programmable): T7351F
   2. Accuracy: +/- 1 degrees F.
   3. 24 VAC electrical.
   4. LCD backlight display.
   5. 365 day programming with 2 occupied and 2 unoccupied periods per day.
   6. Individual heat and cool setpoints for both occupied and unoccupied.
   7. P+I+D temperature control.
   8. Auxiliary subbase connection for economizer control.
   9. 3 heat/3 cool conventional or heat pump operation.
   11. Remote sensor

D. Room Thermostat Accessories:
   1. Insulating Bases: For thermostats located on exterior walls.
   2. Thermostat Guards: Locking transparent plastic mounted on separate base.
   3. Adjusting Key: Matching device.

2.2 CONTROL AIR DAMPERS

A. See Section 23 33 00.

2.3 ELECTRIC DAMPER ACTUATORS

A. Manufacturers: Belimo or approved equal.

B. Operation: Two-position or proportional as required for application. [Reversing type proportional motor], spring-return.

C. Enclosure Rating: NEMA 250 Type 2 Enclosure.

D. Mounting: Direct mount.

E. Stroke: 30 seconds end to end full stroke, 15 seconds return to normal for spring return.
F. Protection: Electronic stall protection.

G. Control Input: 0-10 VDC or 0-20 mA DC.

H. Power: Nominal 24 V 120 volt AC.

I. Torque: Size for minimum 150 percent of required duty.

J. Duty cycle: rated for 65,000 cycles.

K. Accessories:
   1. Cover mounted transformer.
   2. Auxiliary potentiometer.
   3. Damper linkage.
   4. Direct drive feedback potentiometer.
   5. Output position feedback.
   6. Field selectable rotational, spring return direction, field adjustable zero and span.
   7. End switch.

2.4 ENCLOSURES

A. All enclosures to be UL listed and all metal construction. All controls and instruments logically assembled at one or more panels.

2.5 CONTROL RELAYS

A. Shall be rated for the application, with a minimum of two sets of Form C contacts, enclosed in a dust proof enclosure. Relays shall be rated for a minimum life of one million operations. Operating time shall be 20 milliseconds or less, with release time of 10 milliseconds or less. Relays should be equipped with coil transient suppression devices to limit transients to 150% of rated coil voltage.

2.6 WIRING

A. Electric wiring and wiring connections required for the installation of the temperature control system as herein specified, shall be provided by the temperature control contractor. All wiring shall comply with the requirements of local and national electrical codes, and with applicable requirements of Electrical Division. Install all wiring in conduit.

B. Line voltage wiring type and size shall be per NEC.

C. Low voltage wiring type and size shall be per control manufacturer’s recommendations based on application and length of run.

2.7 CONTROL POWER

A. Provide transformers to supply power for control equipment operating at less than normal lighting circuit voltage. Do not connect wiring to lighting circuits.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify building systems to be controlled are ready to operate.
B. Verify air handling units and ductwork have been accepted and air filters are in place before installing sensors in air streams.

C. Verify location of thermostats, humidistats and other exposed control sensors with Drawings before installation.

3.2 COORDINATION

A. Furnish all control products to accomplish the specified sequence of operation, except those products specifically furnished under other sections.

B. Install all control products and connections, except where already installed by the equipment manufacturer.

C. Thermostats located in electrical transformer vaults shall be model approved by electrical utility.

3.3 INSTALLATION

A. General:
   1. Install controls by mechanics skilled in erection of control systems employed by and under direct supervision of control manufacturer's representative.
   2. Mount control equipment and devices as recommended by manufacturers and as shown on drawings; in case of conflicts between manufacturer's instructions and the drawings, consult the Project Manager for direction.
   3. Fasten all equipment securely to structure. Install equipment and exposed piping and conduit runs parallel to building lines, plumb and level.

B. Wiring:
   1. Provide line voltage and/or low voltage wiring as required to serve the complete system; conform to code.
   2. Provide EMT or rigid conduit for exposed control wiring outside of cabinets or enclosures. Concealed low voltage wiring need not be in conduit, except in walls (see “3”).
   3. Provide rigid conduit for control wiring concealed in partition walls, until conduit emerges from wall above ceilings.
   4. Run low voltage control wiring separate from line voltage wiring and segregate from other systems to avoid Electromagnetic Interference (EMI).
   5. All low voltage control wiring shall be home runs between components without splices.

C. Install sleeves through concrete surfaces in minimum one inch sleeves, extended 6 inches above floors and one inch below bottom surface of slabs.

D. Install thermostats, humidistat, space temperature sensors, and other exposed control sensors after locations are coordinated with other Work.

E. Install thermostats in aspirating boxes in public areas and as indicated on Drawings.

F. Install control panels adjacent to associated equipment on vibration free walls or freestanding supports. Install engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

G. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.
3.4 THERMOSTATS AND SENSORS

A. Mount thermostats and other human interface devices at 48” centerline above finished floor to comply with ADA accessibility per ANSI A117.1. Align thermostats and devices with light switches and other controls.

B. Coordinate wall location of thermostats and other wall mount devices with light switches and controls provided by others. All devices in the same vicinity should be grouped at a common elevation with regular horizontal spacing intervals.

3.5 FIELD QUALITY CONTROL

A. After completion of installation, start-up, test and adjust each system. Submit data showing set points, final adjustments of controls and compliance with sequence of operations.

B. Conduct functional tests on complete systems, or individual portions as approved.

C. Conduct operational tests; set controls to operating conditions, record settings and readings of each control device.

D. Work in close coordination with testing and balancing Agency to set up control devices, set damper flow rates, and provide control system in perfect operating order. See Section 23 05 93.

3.6 DEMONSTRATION AND TRAINING

A. Demonstrate complete operation of systems, including sequence of operation prior to Date of Substantial Completion.

B. Not less than 60 days after beneficial occupancy by the Owner, recheck entire control system for compliance with Sequence of Operation.

C. Recheck controls for proper operation at the start of the heating season, if other than above timing, and again during the first warm weather period following winter operation.

END OF SECTION
SECTION 23 23 00
REFRIGERANT PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Refrigerant piping.
   2. Refrigerant moisture and liquid indicators.
   3. Refrigerant piping accessories.

1.2 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections when joining dissimilar metals in systems.

B. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges, or couplings downstream of valves and at equipment connections. Do not use direct welded or threaded connections to valves or equipment.

C. Size piping in accord with equipment manufacturer's refrigerant piping design guidelines based on actual piping installation lengths. Use long line calculations when applicable.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.5 code for installation of refrigerant piping systems.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Dehydrate and charge refrigeration components including piping and receivers, seal prior to shipment. Maintain seal until connected into system.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 REFRIGERANT PIPING

A. Copper Tubing: ASTM B280, Type ACR hard drawn or annealed.

2.2 COPPER PRESSURE-SEAL FITTINGS FOR REFRIGERANT PIPING

A. Manufacturers: Parker Hannifin – Zoomlock

B. Flame-Free press fittings: UL 207 Listed. Refrigerant Grade Copper in accordance with ASTM B75 or ASTM B743. O-Rings: HNBR.
C. Tools: Manufacturer's approved special tools.

D. Ratings:
   2. Continuous Operating Temperature: 250 deg F.
   3. O-Ring Temperature Rating: -40 to 300 deg F.
   4. Minimum Burst Pressure in accordance with UL 207: 2100 psig.
   6. Complies with UL 109 for vibration resistance.
   7. Approved for the following oils: POE, PVE, PAG.

E. Approved Tubing Materials: Copper-to-copper connections with the following copper tubing:
   1. Hard Drawn Copper, 1/4 to 1-3/8 inch (6.4 to 35 mm): Type ACR, M, L, K.
   2. Soft (Annealed) Copper 1/4 to 1-3/8 inch (6.4 to 35 mm): Type ACR, L, K.

2.3 REFRIGERANT LINE SET

A. Copper Tubing: ASTM B280, annealed, Type ACR
   1. Flared ends with brass nuts and protective caps.
   2. Pre-insulated, dual tube, liquid and vapor lines with closed-cell elastomeric foam.

2.4 UNIONS, FLANGES, AND COUPLINGS

A. Copper Pipe: Bronze, soldered joints.

2.5 REFRIGERANT MOISTURE AND LIQUID INDICATORS

A. Manufacturers: Alco Controls, Parker Hannifin, Sporlan Valve or approved equal.

B. Indicators:
   1. Port: Single, UL listed.
   2. Body: Copper or brass, flared or solder ends.
   4. Maximum working pressure: 500 psig
   5. Maximum working temperature: 200 degrees F.

2.6 REFRIGERANT STRAINERS

A. Manufacturers: Alco Controls, Parker Hannifin, Sporlan Valve or approved equal.

B. Straight Line or Angle Line Type:
   1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.
D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION PIPING SYSTEMS

A. Route piping parallel to building structure and maintain gradient.

B. Install piping to conserve building space, and not interfere with use of space.

C. Group piping whenever practical at common elevations.

D. Sleeve pipe passing through partitions, walls and floors.

E. Protection: Where piping, other than cast iron or steel, is installed in a concealed location through holes or notches in framing (i.e. studs, joists, rafters, etc.), less than 1-1/2 from framing edge, provide shield plates. Shield plates shall be 16 gauge steel and cover the piping area within framing plus 2” on each side along framing.

F. Use rigid Armacell Armafix pipe clamp assembly at all supports.

G. Determine equivalent line length and size piping per manufacturer’s installation instructions. Provide solenoid valve and other required piping accessories for long line installation.

H. Refrigerant piping shall not be installed in elevators, public stairways, stair landing or means of egress spaces.

I. Install pipe identification.

J. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

K. Provide access where valves and fittings are not exposed.

L. Arrange refrigerant piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

M. Flood refrigerant piping system with nitrogen during brazing. Keep piping open with nitrogen flow for zero pressure while brazing.

N. Install valves with stems upright or horizontal, not inverted.

O. Insulate piping and equipment.

P. Provide replaceable cartridge filter-dryers, with isolation valves and bypass with valve.

Q. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

R. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

S. Fully charge completed system with refrigerant after testing.

T. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.

U. Install refrigerant piping in accordance with ASME B31.5.
3.3 INSTALLATION-EXTERIOR PIPING
   A. Protect exterior piping with application specific piping protection cover system or field fabricated
      GSM cover with steel angle supports.
   B. Provide waterproof pipe entry into building with trim and flashing.
   C. Protect exposed insulated pipe with aluminum jacket.

3.4 INSTALLATION - REFRIGERANT SPECIALTIES
   A. Refrigerant Liquid Indicators: Install line size liquid indicators in main liquid line downstream of
      condenser.
   B. Refrigerant Valves: Install service valves on compressor suction and discharge.
   C. Strainers: Install shut-off valves on each side of strainer.

3.5 FIELD QUALITY CONTROL
   A. Test refrigeration system in accordance with ASME B31.5.
   B. Pressure test refrigeration system with dry nitrogen to 400 psig. Perform final tests at 27 inches
      vacuum and 400 psig using halide torch or electronic leak detector.
   C. Repair leaks.
   D. Retest until no leaks are detected.

END OF SECTION
PART 1  GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Ductwork
   2. Duct Sealant
   3. Fabrication

1.2 PERFORMANCE REQUIREMENTS

A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

B. Standards: Comply with most stringent requirements and recommendations of International Mechanical Code or SMACNA (Sheet Metal and Air Conditioning Contractors National Association) Duct Construction Standards for fabrication, construction and sealant of duct, fittings, and accessories.

C. Construct ductwork to NFPA 90A.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures during and after installation of duct sealant.

1.4 DEFINITIONS

A. Black Carbon Steel: Plain carbon steel which is not galvanized or oiled.

PART 2  PRODUCTS

2.1 DUCT MATERIALS

A. Galvanized Steel Ducts: ASTM A653 galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90.

B. Fasteners: Rivets, bolts, or sheet metal screws.

C. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCT SEALANT

A. Manufacturer: Design Polymeric, United McGill or approved equal.
B. Sealant shall be water based and formulated to withstand working temperatures of -25°F to +200°F. All sealants shall exceed 500 hours under ASTM C 732 (artificial weathering) and pass ASTM C 734 (low temperature flexibility after artificial weathering). All sealants shall be of an elastomeric nature, have a weight per gallon not to exceed 12.5, have solids by weight of 66% ± 2%, pass UL 723 with a flame spread of 5 and smoke developed of 5.

2.3 DUCTWORK FABRICATION

A. Fabricate and support rectangular and round ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Provide duct material, gages, reinforcing, and sealing for operating pressures corresponding to the ESP (external static pressure) of the fan system. i.e. Ductwork for a fan with and ESP of 0.75” w.g. should be constructed per SMACNA 1” w.g. pressure standard.

B. Construct T’s, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.

C. Indicated dimensions on drawings are net inside. Allow for thickness of duct lining where indicated.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

F. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify sizes of equipment connections before fabricating transitions.

3.2 INSTALLATION

A. Make field measurements to establish locations of hangers and supports where installation will not damage building construction.

B. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

C. Where ducts pass through partitions, ceilings or floors. Provide 1” clearance and insulate from structure with insulation material. Provide flanged sheet metal closure.

D. Where ducts pass through rated walls or assemblies without fire dampers, provide ¼” to 1” annular space and fill with firestop sealant. Ductwork shall be minimum 26 gauge metal.

E. Isolate joints between dissimilar metals with fiber gasket.

F. Drawings do not attempt to show all offsets in ductwork. Make such offsets as necessary for installation of work without additional cost to Owner. 15 degree maximum angle of offset.
3.3 SEISMIC BRACING
A. See 23 05 00.

3.4 DUCT SEALING
A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Ductwork shall be sealed using welds, gaskets, or mastic. Duct tape is not permitted as a sealant on any ducts with the exception of that on fiberglass ducts specifically made for such use.
B. For all ductwork seal all transverse joints and longitudinal seams. For 2” w.g. and higher pressure class ductwork also seal all duct wall penetrations (i.e. screw, fastener, rod or wire).
C. Low pressure ductwork (less than 3” w.g.) shall be sealed to a leakage rate not to exceed 6 percent of the system airflow. All deficient ductwork shall be re-sealed until compliant.

3.5 INTERFACE WITH OTHER PRODUCTS
A. Install openings in ductwork where required to accommodate thermometers and controllers. Install pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.
B. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.
C. Connect air outlets and inlets to supply ducts with five foot maximum length of flexible duct. Do not use flexible duct to change direction.

3.6 CLEANING
A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air flow, clean one half of system completely before proceeding to other half. Protect equipment with potential to be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.7 SCHEDULES
A. Ductwork Material Schedule:

<table>
<thead>
<tr>
<th>AIR SYSTEM</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside Air Intake</td>
<td>Galvanized Steel</td>
</tr>
</tbody>
</table>

B. Ductwork Pressure Class Schedule: Install higher pressure class than indicated where corresponding fan system ESP (external static pressure) is higher.

<table>
<thead>
<tr>
<th>AIR SYSTEM</th>
<th>PRESSURE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant Volume Low Pressure Supply</td>
<td>Minimum 1 inch wg.</td>
</tr>
<tr>
<td>Return, Exhaust</td>
<td>Minimum 1 inch wg</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Louvers

1.2 QUALITY ASSURANCE
A. Diffuser, register, and grille performance shall be tested and rated in accordance with ASHRAE 70.
B. Louver performance shall be tested and rated in accordance with AMCA 500.

PART 2 PRODUCTS

2.1 LOUVERS
A. Manufacturers: Greenheck ESD-403, Ruskin, Wonder Metal or approved equal.
B. Product Description: Stationary, drainable blade. AMCA certified.
C. Type: 4 inch deep with blades on 45 degree slope, heavy channel frame. Minimum initial point of water penetration of 900 fpm.
D. Fabrication: 12 gage thick extruded aluminum, welded assembly, with factory 2-coat 70% Kynar finish, color to be selected.
E. Mounting: Furnish with flanges, mullions, and hardware for installation.
F. Bird Screen: Aluminum 3/4" x 0.051" flattened expanded metal.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify inlet and outlet locations with Architectural Plans.
B. Verify ceiling/wall type before ordering.

END OF SECTION
SECTION 23 40 00
HVAC FILTERS

PART 1 GENERAL
1.1 SUMMARY
   A. Section Includes:
      1. Disposable, pleated filters.

1.2 PERFORMANCE REQUIREMENTS
   A. Conform to ARI 850 Section 7.4.
   B. Dust Spot Efficiency: Plus or minus 5 percent.

PART 2 PRODUCTS
2.1 DISPOSABLE, PLEATED FILTERS
   A. Manufacturers: Camfil, Flanders, Airguard, Viledon or approved equal.
   B. MERV 8: UL 900 Class 2, pleated, cotton and polyester blend, radial pleat with welded wire grid, cardboard frame. 1”, 2” & 4”. (Camfil 30/30)

PART 3 EXECUTION
3.1 INSTALLATION
   A. Install filters with felt, rubber, or neoprene gaskets to prevent passage of unfiltered air around filters.
   B. Install filter gage static pressure tips upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum, in accessible position. Adjust and level.
   C. Do not operate fan system until filters are in place. Replace filters used during construction before testing, with clean set. Provide owner with replacement set of filters.

END OF SECTION
PART 1   GENERAL

1.1  SUMMARY
   A.  Section Includes:
       1.  Multi-zone split systems.

1.2  MAINTENANCE SERVICE
   A.  Furnish service and maintenance of equipment for one year from Date of Substantial Completion.
       Include maintenance items as shown in manufacturer’s operating and maintenance data, including
       filter replacements, fan belt replacement, and controls checkout and adjustments.
   B.  Furnish 24-hour emergency service on breakdowns and malfunctions for this maintenance period.

1.3  QUALITY ASSURANCE
   A.  Capacity rating in accordance with ARI.
   B.  Sound rating is accordance with ARI 270.
   C.  Insulation and adhesives: Meet requirements of NFPA 90A.

1.4  ELECTRICAL
   A.  Short-Circuit Current Rating (SCCR): All HVAC and refrigeration equipment with multi-motor
       or combination electrical loads shall comply with NEC 110.10 & 440.4 and must include a SCCR
       greater than the Available Interrupting Current (AIC) of the electrical circuit serving the
       equipment.  See electrical drawings for required AIC kA rating.  Equipment SCCR may be
       presented in writing from the manufacturer or shown on the unit nameplate.  Refrigeration or air-
       conditioning equipment over 60 Amps MOCP must list the SCCR on the unit nameplate.  If the
       AIC rating is unavailable or cannot be determined provide equipment with a minimum SCCR of
       10kA.

1.5  QUALIFICATIONS
   A.  The system shall be installed by a Mitsubishi authorized CITY MULTI Diamond Dealer.  The
       contractor service and install training should be performed by the manufacturer.

PART 2   PRODUCTS

2.1  SPLIT SYSTEM HEAT PUMPS OUTDOOR CONDENSING UNIT
   A.  Manufacturers: Mitsubishi, LG or approved equal.
   B.  General: Variable capacity, heat pump system capable of single or multiple zones.
   C.  Units shall be equipped with multiple circuit boards that interface to the control system and shall
       perform all functions necessary for operation, be completely factory assembled, piped and wired.
       Each unit shall be run tested at the factory.
       1.  Sound pressure rating no higher than 59 dB(A).
2. All refrigerant lines shall be individually insulated.
3. Accumulator with refrigerant level sensors and controls.
4. High pressure safety switch, over-current protection and DC bus protection.
5. Capable of operating in heating down to -13°F ambient temperature without additional low ambient controls.
6. High efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

D. Unit Cabinet: The casing shall be fabricated of galvanized steel, bonderized and finished with powder coated baked enamel.

E. Fan: Direct drive, variable speed propeller type fan with inherent protection, permanently lubricated bearings, mounted for quiet operation, raised guard and horizontal discharge airflow.

F. Refrigerant: R410A refrigerant is required.

G. Coil: Nonferrous construction with lanced or corrugated plate fins on copper tubing with an integral metal guard. Fins shall have corrosion resistant blue-fin finish.

H. Compressor: High performance, inverter driven, modulating capacity scroll compressor with a factory mounted crankcase heater, an inverter to modulate capacity, internal thermal overload, mounted to avoid the transmission of vibration.

I. Electrical: The unit shall be controlled by integral microprocessors with the control circuit between the indoor units and the outdoor unit being 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.2 PKFY INDOOR UNIT (wall-mounted)

A. Manufacturers: Mitsubishi, LG or approved equal.

B. General: Wall mounted indoor unit section with a slim silhouette and a modulating linear expansion device.

C. Indoor Unit: Factory assembled, wired and run tested with all factory wiring, piping, electronic modulating linear expansion device, control circuit board, fan motor, 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.

D. Unit Cabinet: White finish, same for all model sizes. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining. Separate back plate which secures the unit firmly to the wall.

E. Fan: An assembly with one or two line-flow fan(s) direct driven by a single motor. Statically and dynamically balanced to run on a motor with permanently lubricated bearings. Multi-speed fan with two speeds selected by the room controller. Manual adjustable guide vane with the ability to change the airflow from side to side (left to right). Motorized air sweep louver with automatic change in airflow by directing the air up and down to provide uniform air distribution.


G. Coil: Nonferrous construction with smooth plate fins on copper tubing, inner grooves for high efficiency heat exchange, phos-copper or silver alloy brazed joints, pressure tested at the factory. A condensate pan and drain shall be provided under the coil. Both refrigerant lines to the PKFY indoor units shall be insulated.
H. Controls: Unit controls to be provided with unit as part of VFRZ system to perform functions necessary to operate the system. The unit shall be able to control external backup heat.

I. Accessories:
1. Provide with BlueDiamond condensation pump complete with reservoir and accessories. Provide model MicroBlue for units up to 15 MBH and MaxiBlue for units 18 MBH and larger. Provide power from fan coil unit.

2.3 CONTROLS

A. General: The physical controllers shall be plastic material with a neutral color. Each remote controller, at a minimum, shall have a LCD (Liquid Crystal Display) that shows room temperature, set point, and fan speed.

B. Electrical:
1. The electrical voltage from each circuit board to the controls shall be 12 volts DC.
2. Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit then to the BC controller and outdoor unit. Control wiring shall run from the indoor unit terminal block to the controller associated with that unit.
3. Wiring shall be 2-conductor 16 AWG or 18 AWG stranded wire with a shield, as defined by control drawing.

2.4 CMCN: System Controllers

A. AE-200 Centralized Controller
1. Standalone controller shall be capable of controlling up to 50 indoor units across multiple outdoor units. Controller shall be capable of controlling up to 200 indoor units across multiple outdoor unit with expansion of up to three AE-50A controllers.
2. Power shall be provided by integrated power supply.
3. Controller shall support operation superseding that of the remote controllers, system configuration, daily/weekly scheduling, monitoring of operation status, night setback setting, free contact interlock configuration and malfunction monitoring.
4. Controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units, or all indoor units. These controls shall include on/off, operation mode selection (cool, heat, auto, dry, setback and fan), temperature setting, fan speed setting, and airflow direction setting.
5. Ability to enable or disable operation of local remote controllers.
6. Allow both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed and permit/prohibit of remote controllers.
7. Controller shall be equipped with a RJ-45 Ethernet port to support interconnection with a network PC via a closed/direct Local Area Network (LAN), via an Ethernet Hub on a LAN.
8. 9” high resolution, back lit, color touch panel interface for direct graphical interface and control of system.
9. Memory back up via USB port.
10. Software functions shall be available so that the building manager can securely log into each AE-200 via the PC’s web browser to support operation monitoring, scheduling, error e-mail, personal browser, and maintenance diagnostics.

2.5 CONDENSATE PUMPS

A. See Section 230500.
PART 3  EXECUTION

3.1  EXAMINATION

A. Coordinate size and location of concrete pad for condensing unit. Provide inserts for mounting.
B. Coordinate size and location of sleeves or block-outs needs for refrigerant piping.
C. Determine refrigerant pipe routing to efficiently minimum run length and avoid interference.

3.2  INSTALLATION

A. Install condensate piping with trap and determine route from drain pan to nearest waste with 1/4" slope. Provide condensate pump where drain is not available, or slope cannot be made.
B. Install components furnished loose for field mounting.
C. Install refrigerant piping from condensing unit to indoor unit(s). Install refrigerant specialties furnished with unit.
D. Insulate both liquid and vapor refrigerant piping on all runs.
E. Evacuate refrigerant piping and install initial charge of refrigerant.
F. Install electrical devices furnished loose for field mounting.
G. Install control wiring between air handling unit, condensing unit, and field installed accessories.

3.3  INSTALLATION – FAN COIL UNIT

A. Install condensate piping with trap and determine route from drain pan to nearest waste with 1/4" slope. Provide condensate pump where drain is not available or slope cannot be made.
B. Install fan coil units on vibration isolators.
C. Connect ducted fan coil units to supply and return ductwork with flexible connections.

3.4  INSTALLATION - CONDENSING UNIT

A. Install condensing units at grade on concrete foundations with anchors.
B. Install condensing units on neoprene vibration isolators.

3.5  INSTALLATION - CONDENSATE PUMPS

A. See Section 230500.

3.6  MANUFACTURER'S FIELD SERVICES

A. Furnish initial start-up and commissioning. During first year of operation, including routine servicing and checkout.

3.7  CLEANING

A. Vacuum clean coils and inside of unit cabinet if necessary.
B. Install new filters in units at Substantial Completion.

3.8 DEMONSTRATION
A. Demonstrate unit operation and maintenance.
B. Furnish services of manufacturer's technical representative for one day to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner, provide at least 7 days' notice to Architect/Engineer of training date.

3.9 PROTECTION OF FINISHED WORK
A. Do not operate indoor units during construction for temporary heat.
B. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Electric cabinet heater.

PART 2 PRODUCTS

2.1 ELECTRIC CABINET HEATER

A. Manufacturers: OCA or approved equal.

B. Assembly: UL listed and labeled assembly with terminal box and cover. Complete with mounting bracket.

C. Heating Elements: Tubular heating element with fins.

D. Cabinet: 18 gauge steel with white powder coated finish, hinged and latched access door, overheat protection.


F. Options:
   1. 100% fresh air inlet with motorized damper.
   2. Disposable MERV 8 filter.
   3. Custom configuration with rear outside air intake and front discharge.

PART 3 EXECUTION

3.1 EXAMINATION

A. For recessed units, verify recess dimensions are correct size.

B. Verify wall construction is ready for installation.

C. Verify concealed blocking and supports are in place.

3.2 INSTALLATION

A. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.

B. Protection: Install finished cabinet units with protective covers during remainder of construction.

C. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals.
3.3 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of units.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

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.

1.2 SUMMARY
   A. This section includes general electrical requirements for all Division 26 work and is supplemental and in addition to the requirements of Division 01.
   B. Section Includes:
      1. Electrical equipment coordination and installation.
      2. Common electrical installation requirements.
   C. General Requirements: Conform to Contract Documents. This section is supplemental and in addition to requirements of Division 01.
   D. Conditions and Requirements: Conditions and requirements of the General Provisions, Supplemental General provisions and Special Provisions are hereby made a part of the Electrical Division of this Specification. If requirements disagree, the more stringent requirement will become the contractual obligation.
   E. Provide a complete working installation with all equipment called for in proper operating condition. Documents do not undertake to show or list every item to be provided. When an item not shown or specified is clearly necessary for proper operation of equipment shown or specified, provide an item which will allow the system to function at no increase in Contract Sum.
   F. Workmanship shall be of the best quality and competent and experienced electricians shall be employed and shall be under the supervision of a competent and experienced foreman.
   G. The drawings and specifications are complimentary and what is called for (or shown) in either is required to be provided as if called for in both.

1.3 DEFINITIONS
   A. Definitions of all terms shall be in accordance with applicable definitions of:
      1. AIA - American Institute of Architects
      2. IEEE - Institute of Electrical and Electronic Engineers
      3. IES - Illuminating Engineering Society
      4. NEMA - National Electrical Manufacturers Association
      5. NEC - National Electrical Code
      6. IBC - International Building Code
      7. IFC - International Fire Code
      8. ADA - Americans with Disabilities Act
      9. NFPA - National Fire Protection Association

1.4 CODES
   A. Codes for installation of electrical work shall be State of Washington Electrical Code, Washington Cities Electrical Code, Electrical Safety Code, applicable rules and regulations and OSHA and Washington Industrial Safety and Health Act. Any violation of the above Safety Codes shall be cause for immediate termination of Contractor’s authority to proceed with work, and recourse to surety for completion of the project.

1.5 PERMITS AND INSPECTIONS
   A. Obtain permits and pay fees required by governmental agencies having jurisdiction over this work.
B. Arrange for inspections required during construction. On completion of work, furnish satisfactory evidence to show all work installed in accordance with codes.

1.6 CLEARANCES
A. Adequate working space shall be provided around electrical equipment for maintenance and operation. Minimum clearances shall conform to Art. 110-26 of NEC.

1.7 TESTS
A. Test all wiring and connections installed in this project for continuity and grounds before any fixtures or equipment are connected. This testing is only required for new wiring installed in this project. It is not required for existing wiring.

1.8 INDUSTRY STANDARDS, CODES AND SPECIFICATIONS
A. All materials, equipment, and systems shall conform to the following applicable Industry Standards, Codes and Specifications:
   1. ANSI - American National Standards Institute
   2. IEEEI - Institute of Electrical and Electronic Engineers
   3. IES - Illuminating Engineering Society
   4. IPCEA - Insulated Power Cable Engineers Association
   5. NFPA - National Fire Protection Association
   6. NEMA - National Electrical Manufacturers Association
   7. UL - Underwriters Laboratory
   8. IBC - International Building Code
   9. IFC - International Fire Code
   10. IMC - International Mechanical Code
   11. ADA - Americans with Disabilities Act (Washington State ADA/WAC51-30)
   12. WAC - Washington Administrative Code
B. Where differences occur between state laws, local ordinances, industry standards, utility company regulations and the Contract Documents, the most stringent shall govern.

1.9 QUALITY ASSURANCE
A. Regulatory Requirements:
   1. Nothing in the Drawings or Specifications shall be construed to permit Work not conforming to applicable laws, ordinances, rules or regulations.
   2. When Drawings or Specifications exceed requirements of applicable laws, ordinances, rules, or regulations, comply with documents establishing the more stringent requirements.

1.10 DELIVERY, STORAGE, AND HANDLING
A. 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. Provide protective coverings during construction.
B. Identify materials and equipment delivered to the Site to permit check against approved materials list, and reviewed submittals.

1.11 MATERIAL AND EQUIPMENT ENVIRONMENT
A. All equipment and material shall be suitable for the environment of the installation, and the installation including equipment shall satisfy the governmental agencies having jurisdiction.
1.12 DRAWINGS AND SPECIFICATIONS
   A. Specifications, with drawings, are intended to cover installation of all electrical equipment. Materials shown and called for on drawings, but not mentioned in specifications, or vice versa, necessary for proper completion and operation of equipment, shall be furnished the same as if called for in both.
   B. Electrical drawings do not attempt to show complete details of project construction which affect electrical installations. Refer to architectural drawings for additional details which affect installation of this work.

1.13 COORDINATION
   A. Before installation Contractor shall make proper provisions for electrical work and to avoid interferences with installation of other work. Any changes caused by neglect to do so shall be made at Contractor’s expense.
   B. Electrical drawings and specifications shall be compared with drawings and specifications of other trades and any discrepancies between them reported to the Architect prior to installation of work.

1.14 CUTTING AND PATCHING
   A. Do all cutting and patching for installation of the work. All cutting done carefully to prevent damage to work of other trades, and all patching done by mechanics skilled in the trade affected, and subject to approval by Architect. Provide all work per Division 01. Work shall include:
      1. Painting: All exposed conduit, boxes, surface metal raceway, enclosures, multi-outlet assemblies shall be painted to match wall color. Where exact color unknown, coordinate with Architect to obtain color. All items shall be painted regardless of whether wall, ceiling, or floor finish is painted.

1.15 RUBBISH AND CLEAN-UP
   A. Contractor shall promptly remove waste material and rubbish caused by workers.
   B. At completion of work, clean all fixtures, electrical panel interiors, switchboards, distribution centers, and all other equipment installed.

1.16 SCOPE OF WORK
   A. Mention herein or indication on drawings of articles, materials, operations or methods, requires that Contractor provide each item mentioned or indicated, of quality, or subject to qualifications noted; perform according to conditions stated, each operation prescribed.
   B. Work included under this contract provides for all labor, equipment, and materials to complete all electrical work as outlined in drawings and specifications for project.
   C. The scope of this work is listed generally but is not limited to as follows:
      1. Lighting fixtures and switches
      2. Smoke/CO detectors
      3. Branch wiring, power, lighting, and equipment
      4. Equipment connections
      5. Wall Heaters
      6. Bath fans

1.17 SUBMITTALS
   A. General:
      1. Submittals shall be in accordance with requirements of Division 01 and as specified.
      2. Forward all submittals to the Architect, together, at one time. Individual or incomplete submittals are not acceptable.
      3. Organize submittals in same sequence as they appear in Specification Sections.
4. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or Drawing and Detail number.

5. 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. Words "as specified" are not sufficient identification.

B. Contract Closeout Submittals:
   1. Operation and Maintenance:
      a. Subsequent to final completion, and testing operations, instruct Owner’s authorized representatives in operation, adjustment, and maintenance of electrical plant.
      b. Before Owner’s personnel assume operation of systems, submit operating and maintenance instructions, manuals, parts lists on electrical plant, its component parts, including all equipment which requires, or for which the manufacturer recommends, maintenance in a specified manner. Data sheets shall show complete internal electrical wiring, ratings, and characteristics, catalog data on components parts whether furnished by equipment manufacturer or others, names, addresses, and telephone numbers of source of supply for parts subject to wear or electrical failure, and description of operating, test, adjustment, and maintenance procedures.

C. Prior to installation, submit the equipment list to the Architect for final review. This list shall consist of, but not be limited to, the basic items applicable to the project as follows:
   1. Lighting System and fixtures
   2. Smoke/CO detectors
   3. Branch wiring, power, lighting, and equipment
   4. Wall heaters
   5. Bath Fans

1.18 JOB RECORD INFORMATION
   A. Record drawings shall be continuously maintained in the field by the Contractor. Drawings used for this purpose shall be the latest revision and shall be kept neat and clean.

1.19 NAMEPLATES AND TAGS
   A. The following items shall be equipped with tags or nameplates with etched letters:
      1. Disconnect switches
      2. Panelboards

1.20 FINAL SUBMITTALS
   A. After completion of all electrical work and prior to final inspection, submit the following:
      1. One copy of the electrical equipment maintenance manual to be sent direct to Architect for review, containing the following:
         a. List of suppliers of replacement parts for all electrical equipment used on job.
         b. Panel schedules
         c. Catalog cuts of all lighting fixtures, lamps, starters, special devices and all other equipment used on job.
         d. All available maintenance data published.
         e. Wiring diagrams and operating instructions for all systems installed.
         f. Marked-up set of prints showing exact location of all conduits and outlets deviating from original plans.
      2. Refer to Division 01 for Operations and Maintenance Manuals.
1.21 WARRANTY
   A. Warranties shall be provided per Division 01. Where not indicated provide minimum 1 year (or standard manufacturers warranty if longer) warranty for all equipment installed on this project. Warranty shall include all labor, site visit, installation costs.

PART 2 PRODUCTS

2.1 MATERIALS
   A. Materials and Equipment General Requirements:
      1. All items of materials in each category of equipment shall be of one manufacturer.
      2. Groups of items having same or similar function shall be by single manufacturer to facilitate maintenance and service.
      3. Compatible with space allocated. Modifications necessary to adjust items to space limitations shall be at Contractor’s expense.
      4. Conform with conditions shown and specified. Coordinate with other trades for best possible assembly of completed work.
      5. Install fully operating without objectionable noise or vibration.

PART 3 EXECUTION

3.1 INSTALLATION
   A. Follow manufacturer’s directions in all cases where manufacturers of articles used furnish directions covering points not shown or specified.
   B. Accurately set and level equipment with supports neatly placed and properly fastened. No allowance of any kind will be made for negligence on the part of the Contractor to foresee means of bringing in and installing equipment in position inside the building.
   C. Provide hangers, supports, anchors and chases as required for installation of electrical work.
   D. Interface with other products:
      1. For purposes of clarity and legibility, Drawings are essentially diagrammatic to the extent that many offsets, bends, special fittings, and exact locations of items are not indicated, unless specifically dimensioned. Exact routing of wiring, and locations of outlets, panels, and other items shall be governed by structural conditions or obstructions.
      2. Take dimensions, location of doors, partitions, and similar features from Architectural Drawings. Verify at the site under this Division.

3.2 FIELD QUALITY CONTROL
   A. Test panels and circuits for grounds and shorts with mains disconnected from feeders, branch circuits connected, and circuit breakers closed, all fixtures in place, permanently connected, grounding jumper to neutral lifted, and with all wall switches closed.

3.3 CLEANING
   A. Properly prepare work under this Division to be finish painted under Division 01.

3.4 EQUIPMENT IDENTIFICATION
   A. Properly identify panelboards, circuit breakers in panelboards, disconnect switches, and other apparatus used for operation or control of circuits, appliances or equipment.

3.5 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION
   A. Comply with NECA 1.
B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

3.6 DEMOLITION

A. Remove devices as indicated on demolition plans.
B. Removed associated circuitry for removed devices unless circuitry will be re-used for a replacement device.
C. Patch walls and ceilings as required after removal of devices.
D. Provide blank faceplates for boxes no longer in use after removal of devices.
E. Field verify conditions to determine full extent of demolition work.

END OF SECTION
SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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.

1.2 SUMMARY
A. This Section includes the following:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

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

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. Comply with NFPA 70.

PART 2 PRODUCTS

2.1 CONDUCTORS AND CABLES
A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alcan Products Corporation; Alcan Cable Division.
   3. General Cable Corporation.
   4. Senator Wire & Cable Company.
   5. Southwire Company.
C. Copper Conductors: Comply with NEMA WC 70. Minimum size - No. 12 AWG.
D. Aluminum Conductors: Sizes #2 and larger subject to using Burndy Hy-lug or Hy-Plug terminations.
E. Conductor Insulation: Comply with NEMA WC 70. Drawings are based on using THHN-THWN cables. Contractor shall increase conduit size for any other insulation.
F. Ground Wire: Proved THWN ground wire in all circuits, sized per code. Raceway shall not be used as ground.

PART 3 EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS
A. Branch Circuits: Copper.
B. Minimum wire size: No. 12 AWG.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS
A. Branch Circuits: Non-metallic sheathed cable as allowed by code. UL listed. Romex or equal.

3.3 BRANCH WIRING
A. General: Complete system of circuitry required to all light outlets, receptacles, switches, etc. as shown.

3.4 EQUIPMENT WIRING
A. General: Wiring connections for power and control for all equipment shall be complete including disconnect switches and controls unless otherwise specified or noted on drawings.
B. Control wiring for mechanical systems installed under this section of specifications shall be in accordance with mechanical drawings and specifications.

3.5 INSTALLATION OF CONDUCTORS AND CABLES
A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
B. Exposed cables not permitted.
C. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.6 CONNECTIONS
A. 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.
B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
   1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

3.7 FIELD QUALITY CONTROL
A. Perform tests and inspections and prepare test reports.
B. Tests and Inspections:
   1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and branch conductors for compliance with requirements.
C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION
SECTION 26 05 26 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY
A. This Section includes methods and materials for grounding.

1.2 SUBMITTALS
A. Product Data: For each type of product indicated.
B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:
   1. Ground rods.
C. Qualification Data: For testing agency and testing agency's field supervisor.
D. Field quality-control test reports.
E. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:
   1. Instructions for periodic testing and inspection of grounding features at test wells, ground rings, grounding connections for separately derived systems, based on NFPA 70B.
      a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
      b. Include recommended testing intervals.

1.3 QUALITY ASSURANCE
A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 PRODUCTS

2.1 CONDUCTORS
A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
B. Bare Copper Conductors:

2.2 CONNECTORS
A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
   1. Pipe Connectors: Clamp type, sized for pipe.
C. Insulated Ground Conductors: Per 260519.
D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

PART 3 EXECUTION

3.1 APPLICATIONS
A. Ground Conductors: Green colored insulation. Provide in all raceways.
B. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors or exothermic weld where required by code authority.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS
A. Comply with IEEE C2 grounding requirements.

3.3 GROUNDING
A. Install insulated equipment grounding conductors with all feeders and branch circuits.
B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
   1. Feeders and branch circuits.
   2. Lighting circuits.
   3. Receptacle circuits.
C. Water Heater: Install a separate insulated equipment grounding conductor to each electric water heater. Bond conductor to heater units, piping, connected equipment, and components.

3.4 INSTALLATION
A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
C. Consult with code authority and comply with all code authority requirements.

END OF SECTION
SECTION 260529 – HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.
B. IMC: Intermediate metal conduit.
C. IBC: International Building Code

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.
E. All supports shall comply with IBC, Washington Seismic Zone, Building Use Group III.

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Steel slotted support systems.
   2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
   1. Trapeze hangers. Include Product Data for components.
   2. Steel slotted channel systems. Include Product Data for components.
   3. Nonmetallic slotted channel systems. Include Product Data for components.
   4. Equipment supports.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
B. Comply with NFPA 70.
Section 26 05 29
HANGERS AND SUPPORTS

Bellevue Manor Apartments
Bellevue, WA
January 17th, 2020

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   5. Channel Dimensions: Selected for applicable load criteria.


C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Hilti Inc.
         2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
         3) MKT Fastening, LLC.
         4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

   A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
   B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

   A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
   B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
   C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel-slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
      1. Secure raceways and cables to these supports with two-bolt conduit clamps.
      D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

   A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
   B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.
   C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS
A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES (HOUSEKEEPING PADS)
A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section.
C. Anchor equipment to concrete base.
1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING
A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
B. Touchup: Comply with requirements in Division 09 for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

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.

1.2 SUMMARY
   A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS
   A. EMT: Electrical metallic tubing.
   B. ENT: Electrical nonmetallic tubing.
   C. EPDM: Ethylene-propylene-diene terpolymer rubber.
   D. FMC: Flexible metal conduit.
   E. LFMC: Liquidtight flexible metal conduit.
   F. LFNC: Liquidtight flexible nonmetallic conduit.

1.4 SUBMITTALS
   A. Product Data: For raceway and boxes.

1.5 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. Comply with NFPA 70.

PART 2 PRODUCTS

2.1 METAL CONDUIT AND TUBING
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1. AFC Cable Systems, Inc.
      2. Alflex Inc.
      3. Allied Tube & Conduit; a Tyco International Ltd. Co.
      4. Anamet Electrical, Inc.; Anaconda Metal Hose.
      5. Electri-Flex Co.
      7. Maverick Tube Corporation.
   B. EMT: ANSI C80.3. Hot dipped galvanized inside and outside.
   C. LFMC: Flexible steel conduit with PVC jacket.
D. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
   1. Fittings for EMT: Steel, compression or set screw type.
   2. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping sleeves protecting threaded joints.

E. MC Cable: Flexible steel conduit with THHN conductors

2.2 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   2. Anamet Electrical, Inc.; Anaconda Metal Hose.
   3. Arnco Corporation.
   4. CANTEX Inc.
   7. ElecSYS, Inc.
   8. Electri-Flex Co.
   9. Lamson & Sessions; Carlon Electrical Products.
   10. Manhattan/CDT/Cole-Flex.
   11. RACO; a Hubbell Company.
   12. Thomas & Betts Corporation.

B. ENT: NEMA TC 13. Not permitted

C. LFNC

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
   2. EGS/Appleton Electric.
   7. RACO; a Hubbell Company.
   10. Spring City Electrical Manufacturing Company.

B. Nonmetallic Outlet and Device Boxes

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

PART 3 EXECUTION

3.1 RACEWAY APPLICATION

A. All conduit sizes on drawings are based on EMT. Any alternate raceway used shall have it’s size adjusted per the NEC
B. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
   1. Exposed Conduit: EMT
   2. Concealed Conduit, Aboveground: EMT.
   3. Connection to Vibrating Equipment: LFMC.
   4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

3.2 INSTALLATION
A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
B. Complete raceway installation before starting conductor installation.
C. Support raceways as specified in Division 26 Section "Hangers, Supports and Fasteners."
D. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
E. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
F. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for equipment subject to vibration.
   1. Use LFMC in damp or wet locations
G. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

END OF SECTION
SECTION 260534 – RACEWAYS AND BOXES FOR COMMUNICATIONS AND ELECTRONIC SAFETY AND SECURITY SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for raceways, fittings, and boxes specific to communications circuits for fire alarm, security, CCTV, sound, television, voice, and data which are additional to, or different from, that of Divisions 27 and 28.

1.2 REFERENCES

A. The applicable portions of the following specifications, standards, codes and regulations (latest editions and/or amendments) shall be incorporated by reference into these specifications.

1. General:
   a. National Electrical Code (NEC)
   b. National Electrical Safety Code (NESC)
   c. Washington Industrial Safety and Health Act (WISHA)
   d. Occupational Safety and Health Act (OSHA)

2. Communications:
   a. TIA/EIA - 568A: Commercial Building Telecommunications Cabling Standard
   b. TIA/EIA - 568A2: Corrections and Additions to TIA/EIA 568A
   c. TIA/EIA - 569A: Commercial Building Standard for Telecommunication Pathways and Spaces
   d. TIA/EIA - 606: The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
   e. TIA/EIA - 607: Commercial Building Grounding and Bonding Requirements for Telecommunications
   f. TIA/EIA - TSB67: Transmission Performance Specifications for Field Testing of Unshielded Twisted Pair Cabling Systems
   g. ISO/IEC IS 11801: Generic Cabling for Customer Premises
   h. BICSI: BICSI Cabling Installation Manual

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials shall consist of conduit, multi-outlet assemblies (SMR), device boxes, fittings, enclosures, pull boxes, hangers/supports, backboards, and other raceway incidentals and accessories as required and as detailed in Division 26 05 33 except where specifically noted below.

2.2 MATERIALS

A. Conduit: Minimum conduit size shall be 1.25 inch. Provide EMT, IMC or RGS.

1. Data conduits shall be minimum 1.25 inch
2. Underslab or Underground: NOT ALLOWED
3. Minimum Size for AV Shall be 1.25 inch
4. Provide metallic bushing on all conduit
5. All conduit bends shall comply with EIA/TIA standards for Category 6A cabling installation (8x minimum bending radius)

B. Device boxes: Provide device boxes as follows:
   1. At all locations provide Randl 5” x 5” x 2.875” deep box with single and double gang mudrings. Randl R-55014 for electronic safety and security and signal systems and Randl T-55017 for communications systems
      a. Exception: When in fire rated wall, Randl box exceeds allowable area, provide 4” x 4” by 2-1/8” box.
   2. Alternate approved box Hubbl HBL260 or HBL263 extra deep 4-11/16” box.
   3. Surface mounted outlets – Not allowed:
   4. For all other outlets:
      a. Device boxes shall be double gang deep depth with single or double gang extension rings (i.e. device covers, mud rings) unless otherwise noted on the Drawings. Combined depth of device box and extension ring shall be 2-3/4”.

C. Backboards: Provide backboards which are 5/8” A-C fire treated plywood, void free, 8-ft high unless otherwise noted, capable of supporting attached equipment, and painted with a minimum of two coats of fire retardant light gray semi gloss paint.

D. Pull Boxes: Provide pull boxes (junction boxes) as shown on the Drawings and as required. 90 degree condulets (LB’s) are not acceptable.
   1. Pull boxes shall be sized as follows:
      Maximum For Each
      Trade Size Box Size Additional Conduit
      | Conduit | Width | Length | Depth Increase | Width |
      |---------|-------|--------|---------------|-------|
      | 1”      | 4”    | 16”    | 3”            | 2”    |
      | 1-¼”    | 6”    | 20”    | 3”            | 3”    |
      | 1-½”    | 8”    | 27”    | 4”            | 4”    |
      | 2”      | 8”    | 36”    | 4”            | 5”    |

E. Firestopping: Provide firestopping material to maintain the fire rating of all penetrated walls, floors, and ceiling structures. Material shall be acceptable to the local fire and building authorities as well as applicable codes and shall be removable. Firestopping material shall be:
   1. Specified Tech. Inc.

F. Grounding Conductor: Provide #6 AWG insulated solid copper conductor (green) to bond all metallic raceway to the nearest grounding bus bar (as provided under Division 26 Section — “Grounding”).

G. Labels: Provide labels as recommended in TIA/EIA 606. Labels shall be permanent/legible typed and created by a Brady LS-2000 label maker or equivalent system. Handwritten labels are not acceptable. Labels are required for all raceway and pull boxes.

H. Pull Strings: Provide pull strings in all conduit with tag on each end.
PART 3 - EXECUTION

3.1 GENERAL

A. All work shall comply with Division 26 05 33.

B. The Contractor is solely responsible for the safety of the public and workers in accordance with all applicable rules, regulations, building codes and ordinances.

C. The Contractor shall follow all applicable safety rules and regulations including OSHA and WISHA. The National Electrical Safety Code (NESC) and the NEC shall be strictly followed except where local codes and/or regulations are more stringent, in which case the local codes and/or regulations shall govern.

D. All work shall comply with the standards, references and codes listed in Part 1 — References above. Where questions arise regarding which standards, references, or codes apply, the more stringent shall prevail.

E. The Contractor shall install all components strictly to manufacturers’ recommendations.

F. Install the raceway system in a manner ensuring that communications circuits, when installed, are able to fully comply with the TIA/EIA, ISO/IEC and BICSI references listed in Part 1 — References, above.

G. If raceway (conduits, sleeves, etc.) is installed after walls are installed and/or after finish to walls has been applied, wall penetrations shall be sealed, patched and painted to match condition and finish of undisturbed wall.

H. Upon project completion, all surplus material and debris shall be cleared from the job site and legally disposed of.

3.2 INSTALLATION

A. Conduit:
   1. Run conduit in the most direct route possible, parallel to building lines. Do not route conduit through areas in which flammable material may be stored, or over or adjacent to boilers, incinerators, hot water lines, or steam lines.
   2. Conduit bends:
      a. A conduit bend shall not exceed 90 degrees.
         1) For conduit up to 2”, the bend must be at least 8 times the internal diameter of the conduit.
         2) For conduit greater than 2”, the bend must be at least 10 times the internal diameter of the conduit.
      b. The sum total of conduit bends for a section of conduit shall not exceed 180 degrees, except as noted below:
         1) One additional bend of up to 90 degrees is acceptable if the bend is located within 12 inches of the cable feed end.
      c. 90 degree condulets (B’s) are not acceptable.
   3. Ream conduits to eliminate sharp edges and terminate with metallic insulated grounded throat bushings. Cap each conduit with a mechanical-type seal for protection. Equip all conduits with a plastic or nylon pull string with a minimum test rating of 200 lb.
4. Terminate conduits that protrude through a floor 1” to 3” above the surface of the floor. Conduits stubbed to ceiling shall be clear of all casework and obstacles on floor below. Also conduits shall be located to be easily accessible and not blocked by structural members, ductwork, piping, equipment, etc.

5. Label each conduit end in a clear manner by designating the location of the other conduit end (i.e. room name, communications closet name, junction box number, etc.). Indicate conduit length on the label.

B. Device Boxes: Set device boxes plumb, level, square and flush with wall. Do not exceed more than 1/16” tolerance for each condition.

C. Pull Boxes: Install pull boxes in an exposed location, readily accessible both at time of construction and after building occupation. Pull boxes shall not be installed in interstitial building space.

1. Do not exceed one pull box per total conduit run between device box and termination point in a communications closet.

2. If mounting pull box on ceiling structure above ceiling grid, do not mount higher than 4’ above grid (mount on wall instead).

3. A pull box may not be substituted for a 90 degree bend.

4. Install pull boxes such that conduit enters and exits at opposite ends of the box as follows:

D. Grounding/Bonding: All grounding and bonding work shall comply with the Uniform Building Code, Uniform Fire Code, WAC, National Electrical Code, UL 467, and ANSI/TIA/EIA standards listed in Part 1 — References above, as well as local codes which may specify additional grounding and/or bonding requirements.

1. Bond all metallic raceway at both ends to the nearest grounding bus bar (as provided under Division 27 15 00). Ensure that bonding breaks through paint to bare metallic surface of all painted metallic raceway.

E. Provide pull strings in all conduit.

F. Provide metallic grounding bushings on all raceways.

END OF SECTION
SECTION 260553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

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.

1.2 SUMMARY
   A. This Section includes the following:
      1. Identification for raceway and metal-clad cable.
      2. Identification for conductors and communication and control cable.

1.3 SUBMITTALS
   A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE
   B. Comply with NFPA 70.

PART 2 PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS
   A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
   B. Color for Printed Legend:
      2. Fire Alarm: White letters on red field.
   C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
   D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS
   A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
   B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
   C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.
   D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch with stamped legend, punched for use with self-locking nylon tie fastener.
E. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 EQUIPMENT IDENTIFICATION LABELS
A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

PART 3 EXECUTION

3.1 APPLICATION
A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange self-adhesive vinyl label or snap-around label or self-adhesive vinyl tape applied in bands.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands or snap-around, color-coding bands:
   1. Mechanical and Electrical Supervisory System: Green and blue.
   2. Telecommunication System: Green and yellow.
   4. Control Wiring: Green and red.

C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 4 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use aluminum wraparound marker labels. Identify each ungrounded conductor according to source and circuit number.

3.2 INSTALLATION
A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Short circuit study
   2. Arc fault study per NEC 70E for entire system. Provide an Arc Flash Hazard Study for the electrical distribution system shown on the one-line drawings. The intent of the Arc Flash Hazard Study is to determine hazards that exist at each major piece of electrical equipment shown on the one-line drawings. This includes switchgear, switchboards, panelboards, motor control centers, automatic transfer switches, VFD’s, and transformers. The study will include creation of Arc Flash Hazard warning labels. These labels serve as a guide to assist technicians and others in the selection of proper personal protective equipment when working around exposed and energized conductors. Electrical contractor shall install the labels.

1.2 SCOPE

A. It is the intent of these tests to assure that protective devices are operational, correctly applied, within industry and manufacturer's tolerances, and installed in accordance with the specifications. This effort should minimize the damage caused by any electrical failure. The testing agency shall verify that the electrical system and electrical equipment configuration matches the contract documents, vendor shop drawings, and the electric system coordination study recommended settings.

B. Prepare a coordination study for the specific electrical overcurrent devices and feeder lengths, to be installed under this project, from the primary overcurrent protective device to the branch circuit breaker panels to assure proper equipment and personnel protection.

C. The study shall present an organized time-current analysis of each protective device in series from the individual device back to the source at Puget Sound Energy. The study shall reflect the operation of each device during normal and abnormal current conditions, and confirm that devices are coordinated.

D. The study shall coordinate the emergency system to meet NEC 700, 701, and 702. The system shall selectively coordinate to comply with all requirements of 700.27 and 701.18. All equipment provided under Panels, Switchboards, Circuit Breakers, Fusing, Controllers, etc. shall be designed and provided by the contractor to comply with the selective coordination requirements of the code. Study shall be completed and accepted by the engineer prior to ordering any equipment.

E. Provide arc fault/flash study per NFPA 70E.

F. Study shall be stamped by the coordination study engineer with a Professional Engineer’s stamp from the State of Washington

G. Report shall not be submitted until complete compliance with NEC 700.27 is complete. Contractor shall provide all devices as directed in the coordination study.
H. Coordination Study Engineer report and stamp states that the coordination engineer is stating that the system complies with NEC 700.27 and 701.18.

1.3 APPLICABLE CODES, STANDARDS AND REFERENCES

A. Inspection and tests shall be in accordance with the following codes and standards except as provided otherwise herein:
   3. Association of Edison Illuminating Companies – AEIC
   4. Institute of Electrical and Electronic Engineers – IEEE
   5. Insulated Cable Engineers Association – ICEA
   7. National Electrical Manufacturer's Association – NEMA
      a. ANSI/NFPA 70: National Electrical Code
      b. ANSI/NFPA 70B: Electrical Equipment Maintenance
      c. NFPA 70E: Electrical Safety Requirements for Employee Workplaces
      d. ANSI/NFPA 78: Lightning Protection Code
      f. NFPA 70E
   9. Occupational Safety and Health Administration – OSHA
   10. State and local codes and ordinances

1.4 SUBMITTALS

A. Submit the following in accordance with Division 01:
   1. Protective equipment shop drawings with the protective device study. The one-line diagram showing available fault currents and timing of devices shall be submitted both as hard copies and as two electronic copies of AutoCad drawings on Compact Disc. Two electronic copies of both the Dapper and Captor software files shall be provided on Compact Disc. An index shall be provided which cross references the file names on these disks to the specific pieces of equipment or system.
   2. Certifications: Two weeks prior to final inspection, the Contractor shall deliver four copies of the following certifications to the Owner's representative:
      a. That the protective devices have been adjusted and set in accordance with the approved protective device study.
      b. That tests and settings have been witnessed by the Owner.
   3. Short circuit study in conjunction with, and at the same time as, the submittal for Panelboards. The study shall show fault currents available at key points in the system down to a fault current of 7000A. The purpose of this submittal is to verify the fault current ratings of the panelboards.

1.5 QUALIFICATIONS

A. The coordination study shall be prepared by qualified engineers of the switchgear manufacturer or an approved consultant. Provide pertinent information required by the preparers to complete the study.
B. The short circuit study and coordination study shall be performed on the Dapper and Captor computer software packages. No substitutions.

C. Preapproved: Electrotest, Power Systems Engineering, Siemens Engineering Service Division, Square D, GE.

PART 2 - EXECUTION

2.1 REQUIREMENTS

A. The complete study shall include a system one line diagram, short circuit and ground fault analysis, and protective coordination plots.

B. One-Line Diagram:
1. Show, on the one line diagram, electrical equipment wiring to be protected by the overcurrent devices installed under this project. Clearly show, on the one line, the schematic wiring of the electrical distribution system.
2. Show reference nodes on the one line diagram referring to a formal report, to include the following specific information:
   a. X/R ratios, utility contribution, and short circuit values (asymmetric and symmetric) at the bus of the main switchboard, and all downstream equipment containing overcurrent devices.
   b. Breaker and fuse ratings.
   c. Transformer KVA and voltage ratings, percent impedance, X/R ratios, and wiring connections.
   d. Voltage at each bus.
   e. Identifications of each bus.
   f. Conduit material, feeder sizes, and length.
   g. Calculated short circuit current.

C. Short Circuit Study:
1. Determine the available 3 phase short circuit and ground fault currents at each bus. Incorporate the motor contribution in determining the momentary and interrupting ratings of the protective devices.
2. The study shall be calculated by means of the Dapper computer software package. Pertinent data and the rationale employed in developing the calculations shall be incorporated in the introductory remarks of the study.
3. Present the data determined by the short circuit study in a table or report format. Include:
   a. Device identification.
   b. Operating voltage.
   c. Protective device.
   d. Device rating.
   e. Calculated 3 phase short circuit current (asymmetrical and symmetrical), and ground fault current.
   f. Ground fault pickup and time delay.

2.2 ANALYSIS

A. Analyze the short circuit calculations, and highlight any equipment that is determined to be underrated as specified or not coordinated. Propose approaches to effectively protect the underrated equipment. Proposed major corrective modifications will be taken under advisement by the Owner and further instructions will be given.
B. After developing the coordination curves, highlight areas lacking coordination. Present a technical evaluation with a discussion of the logical compromises for best coordination.

2.3 ADJUSTMENTS, SETTINGS AND MODIFICATIONS

A. Accomplish necessary field settings, adjustments and minor modifications to conform with the study without additional cost to the Owner. (Examples of minor modifications are trip sizes within the same frame, the time curve characteristics of induction relays, ranges etc.)

2.4 FIELD INFORMATION

A. Gather field information needed for the protective device study.

END OF SECTION
SECTION 260923 – LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Digital Occupancy and Daylighting Sensor Control
   2. Analog Occupancy Sensor Control
   3. Networked Digital Low Voltage Control Panels

B. Control Intent – Control Intent includes, but is not limited to:
   1. Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
   2. Initial sensor and switching zone.
   3. Initial time switch settings
   4. Task lighting and receptacle controls.
   5. Blind Control

1.2 REFERENCES

A. Edit the following to include only those standards referenced elsewhere in this Section.
B. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) (www.ansi.org and www.ieee.org)
C. Underwriter Laboratories of Canada (ULC) (www.ulc.ca)
D. International Electrotechnical Commission (www.iec.ch)
E. International Organization for Standardization (ISO) (www.iso.ch):
F. National Electrical Manufacturers Association (NEMA)
G. WD1 (R2005) - General Color Requirements for Wiring Devices.
H. Underwriters Laboratories, Inc. (UL) (www.ul.com):
   1. 916 – Energy Management Equipment.
   2. 924 – Emergency Lighting

1.3 SYSTEM DESCRIPTION & OPERATION

A. The Lighting Control and Automation system as defined under this section covers the following equipment:
   1. Digital Room Controllers – Self-configuring, digitally addressable one, two or three relays controllers with 0-10 volt control for ballasts (if applicable), single or dual relay controllers for switching control of ballasts and single relay application-specific plug load controllers.
   2. Digital Low Voltage Control Panels (RELAY PANELS-LVR)– Native BACnet communicating over MSTP protocol presenting BACnet objects for all loads and groups. All connected devices including sensors and switches shall present as BACnet objects. Available in 8, 24 or 48 relay configurations with 24VDC available to support digital switches and sensors. Panel operates in conjunction with the other devices specified herein, both local and networked. Support on board clock and/or network clock functionally, while supporting free topology over a CAT5e network. Setup may be configured on board, via a handheld configuration toll, Software or via a BACnet GUI.
3. Blind Controller (BC) – provide blind controller to allow up/down control of blinds from dedicated switches and provide for automatic raising of blinds at set time each night.

4. Digital Occupancy DT Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications. Sensors shall be available in both flush ceiling mounting configurations and surface bracket mounting configurations.

5. Digital Switches – Self-configuring, digitally addressable pushbutton switches, dimmers, and scene switches with two-way active infrared (IR) communications. Switch pushbuttons shall be configurable for zones or scenes as noted on drawings or in sequence of operations.

6. Digital Wall Occupancy DT Sensors – Self-configuring digitally addressable and calibrated occupancy sensor with one or two pushbuttons and two-way active infrared (IR) communications. Unit shall be furnished for flush wall box installation and pushbuttons shall be configurable for zones or scenes as noted on drawings or in sequence of operations.

7. Digital Photosensors – Single-zone closed loop and multi-zone open loop daylighting sensors with two-way active infrared (IR) communications can provide switching or dimming control for daylight harvesting.

8. Configuration Tools – Handheld remote for room configuration provides two-way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away. Unit to have Organic LED display, simple pushbutton interface, and allow send and receive of room variables and stored occupancy sensor settings. Unit must indicate confirmation of commands sent to system devices. Computer software must also be available to customize room settings.

9. Where specified handheld remotes for personal control – One-button dimming, two-button on/off, or five-button scene remotes provide control using infrared communications. Remote may be configured in the field to control selected loads or scenes without special tools.

10. Where specified to interface with other systems or equipment the system shall be furnished with input/output control modules to provide a contact closure based on the depressing of a system pushbutton, or activation of a command from the network Segment Manager.

11. Digital Lighting Management (DLM) local network – Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.

12. Network Bridge – provides BACnet MS/TP-compliant digital networked communication between rooms, panels and the Segment Manager or building automation system (BAS).

13. Segment Manager – provides web browser-based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting. When communication between the BAS system is specified, the information shall be provided to the System Integrator in the form of object tables including Device Instance, Device Alias and Device Function for the required points.

14. Analog Occupancy Sensors and power packs – Where shown on drawings ceiling or wall corner type Dual Technology type occupancy sensors shall be installed. They shall be furnished complete with power packs and switching functions that allow for manual on operation. Momentary contact decora style switch shall be paired to sensor and power pack providing this operation.

15. Wallbox Dual Technology Sensors – Furnish line voltage wall box sensors for smaller areas where noted on plans. Sensor shall be furnished for 120/277V
operation and shall utilize the principals of Dual Technology sensing. Unit shall also include dip switch setting for specific space configuration and allowing for a selectable manual on feature. Dip switches shall be hidden from view.

16. Emergency Lighting Control Unit (ELCU) – allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building

1.4 LIGHTING CONTROL APPLICATIONS

A. Unless relevant provisions of the applicable local Energy Codes are more stringent, provide a minimum application of lighting controls as follows:
   1. Space Control Requirements – Provide occupancy/vacancy sensors with Manual-ON functionality in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors and Manual-ON switches.
   2. Bi-Level Lighting – Provide multi-level controls where shown on drawings
   3. Task Lighting / Plug Loads – Provide automatic shut off of non essential plug loads and task lighting in all spaces except toilet rooms and storerooms. Provide Automatic-ON of plug loads whenever spaces are occupied. For spaces with multiple occupants a single shut off consistent with the overhead lighting may be used for the area.
   4. Daylit Areas – All luminaries within daylighting zones as defined in the Seattle Energy Code (the daylit zones) shall be controlled separately from luminaires outside of daylit zones. Luminaires closest to the daylight aperture shall be controlled separately from luminaires farther from the daylight aperture, within the daylight zones.
   5. Daytime set points for total ambient illumination (combined daylight and electric light) level that initiate dimming shall be programmed to be not less than 125% of the nighttime maintained designed illumination levels.
   6. Multiple-leveled dimmed or switched daylight harvesting controls may be utilized for areas as marked on drawings.
   7. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to turn off electric lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.

B. Additional controls.
   1. Provide occupancy/vacancy sensors for any enclosed office, conference room, meeting room, and training room. For spaces with multiple occupants or where line-of-sight may be obscured, provide ceiling- or corner-mounted with manual-on switches. Where noted on drawings smaller spaces may be specified with line voltage wall switch style occupancy sensors.
   2. Conference, meeting, training, auditoriums, and multipurpose rooms shall have controls that allow for independent control of each local control zone. Rooms larger than 300 square feet shall instead have at least four (4) pre-set lighting scenes unless otherwise specified. Occupancy / vacancy sensors shall be provided to extinguish all lighting in the space.
1.5 SUBMITTALS

A. Submittals Package: Submit the shop drawings, and the product data specified below at the same time as a package.

B. Shop Drawings:
   1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed (standard diagrams will not be accepted).
   2. Scale drawings indicating panel locations, sensors, switches, bridges and segment manager. Drawing should show MSTP network wiring and local CAT5 wiring between devices. Relay and device schedules shall be included.
   3. Scale drawing for each area showing exact location of each sensor, room controller, and digital switch.

C. Product Data: Catalog sheets, specifications and installation instructions.

D. Include data for each device which:
   1. Indicates where sensor is proposed to be installed.
   2. Prove that the sensor is suitable for the proposed application.

1.6 QUALITY ASSURANCE


1.7 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
   1. Ambient temperature: 0° to 40° C (32° to 104° F).
   2. Relative humidity: Maximum 90 percent, non-condensing.

1.8 WARRANTY

A. Provide a five year complete manufacturer’s warranty on all products to be free of manufacturers’ defects.

1.9 MAINTENANCE

A. Spare Parts:
   1. Provide
      a. Switching Controllers – 1
      b. Dimming Controllers – 1
      c. Wall Switches – 4 button – 10
      d. Digital Photocell – 4
      e. Digital Occupancy Sensor – 6
      f. Wall Box Occupancy Sensor – 6
      g. Relays – Per Schedules

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. WattStopper or similar products by Hubbell, Cooper.
B. Substitutions:
   1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
   2. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring. The contractor shall provide complete engineered shop drawings (including power and control wiring) with deviations from the original design highlighted in an alternate color to the engineer for review and approval prior to rough-in.

2.2 STAND ALONE CONTROL DEVICES

A. General Ceiling Mount: Dual-technology Wattstopper #DT-300 with BZ-1 relay pack and additional slave pack for connection to DDC system. Wire per manufacturer
B. General Wall Mount: Wattstopper #DT-200 with BZ-1 relay pack and additional slave pack for connection to DDC system. Wire per manufacturer
C. Hallway and Corridor Sensors: Dual-technology Wattstopper WT with BZ-1 relay pack and additional slave pack for connection to DDC system. Wire per manufacturer
D. Restrooms: Wattstopper UT with relay pack and additional slave pack for connection to DDC system. Wire per manufacturer.
E. Photocell: Wattstopper LS-102 Analog with BZ-1 power pack

2.3 SINGLE / DUAL RELAY WALL SWITCH OCCUPANCY SENSORS

A. Type DW: Manual-ON, Automatic- occupancy sensor Furnish the Company’s model which suits the electrical system parameters, and accommodates the square-foot coverage and wattage requirement for each area (and type of lighting) controlled;
B. SensorSwitch WSX family

2.4 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR (DLM SYSTEM)

A. Wall or ceiling mounted (as indicated) DT dual technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the Company’s system which accommodates the square-foot coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors and accessories which suit the lighting and electrical system parameters.
B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
   1. Digital calibration and pushbutton programming for the following variables:
      a. Sensitivity – 0-100% in 10% increments
      b. Time delay – 1-30 minutes in 1 minute increments
      c. Test mode – Five second time delay
      d. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
      e. Walk-through mode
      f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
   2. One or two RJ-45 port(s) for connection to DLM local network.
   3. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
4. Device Status LEDs including:
   a. PIR Detection
   b. Ultrasonic detection
   c. Configuration mode.
   d. Load binding

5. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.


C. Units shall not have any dip switches or potentiometers for field settings.

D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

E. WattStopper product numbers: LMDX, LMDC

2.5 DIGITAL WALLBOX MOUNTED OCCUPANCY SENSOR (DLM SYSTEM) – GRAY COLOR WITH STAINLESS STEEL PLATES

A. Wallbox mounted DT dual technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the Company’s system which accommodates the requirements for each area controlled, utilizing room controllers, digital occupancy sensors and accessories which suit the lighting and electrical system parameters.

B. Digital Occupancy Sensors shall provide for digital calibration and electronic documentation. Features include the following:
   1. Digital calibration and pushbutton programming for the following variables:
      a. Sensitivity – 0-100% in 10% increments
      b. Time delay – 1-30 minutes in 1 minute increments
      c. Test mode – Five second time delay
      d. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
      e. Walk-through mode
      f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
   2. Two RJ-45 port(s) for connection to DLM local network.
   3. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
   4. Device Status LEDs including:
      a. PIR Detection
      b. Ultrasonic detection
      c. Configuration mode
      d. Load binding
   5. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.

C. Units shall not have any dip switches or potentiometers for field settings.

D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

E. WattStopper product numbers: LMDW
2.6 HIGH CEILING OCCUPANCY SENSOR
   A. Wattstopper#HB3 with mount and interface relay to interface to DLM system.

2.7 DIGITAL WALL SWITCHES (DLM SYSTEM) – GRAY COLOR WITH STAINLESS STEEL PLATES
   A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration; available in white, light almond, ivory, grey and black; compatible with wall plates with decorator opening. Wall switches shall include the following features:
      1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
      2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
      3. Red configuration LED on each switch that blinks to indicate data transmission.
      4. Blue Load/Scene Status LED on each switch button with the following characteristics:
         a. Bi-level LED
         b. Dim locator level indicates power to switch
         c. Bright status level indicates that load or scene is active
      5. Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.
   B. Two RJ-45 ports for connection to DLM local network.
   C. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.
   D. The following switch attributes may be changed or selected using a wireless configuration tool:
      1. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
      2. Individual button function may be configured to Toggle, On only or Off only.
      3. Individual scenes may be locked to prevent unauthorized change.
      4. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
      5. Ramp rate may be adjusted for each dimmer switch.
      6. Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

2.8 HANDHELD REMOTE CONTROLS (DLM SYSTEM)
   A. Battery-operated handheld switches in 1, 2 and 5 button configuration for remote switching or dimming control. Remote controls shall include following features:
   B. Two-way infrared (IR) transceiver for line of sight communication
      1. Communicate with DLM local network within up to 30 feet.
      2. Blue LED on each button confirms button press.
      3. Load buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.
4. Inactivity timeout to save battery life.

C. A wall mount holster and mounting hardware shall be included with each remote control

D. WattStopper part numbers: LMRH-101, LMRH-102, LMRH-105.

2.9 ROOM CONTROLLERS (DLM SYSTEM)

A. Room Controllers automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room Controllers shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will not have, dip switches, potentiometers or require special configuration. The control units will include the following features:

1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.
2. Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.
3. Device Status LEDs to indicate:
   a. Data transmission
   b. Device has power
   c. Status for each load
   d. Configuration status
4. Quick installation features including:
   a. Standard junction box mounting
   b. Quick low voltage connections using standard RJ-45 patch cable
5. Plenum rated
6. Network Bridge for BACnet MS/TP communications (LMRC-3xx).
7. Manual override and LED indication for each load
8. Dual voltage (120/277 VAC, 60 Hz)
9. Zero cross circuitry for each load.

B. Switching On/Off Room Controllers (SRC) shall include:

1. One or two relay configuration
2. Efficient 150 mA switching power supply
3. Three RJ-45 DLM local network ports
4. Discrete model listed for connection to receptacles, for occupancy-based control of plug loads within the space.
   a. One relay configuration only
   b. Automatic-ON/OFF configuration
5. WattStopper product numbers: LMRC-101, LMRC-102, LMPL-101

C. Dimming Room Controllers (DRC) shall include:

1. Real time current monitoring.
2. One, two or three relay configuration.
3. Efficient 250 mA switching power supply.
4. Four RJ-45 DLM local network ports.
5. One 0-10 volt analog output per relay for control of compatible ballasts and LED drivers.
6. Network Bridge for BACnet MS/TP communications (LMRC-3xx).
7. The following dimming attributes may be changed or selected using a wireless configuration tool:
   a. Establish preset level for each load from 0-100%
b. Set high and low trim for each load
   c. Set lamp burn in time for each load up to 100 hours

8. Discrete model listed for connection to receptacles, for occupancy-based control of plug loads within the space.
   a. One relay configuration only
   b. Automatic-ON/OFF configuration

D. WattStopper product numbers: LMRC-211, LRMC-212, LRMC-213, LMPL-201.

2.10 DIGITAL LOW VOLTAGE CONTROL PANELS (LOW VOLTAGE RELAY PANELS - LVR)

A. System panels shall be provided in locations and capabilities as indicated on plans and in schedules. Panels shall be configured for surface or flush mounting as shown and shall be furnished in NEMA 1 enclosures with hinged lockable covers unless otherwise noted. Dividers shall be provided between line and low voltage compartments of the panel. Where different voltages or emergency circuits are present in the same panel, additional dividers shall be installed.

B. Panel interior shall be furnished factory assembled and listed for field installation. Interior shall be furnished complete including intelligence boards, power supply, DIN rails, individually replaceable latching type HDR relays and the following added features:

1. IR ports for panel setup via the DLM system LMCT-100 configuration tool.
2. Override pushbuttons for each relay and LED indicators to indicate relay status.
3. Panel shall be capable of running the following events whether stand alone or over the MSTP network.
   a. Scheduled events
   b. Photocell events
   c. Up to 99 control groups
   d. Local or global occupancy sensor inputs
   e. Local or global switch inputs

4. Local CAT5e network segments:
   a. Support for 2 CAT5e DLM device networks supporting 250MA at 24VDC. Up to 60 LMSW Switches or 30 LMDC Sensors or a combination thereof.
   b. Additional current is available by adding power supplies
   c. Each local network has 2 RJ45 ports available in the panel

5. Control both interior and exterior loads
6. Relays are single pole mechanical latching with the following ratings:
   a. 20 amp ballast at 277V
   b. 20 amp ballast at 347V
   c. 20 amp tungsten at 120V
   d. 20 amp resistive at 347V
   e. 1.5HP motor rating at 120V
   f. 14,000 amp short circuit current rating (SSCR) at 347V

7. Manual override and LED indication for each load
8. Dual voltage (120/277 VAC, 60 Hz)
9. Relays tested to minimum of 300,000 operations.
10. Zero cross circuitry for each load.

C. BACnet based communication shall be RS485 MSTP using BACnet Protocol as follows:

1. Each panel shall have an individual device ID
2. Every device ID on the local panel network shall be visible and shall communicate over the network.
3. Relays shall be controlled as binary output objects in the instance of 1-48 the state of each relay shall be readable and writable via the BAS using object present value property.
4. The description property for all objects shall be writable via the network and shall be saved in Non-volatile memory within the panel.
5. Relays shall report their true on/off state as binary input objects in the same instance range of 1-48.
6. The BO an BV objects shall support BACnet priority array with a relinquish default of off and after hours respectively.
7. Setup and commissioning of the panel shall not require manufacturer specific software or configuration tools of any kind. All configuration of the lighting control panel shall be performed using standard BACnet objects or via the LMCT configuration tool.

D. Panel shall support digital wall switches with 1,2,3,4 or 8 buttons, they connect and communicate over the panel’s local CAT5e network. Switches shall have the following characteristics:
   1. Single gang devices shall fit standard decora openings and use standard cover plates.
   2. LED indicator on each button for status and locator functions.
   3. Concealed configuration button with LED indicator for binding buttons to relays, no software or computer shall be required.
   4. Infrared window for use with the LMCT handheld two-way wireless configuration tool.
   5. Selectable function mode per button shall be momentary toggle (on/off), on only or off only.
   6. Removable button assembly for field color change or substitution of engraved buttons.
   7. Two RJ-45 DLM local network ports for connections to panel or other switches/sensors.
   8. Devices shall connect via open topology on the CAT5e digital network.
   9. Digital Switches shall be Wattstopper LMSW series as indicated herein before and on drawings.

E. Panel shall support digital DT dual technology occupancy sensors; they connect and communicate over the panel’s local CAT5e network. Sensors shall have the following characteristics:
   1. Wall or ceiling mounted DT dual technology digital (passive infrared and ultrasonic) occupancy sensor.
   2. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
      a. Digital calibration and pushbutton programming for the following variables:
      b. Sensitivity – 0-100% in 10% increments
      c. Time delay – 1-30 minutes in 1 minute increments
      d. Test mode – Five second time delay
      e. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
      f. Walk-through mode
      g. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
3. One or two RJ-45 port(s) for connection to panel or other switches/sensors.
4. Devices shall connect via open topology on the CAT5e digital network.
5. Digital Switches shall be Wattstopper LMDC or LMDX series as indicated herein before and on drawings.

F. Schedule, Group, and Photocell Control of Relays
1. The lighting control panel shall support schedule, group, and photocell control functions via the network as configured in the Segment Manager controller or building automation system. The lighting control panel shall be fully compatible with building automation systems that are BACnet compliant. See related specification sections for additional information on interfacing the lighting control panel(s) to the building automation system.

G. Browser-Based Programming and Control
1. The digital Segment Manger shall be capable of hosting the schedule, photocell and group relay control functions for up to 96 LMCP series lighting control panels. Panels and devices shall be recognized and controllable via a browser based user interface in the system Segment Manager. The Segment Manager shall provide functionality to the panels as described later in this specification.


2.11 DIGITAL PHOTOSENSORS (DLM SYSTEM)

A. Digital photosensors work with room controllers to provide automatic switching or dimming daylight harvesting capabilities for any load type connected to a room controller. Closed loop photosensors measure the ambient light in the space and control a single lighting zone. Open loop photosensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones. Photosensors shall be interchangeable without the need for rewiring.

B. Digital photosensors include the following features:
1. An internal photodiode that measures only within the visible spectrum, and has a response curve that closely matches the photopic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers.
2. Sensor light level range shall be from 1-10,000 footcandles (fc).
3. The capability of switching one-third, one-half or all lighting ON and OFF, or raising or lowering lighting levels, for each controlled zone, depending on the selection of room controller(s) and load binding to room controller(s).
4. For switching daylight harvesting, the photosensor shall provide a deadband or a separation between the “ON Setpoint” and the “OFF Setpoint” that will prevent the lights from cycling after they turn off.
5. For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a user-selectable minimum level.
6. Optional programmable wall switch override to allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise and lower lighting levels for a selected period of time or cycle of occupancy.
7. Infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.

8. Red configuration LED that blinks to indicate data transmission.

9. Blue status LED indicates test mode, override mode and load binding.

10. Recessed switch to turn controlled load(s) ON and OFF.

11. One RJ-45 port for connection to DLM local network.

12. An adjustable head and a mounting bracket to accommodate multiple mounting methods and building materials. The photosensor may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox. Furnish mounting bracket for sensors located in drywall surfaces.

C. Closed loop digital photosensors include the following additional features:
1. An internal photodiode that measures light in a 100 degree angle, cutting off the unwanted light from bright sources outside of this cone.
2. Automatic self-calibration, initiated from the photosensor, a wireless configuration tool or a PC with appropriate software.
3. Automatically establishes setpoints following self-calibration.
4. A sliding setpoint control algorithm for dimming daylight harvesting with a “Day Setpoint” and the “Night Setpoint” to prevent the lights from cycling.
5. WattStopper Product Number: LMLS-400.

D. Open loop digital photosensors include the following additional features:
1. An internal photodiode that measures light in a 60 degree angle cutting off the unwanted light from the interior of the room.
2. Automatically establishes setpoints following calibration using a wireless configuration tool or a PC with appropriate software.
3. A proportional control algorithm for dimming daylight harvesting with a “Setpoint” to be maintained during operation.

E. WattStopper Product Number: LMLS-500.

2.12 ROOM NETWORK (DLM Local Network)

A. The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building. Digital room devices connect to the network using CAT 5e cables with RJ-45 connectors which provide both data and power to room devices. Features of the DLM local network include:
1. Plug n’ Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
2. Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.
3. Push n’ Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.
4. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.
a. The DLM local network wiring shall connect controller to controller. In no case shall the controller network route through an occupancy sensor or wall switch.

2.13 CONFIGURATIONS TOOLS (DLM SYSTEM)

A. A configuration tool facilitates optional customization of DLM local networks, and is used to set up open loop daylighting sensors. A wireless configuration tool features infrared communications, while PC software connects to each local network via a USB interface.

B. Features and functionality of the wireless configuration tool shall include:
1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.
2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.
3. Read, modify and send parameters for occupancy sensors, daylighting sensors, room controllers and buttons on digital wall switches.
4. Save up to nine occupancy sensor setting profiles, and apply profiles to selected sensors.
5. Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting.
6. Adjust or fine-tune daylighting settings established during auto-commissioning and input light level data to complete commissioning of open loop daylighting controls.

C. WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100

2.14 NETWORK BRIDGE (DLM SYSTEM)

A. The network bridge connects a DLM local network to a BACnet-compliant network for communication between rooms, panels and a segment manager or BAS. Each local network shall include a network bridge component to provide a connection to the local network room devices. The network bridge shall use industry standard BACnet MS/TP network communication.
1. The network bridge may be provided as a separate module connected on the local network through an available RJ-45 port.
2. Provide Plug n’ Go operation to automatically discover all room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning shall be required for set up of the network bridge on the local network.
3. The network bridge shall automatically create standard BACnet objects for selected room device parameters to allow any BACnet-compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. Standard BACnet objects shall be provided as follows:
   a. Read/write the normal or after hours schedule state for the room
   b. Read the detection state of the occupancy sensor
   c. Read/write the On/Off state of loads
   d. Read/write the dimmed light level of loads
   e. Read the button states of switches
   f. Read total current in amps, and total power in watts through the room controller
g. Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings
h. Activate a preset scene for the room
i. Read/write daylight sensor fade time and say and night setpoints
j. Read the current light level, in footcandles, from interior and exterior photosensors and photocells
k. Set daylight sensor operating mode
l. Read/write wall switch lock status

B. WattStopper product numbers: LMBC-300

2.15 SEGMENT MANAGER (DLM SYSTEM)

A. The Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web browser. Each segment manager shall have support for one, two or three segment networks as required and allow for control of a maximum of 40 local networks (rooms) and/or a combination of lighting control panels and bridges per segment network. Each segment shall support up to 300 DLM device addresses. Panels shall account for number of bridges and devices as follows:

1. 8 circuit panel = 3 Bridges and 20 Devices
2. 24 circuit panel = 5 Bridges and 30 Devices
3. 48 circuit panel = 7 Bridges and 40 Devices

B. Operational features of the Segment Manager shall include the following:

1. Connection to PC or LAN via standard Ethernet TCP/IP.
2. Easy to learn and use graphical user interface, compatible with Internet Explorer 8, or equal browser.
3. Log in security capable of restricting some users to view-only or other limited operations.
4. Automatic discovery of all DLM devices on the segment network(s). Commissioning beyond activation of the discovery function shall not be required.
5. After discovery, all rooms and panels shall be presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the user.
6. Ability to view and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hour’s operation.
7. Ability to set up schedules for rooms and panels. Schedules shall automatically set controlled zones or areas to either a normal hours or after hour’s mode of operation.
8. Support for up to 100 unique schedules with up to 4 time events per day.
9. Ability to group rooms and loads for common control by schedules, switches or network commands.
10. Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature.
11. Facilities with networks exceeding the requirements established for the LMSM-603 shall be expanded with the use of native BACnet routers.
12. Provide segment manager with factory NEMA 1 enclosure and power supply.
13. An internet connection shall be made available for the Segment Manager for Owners remote access to the system.
14. Provide seamless integration with the BAS via BACnet IP. Integration to the BAS shall be through the use of export tables.

C. WattStopper Product Numbers: LMSM-201 for a single segment, LMSM-603 for three segments.

2.16 EMERGENCY LIGHTING

A. Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:
   1. 120/277 volts, 50/60 Hz., 20 amp ballast rating
   2. Push to test button.
   3. Auxiliary contact for remote test or fire alarm system interface.

B. WattStopper Product Numbers: ELCU-100, ELCU-200.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the work of this Section in accordance with manufacturer’s printed instructions unless otherwise indicated.

B. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.
   1. Adjust time delay so that controlled area remains lighted for 5 minutes after occupant leaves area.

C. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:
   1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
   2. Sequence of operation, (e.g. manual ON, Auto OFF, etc.)
   3. Load Parameters (e.g. blink warning, etc.)

D. Re-calibration – After 30 days from occupancy re-calibrate all sensor time delays and sensitivities to meet the Owner’s Project Requirements. Provide a detailed report to the Architect / Owner of re-calibration activity.

3.3 FACTORY START-UP

A. Upon completion of the installation, the system shall be started by the manufacturer's factory authorized representative who will verify a complete fully functional system.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the desired system start-up and adjustment date.

C. Upon completion of the system start-up the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.
END OF SECTION
SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Panelboard - Furnish and install lighting and appliance panelboard(s) as specified herein and where shown on the associated drawings.

B. Contractor shall note that drawings show shared neutrals for circuits. Contractor shall comply with NEC 210.4B, which requires either separate neutrals or a disconnecting means that disconnects all ungrounded conductors at the point where the circuit originates. This requires the contractor to provide breaker ties or 3 pole breakers for all groups of 3 circuits run with shared neutral in the field as grouping is frequently changed. Contractor shall include this in the contract. No additional payments will be made for this code requirement.

C. See section 26 05 73 for protective device coordination study requirements. All equipment specified herein shall comply with the requirements of 260573. All equipment shall be increased in size, electronic trip added, wire and conduit size increased as require to provide a complete selectively coordinated system. Nothing in the following specification relieves the contractor from providing a complete selectively coordinated system. Fuses shall not be used to provide selective coordination.

1.2 REFERENCES

A. The panelboard(s) and circuit breaker(s) referenced herein are designed and manufactured according to the latest revision of the following specifications.

B. NEMA PB 1 – Panelboards

C. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

D. NEMA AB 1 - Molded Case Circuit Breakers

E. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

F. UL 50 - Enclosures for Electrical Equipment

G. UL 67 – Panelboards

H. UL 98 - Enclosed and Dead-front Switches

I. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures

J. CSA Standard C22.2 No. 29-M1989 - Panelboards and Enclosed Panelboards

K. CSA Standard C22.2 No. 5-M91 - Molded Case Circuit Breakers

L. Federal Specification W-P-115C - Type I Class 1


N. NFPA 70 - National Electrical Code (NEC)

O. ASTM - American Society of Testing Materials

1.3 SUBMITTAL AND RECORD DOCUMENTATION

A. Approval documents shall include drawings. Drawings shall contain overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of
the main, branches, and solid neutral shall be clearly shown. In addition, the drawing shall illustrate one line diagrams with applicable voltage systems.

1.4 QUALIFICATIONS
A. Company specializing in manufacturing of panelboard products with a minimum of fifty (50) years documented experience.
B. Panelboards shall be manufactured in accordance with standards listed Article 1.2 - REFERENCES.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Inspect and report concealed damage to carrier within their required time period.
B. Handle carefully to avoid damage to panelboard internal components, enclosure, and finish.
C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

1.6 OPERATIONS AND MAINTENANCE MATERIALS
A. Manufacturer shall provide installation instructions and NEMA Standards Publication PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.7 WARRANTY
A. Manufacturer shall warrant specified equipment free from defects in materials and workmanship for the lesser of one (1) year from the date of installation or eighteen (18) months from the date of purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Shall be Square D Company, Eaton, or General Electric.

2.2 208/120 VOLT VOLT PANELBOARD
A. NQOD
   1. Interior
      a. Shall be type NQOD panelboard rated for 240 Vac/48 Vdc maximum. Continuous main current ratings, as indicated on associated drawings, not to exceed 600 amperes maximum.
      b. Minimum short circuit current rating: as shown on drawings but minimum 10,000 in rms symmetrical amperes at 240 Vac.
      c. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for plug-on or bolt-on branch circuit breakers. The bussing shall be fully rated.
Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing rated 100-400 amperes shall be plated copper only. Bussing rated for 600 amperes shall be plated copper as standard construction. Bus bar plating shall run the entire length of the bus bar. Panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and -G.

d. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.

e. A solidly bonded copper equipment ground bar shall be provided. An additional copper isolated/insulated ground bar shall also be provided mounted on insulators.

f. Split solid neutral shall be plated and located in the mains compartment up to 225 amperes so all incoming neutral cable may be of the same length. Where indicated UL Listed panelboards with 200% rated solid neutral shall be plated copper for non-linear load applications. Panelboards shall be marked for non-linear load applications.

g. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twistouts covering unused mounting space.

h. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format.

i. Interiors shall be field convertible for top or bottom incoming feed. Main circuit breakers in 100A interiors shall be vertically mounted. Main circuit breakers over 100A shall be vertically mounted. Sub-feed circuit breakers shall be vertically mounted. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.

2. Main Circuit Breaker where indicated.

a. Shall be Square D type circuit breakers.

b. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40° C ambient environment. Thermal elements shall be ambient compensating above 40° C.

c. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker that allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.

d. Breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings.
e. Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position.

f. Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 90°F C rated wire, sized according to the 75°F C temperature rating per NEC Table 310-16. Lug body shall be bolted in place; snap-in designs are not acceptable.

g. The circuit breakers shall be UL Listed for use with the following accessories: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits.

3. Branch Circuit Breakers
   a. Shall be Square D type circuit breakers. Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the associated drawings.
   b. Molded case branch circuit breakers shall have bolt-on type bus connectors.
   c. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.
   d. There shall be two forms of visible trip indication. The breaker handle shall reside in a position between ON and OFF. In addition, there shall be a red VISI-TRIP® indicator appearing in the clear window of the circuit breaker housing.
   e. The exposed faceplates of all branch circuit breakers shall be flush with one another.
   f. Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 90°F C rated wire, sized according to the 75°F C temperature rating per NEC Table 310-16.
   g. Breakers shall be UL Listed for use with the following factory installed accessories: Shunt Trip, Auxiliary Switch, and Alarm Switch.

4. Enclosures
   a. Type 1 Boxes
      1) Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Galvannealed steel will not be acceptable.
      2) Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
      3) Box width shall be 20” wide maximum unless approved.
   b. Type 1 Fronts
      1) Front shall meet strength and rigidity requirements per UL 50 standards. Front shall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
      2) Fronts shall be hinged 1-piece with door (door in door). Mounting shall be as indicated on associated drawings.
      3) Panelboards shall have MONO-FLAT fronts with concealed door hinges and mounted with trim screws. Front shall not be
removable with the door locked. Doors on front shall have rounded corners and edges shall be free of burrs.

4) Front shall have cylindrical tumbler type lock with catch and spring-loaded stainless steel door pull. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory cardholder shall be mounted on the inside of door.

c. Type 3R, 5, and 12 where indicated.
1) Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.

2) All doors shall be gasketed and equipped with a tumbler type vault lock and two (2) additional quarter turn fasteners on enclosures 59 inches or more in height. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory cardholder shall be mounted on the inside of door.

3) Maximum enclosure dimensions shall not exceed 21” wide and 6.5” deep.

5. Provide Innovative Technology PTE-080 surge protector, 30/3 breaker with maximum 8” lead length at all 120/208V panels or TPS LP series. Provide flush kit at all panels that are flush in wall.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with manufacturer's written instructions, NEMA PB 1.1 and NEC standards.

3.2 FIELD QUALITY CONTROL

A. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.

B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads within 20% of each other. Maintain proper phasing for multi-wire branch circuits.

C. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

END OF SECTION
SECTION 262726 – WIRING DEVICES

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.

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

1.3 QUALITY ASSURANCE
   A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
   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, and marked for intended use.
   C. Comply with NFPA 70.

1.4 COORDINATION
   A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
      1. Cord and Plug Sets: Match equipment requirements.

PART 2 PRODUCTS

2.1 GENERAL
   A. All wiring devices and associated faceplates shall be white in color.
   B. Provide faceplates as required for all devices. Faceplates shall match device style. Decora for switches and receptacles.

2.2 STRAIGHT BLADE RECEPTACLES
   A. Convenience Receptacles (Specification Grade), 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. Use in kitchens and laundry. Decora, style, white color. Tamper resistant.
   B. Convenience Receptacles (Residential Grade), 125 V, 15 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-15R, and UL 498. Decora style, white color. Tamper resistant.

2.3 GFCI RECEPTACLES
   A. General Description: Straight blade. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
B. Duplex GFCI Convenience Receptacles, 125 V, 20 A. Decora style, white color. Tamper resistant.

2.4 SWITCHES
A. Comply with NEMA WD 1 and UL 20.
B. Switches, 120/277 V, 20 A. Decora style, white color.

2.5 WALL PLATES
A. Single and combination types to match corresponding wiring devices, plastic.
B. White color

PART 3 EXECUTION

3.1 INSTALLATION
A. Mounting heights of devices in compliance with ADA requirements or at height of existing device to be replaced.

3.2 FIELD QUALITY CONTROL
A. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION
SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fusible switches.
   2. Non-fusible switches.
   3. Molded-case circuit breakers (MCCBs).
   4. Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.
B. NO: Normally open.
C. SPDT: Single pole, double throw.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Include evidence of NRTL listing for series rating of installed devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
   6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified testing agency.
D. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field quality-control reports.
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Manufacturer's field service report.

G. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
   2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. 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.

D. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fused Disconnect Switches - 3
   2. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
3. Fuse Pullers: Two for each size and type.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper conductors only.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors only.
   3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper neutral conductors only.
   4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
   5. Auxiliary Contact Kit: NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open where required.
   6. Hookstick Handle: Allows use of a hookstick to operate the handle.
   7. Service-Rated Switches: Labeled for use as service equipment.

2.2 NON-FUSIBLE SWITCHES

A. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

4. Auxiliary Contact Kit: NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open where required.

5. Hookstick Handle: Allows use of a hookstick to operate the handle.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products to match panelboard breakers. Square D or GE (No Substitute).

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.


D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
   1. Instantaneous trip.
   2. Long- and short-time pickup levels.
   3. Long- and short-time time adjustments.
   4. Ground-fault pickup level, time delay, and I²t response.

F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

G. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

I. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
   2. Outdoor Locations: NEMA 250, Type 3R.
   4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
   5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

2.5 SPARE FUSE CABINET

A. Provide spare fuse cabinet in each main electric room
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
D. Install fuses in fusible devices.
E. Comply with NECA 1.

3.3 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION
SECTION 262913 – MOTOR CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes ac, enclosed controllers rated 600 V and less, of the following types:
   1. Across-the-line, manual and magnetic controllers.

1.2 SUBMITTALS

A. Product Data: For each type of enclosed controller. Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each enclosed controller.
   1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      a. Each installed unit's type and details.
      b. Nameplate legends.
      c. Short-circuit current rating of integrated unit.
      d. Listed and labeled for series rating of overcurrent protective devices in combination controllers by an NRTL acceptable to authorities having jurisdiction.
      e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices in combination controllers.
   2. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Routine maintenance requirements for enclosed controllers and all installed components.
   2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance and repairs.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as
defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

C. Source Limitations: Obtain enclosed controllers of a single type through one source from a single manufacturer.

D. 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.

E. Comply with NFPA 70.

F. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed controllers, minimum clearances between enclosed controllers, and for adjacent surfaces and other items. Comply with indicated maximum dimensions and clearances.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover enclosed controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install electric heating of sufficient wattage to prevent condensation.

1.5 COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

C. Coordinate features of enclosed controllers and accessory devices with pilot devices and control circuits to which they connect.

D. Coordinate features, accessories, and functions of each enclosed controller with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.
1.6 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. Combination Starter: Provide 3
   2. Spare Fuses: Furnish one spare for every five installed, but no fewer than one set of three of each type and rating.
   3. Indicating Lights: Two of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. General Electric
   2. Square D.

2.2 ACROSS-THE-LINE ENCLOSED CONTROLLERS

A. Manual Controller (Starter): NEMA ICS 2, general purpose, Class A, with "quick-make, quick-break" toggle or pushbutton action, and marked to show whether unit is "OFF," "ON," or "TRIPPED."
   1. Overload Relay: Ambient-compensated type with inverse-time-current characteristics and NEMA ICS 2, Class 10 tripping characteristics. Relays shall have heaters and sensors in each phase, matched to nameplate full-load current of specific motor to which they connect and shall have appropriate adjustment for duty cycle.
   2. Square D Class 2510

B. Magnetic Controller (Starter): NEMA ICS 2, Class A, full voltage, nonreversing, across the line, unless otherwise indicated.
   1. Control Circuit: 120 V; obtained from integral control power transformer with a control power transformer of sufficient capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.
   2. Overload Relay: Ambient-compensated type with inverse-time-current characteristic and NEMA ICS 2, Class 10 tripping characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of specific motor to which they connect and with appropriate adjustment for duty cycle.
   3. Adjustable Overload Relay: Dip switch selectable for motor running overload protection with NEMA ICS 2, Class 10 tripping characteristic, and selected to protect motor against voltage and current unbalance and single phasing. Provide relay with Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
   4. Hand off auto switch.
   5. Red running and green stop pilot lights.
   6. Control transformer.
C. Combination Magnetic Controller (Starter): Factory-assembled combination controller and disconnect switch.
   1. Fusible Disconnecting Means: NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 947-4-1, as certified by an NRTL.
   2. Magnetic controller per above.
   3. Square D 8538, or equal
   4. Type RK1 Time Delay Fuses

2.3 ENCLOSURES
A. Description: Flush- or surface-mounting cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated to comply with environmental conditions at installed location.
   1. Outdoor Locations: NEMA 250, Type 3R.
   3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
   4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

2.4 ACCESSORIES
A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.
C. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
D. Control Relays: Auxiliary and adjustable time-delay relays.
E. Elapsed Time Meters: Heavy duty with digital readout in hours.
G. Current-Sensing, Phase-Failure Relays for Bypass Controllers: Solid-state sensing circuit with isolated output contacts for hard-wired connection; arranged to operate on phase failure, phase reversal, current unbalance of from 30 to 40 percent, or loss of supply voltage; with adjustable response delay.

2.5 FACTORY FINISHES
A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested enclosed controllers before shipping.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers for compliance with requirements, installation tolerances, and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Select features of each enclosed controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, controller, and load; and configuration of pilot device and control circuit affecting controller functions.

B. Select horsepower rating of controllers to suit motor controlled.

3.3 INSTALLATION

A. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 26 Section "Hangers, Supports and Fasteners."

B. Enclosed Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Division 26 Section "Fuses."

3.4 IDENTIFICATION

A. Identify enclosed controller, components, and control wiring according to Division 26 Section "Identification for Electrical Systems."

3.5 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers.

B. Bundle, train, and support wiring in enclosures.

C. Connect hand-off-automatic switch and other automatic-control devices where applicable.
   1. Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.
   2. Connect selector switches with enclosed controller circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.
3.6 CONNECTIONS

A. Conduit installation requirements are specified in other Division 26 Sections. Drawings indicate general arrangement of conduit, fittings, and specialties.

B. Ground equipment according to Division 26 Section "Grounding."

3.7 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
   1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:
   1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS, "Motor Control - Motor Starters." Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.8 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION
SECTION 265100 - LIGHTING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS
A. Fixtures, General: All fixtures complete with lamps of types described and as shown in schedule.
B. Fixtures shall be manufacturer types specified, or equal.
C. All fixtures shall bear U.L. label.
D. Damp, wet or IC labels as applicable.
E. Submittals: Submit photometric data, prepared by independent testing laboratory, showing that fixtures meet performance specifications.
F. Submit for approval complete list of lamps and fixtures, with photometric data, lamps, ballasts, and cuts of fixtures and details of construction.
G. Lamp color consistent thru-out – See plans. PRODUCTS

1.2 FIXTURE TYPES
A. As noted on drawings.
B. See Lighting Fixture Schedule

PART 2 EXECUTION

2.1 FIXTURE INSTALLATION
A. All outlets, unless specifically noted otherwise, shall be completely equipped with fixtures and lamps.
B. After construction has been completed, wash all fixtures and clean lamps.
C. Electrical Contractor responsible for roughing-in details and mounting provisions in general construction for all flush lights. Installation must comply with NEC, IBC, ADA, WAC, and all seismic codes.
D. Coordinate lighting fixture layout with general contractor as directed. Provide additional support if necessary to keep fixtures level where secured to ceiling supports.
E. Where no fixture is scheduled, use same fixture as scheduled in similar areas.

2.2 CEILING, PENDANT, & WALL MOUNTED FLUORESCENT FIXTURES
A. Mount to withstand minimum downward pull, after installing fixtures, of 150# per 48" fixture length, or fraction thereof. Where fixture is not rated for installation against type of ceiling used, equip with 1-1/2" factory made spacers.
B. Provide box, custom as required, for all fixtures. Recess in rigid insulation space.
C. Provide safety chains on all pendant fixtures that weigh over 50 pounds.
D. Provide unistrut above ceilings for additional fixture support where shown.
E. Provide knuckle stems on all pendant fixtures.
END OF SECTION
SECTION 27 51 00 – DATA AND VOICE CABLING SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. Data and voice cabling and jacks to serve wireless access points, access control system and intercom system as needed.

1.2 WORK INCLUDED

A. The work includes cabling, jacks, faceplates, terminations and testing as required for a complete and fully functional cabling system.

PART 2 - PRODUCTS

2.1 DATA/VOICE CABLES

A. EIA/TIA Category 5E. Unshielded twisted pair cables. Non-plenum.

2.2 TELEPHONE OUTLETS

A. EIA/TIA Category 5E RJ-45. White color.
B. Provide compatible faceplate for all outlets. White color.

PART 3 - EXECUTION

3.1 EQUIPMENT MOUNTING

A. Mount to back box.

3.2 COMPANY QUALIFICATIONS

A. The bidder shall be regularly engaged in the type of work specified herein. Award will be made only to a bidder who furnished satisfactory evidence that he has the technical ability, experience, equipment, personnel, and financial resources to enable him to successfully and promptly fulfill the requirements and conditions of these specifications.

END OF SECTION
SECTION 281300 – ACCESS CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Integrated Digital Alarm Communicator and Access Control System (DACS), including but not limited to the following:
   1. Control panel.
   2. Enclosures.
   3. Lock and key.
   4. Power Supplies.
   5. Accessories required to provide a complete DACS.
   7. System programming.
   9. Wiring.
   10. Conduits.

B. AIPHONE intercom system including but not limited to the following:
   1. Category 6 UTP cabling, patch cords and jacks for a complete system.
   2. Door station locations, master-station location and door sub stations.

C. The Contractor shall be responsible for identifying requirements for permits from the local police department for the installation of the alarm system specified herein and shall assist the Owner in obtaining the relevant alarm permits.

1.2 SYSTEM DESCRIPTION

A. A functionally complete, integrated Digital Alarm Communicator System (DACS) per manufacturer’s guidelines, codes and specification requirements.
   1. The DACS shall include a Control Panel with built-in Ethernet jack for event communication and remote services.
   2. The DACS shall include a Control Panel with an optional, supervised telephone line interface module.
   3. The DACS shall include recording and retention of event information in a dedicated event log.
   4. The DACS shall incorporate an integral real-time clock, calendar, and a test timer.
   5. The DACS shall incorporate battery charging capabilities with supervision of battery voltage and battery leads.
   6. The DACS shall accommodate a time / event-based scheduling system.
   7. The DACS shall be capable of supervision of peripheral devices and communications interfaces.
   8. The DACS shall accommodate configuration and operation of separate, independent areas.
9. The DACS shall accommodate hard-wired or wireless point expansion via eight-point interface modules and RF receivers.

10. The DACS shall accommodate addressable expansion utilizing a 2-wire bus

11. The DACS incorporate removable terminal strips for wiring connection to facilitate simple service and replacement

12. The DACS shall have electrically supervised detection loops and power supplies with battery(s) maintenance. This supervision shall be programmable for the purposes of reporting this information to the DACR.

13. The DACS shall be capable of sending (manually or automatically) test and status reports to remote DACRs.

14. The DACS shall be able to accommodate test, diagnostics, and configuration programming functions locally or remotely via a portable programmer or a computer running the Remote Programming Software (RPS).

15. The DACS shall annunciate alarm, trouble, service reminders, and other relevant system status messages in custom English, Latin American Spanish, Portuguese and/or French Canadian text at the ACC.

B. A functionally complete, integrated Intercom System (IS) per manufacturer’s guidelines, codes and specification requirements.

1. The IS shall support two or more video door stations, a master station at manager’s office desk and over 70 audio-door sub stations.

2. Master station to view and communicate with two or more video-door stations.

3. Master station shall have the ability to page and communicate with door sub stations via voice.

4. Substations shall have the ability to page and communicate with master station via voice.

5. Master station shall have ability to page and communicate, one-way, to all sub stations.

6. Sub stations shall not have the ability to communicate with video-door stations.

1.3 REFERENCES

A. National Electric Code, Article 760.


C. Administrative Council for Terminal Attachments (ACTA):

D. American National Standards Institute (ANSI):
   1. ANSI C63.4 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

E. Federal Communications Commission (FCC):
   2. Title 47 C.F.R. Part 68; rules governing the connection of Terminal Equipment (TE) to the Public Switched Telephone Network (PSTN).

F. The National Institute of Standards and Technology of the United States of America (NIST):

G. International Organization For Standardization (ISO):
1. 9001 - Quality System.

H. Underwriters Laboratories, Inc. (UL):
1. UL 50 - Enclosures for Electrical Equipment.
2. UL 294 – Access Control System Units.
3. UL 365 - Police Station Connected Burglar Alarm Units and Systems.
4. UL 609 - Local Burglar Alarm Units and Systems.
5. UL 864 – Control Units and Accessories for Fire Alarm Systems (Commercial Fire)
6. UL 985 - Household Fire Warning System Units.
7. UL 1023 - Household Burglar Alarm System Units.
8. UL 1076 – Proprietary Burglar Alarm Units and Systems
9. UL 1610 - Central Station Burglar-Alarm Units.
10. UL 60950-1 - Information Technology Equipment - Safety.
11. UL 636 – Hold up alarms

1.4 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data: Manufacturer's data, user and installation manuals for all equipment and software programs including computer equipment and other equipment required for complete Digital Alarm including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Shop drawings shall provide details of proposed system and the work to be provided. Include point-to-point drawings of systems and wiring diagrams of individual devices.
1. Detailed wiring diagrams and system description.
2. System device locations on architectural floor plans.
3. Full Schematic of system, including wiring information for all devices.

D. Documentation to be submitted by the Contractor upon completion of system installation:
1. "As-builts": Upon completion of installation, the Contractor shall prepare "as-built" drawings of the system. These "As-builts" shall be 30 inches by 42 inches (76 cm by 107 cm) format mylar reproducible drawings of each floor plan indicating exact device locations, panel terminations, cable routes and wire numbers as tagged and color-coded on the cable tag.
   a. Additionally, final point-to-point wiring diagrams of each type of device (on 30 inches by 42 inches (76 cm by 107 cm) format) shall be included in the "as-builts."
   b. "As-builts" shall be submitted to the Owner for approval prior to the system acceptance walk-through.
2. Operation and maintenance manuals: Three sets of operating manuals shall be provided explaining the operation and maintenance of the system.

3. Parts list.

4. Maintenance required and maintenance schedule.

E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualification:
   1. The system shall be the standard product of one manufacturer, and the manufacturer shall have been in business manufacturing similar products for at least 5 years.

B. Installer Qualification:
   1. Minimum of five years experience installing access control, surveillance and security systems and devices.
   2. After-sales support: The Contractor shall be a factory-authorized and trained dealer of the system and shall be factory-trained and certified to maintain/repair the system after system acceptance.

C. System Requirements:
   1. All equipment, systems, and materials furnished and installed under this section shall be installed in accordance with the applicable standards of:
      a. National Codes: NEC, NFPA, IBC, BOCA, SBCCI, as applicable.
      b. Approvals and listings: UL, ULC, FM, ANSI SIA CP-01, CSFM, NYC-CoA, as applicable.
      c. Local Authorities Having Jurisdiction (AHJ).

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers; and unharmed original identification labels.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Protect store materials from environmental and temperature conditions following manufacturer's instructions.

D. Handle and operate products and systems according to manufacturer's instructions.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
1.8 WARRANTY

A. All components, parts, and assemblies supplied by the manufacturers and installed by the Contractor shall be warranted against defects in material and workmanship for a period of at least 12 months (parts and labor), commencing upon date of acceptance by Owner. A qualified factory-trained service representative shall provide warranty service.

B. Service/Maintenance:
   1. System maintenance and repair of system or workmanship defects during the warranty period shall be provided by the Contractor free of charge (parts and labor).
   2. Periodic testing of the system shall be carried out on a monthly or quarterly basis to ensure the integrity of the control panel, the sensing devices, and the telephone lines.
   3. The installer shall correct any system defect within six hours of receipt of call from the Owner.
   4. Extended service/maintenance agreements shall be offered by the Contractor for up to four years after the warranty expires. The agreement shall be renewable monthly, quarterly, or yearly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Bosch Security Systems, Inc. as basis of design
B. Acceptable Manufacturer: AIPHONE
C. Substitutions: Equal products by other manufacturers are allowed subject to conformance with the documents.

2.2 GENERAL DESCRIPTION

A. Control Panel and Features:
   1. The DACS control panel shall be Bosch Security Systems, Inc. model B9512G comprising a fully integrated intrusion and residential fire control system. The control panel shall support the following:
      a. The DACS system is capable of being utilized as a combination Intrusion and Commercial Fire system per code. Fully integrated intrusion and fire functions allow users to interface with 1 system instead of 2
      b. Optional Telephone Line Module, programmable for signaling and supervision.
      c. Integrated Conettix IP based communication provides high-speed, secure alarm transport and control.
      d. 32 programmable areas with perimeter and interior partitioning.
      e. 8 on-board, hardwired points with expansion capability for a total of 599 using a combination of wired or wireless points.
      f. Compatibility with Color Graphic Touch Screen, 2-line alpha numeric capacitive touch, ATM style LCD or 2-line LCD style Alarm Keypads.
g. Local or remote programming, test, and diagnostic capability via a computer running the Remote Programming Software (RPS).

h. The system shall include an integrated USB port for local programming and diagnostics using a computer running Remote Programming Software (RPS) and a male USB2.0 to male USB 2.0 cable with no additional hardware modules required.

i. The system shall support the use of an Apple iOS device and/or Android device for control. Functions to include arming, disarming and control of outputs and access door, viewing of connected IP cameras. This application shall connect directly to the DACS using internet, wifi or cellular communications and shall not require a third party server of network operations center (noc).

j. The DACS will allow integration with up to 16 Bosch IP video cameras using the built-in Ethernet connection, allowing the cameras to act as inputs and outputs.

k. The DACS shall support integration with the Bosch Video Management System (BVMS) using the built-in Ethernet adapter.

l. The DACS shall support up to thirty-two (32) custom functions allowing the installer to combine up to 6 functions into one command. These custom functions shall be operated by keypad command, point activation, keyfob button, or programmable schedule.

m. The DACS shall support up to 32 keypad shortcuts which allow the installer to define which commands are available at each keypad.

n. The system shall offer multiple language support that can be assigned per keypad. Languages supported must include English, Latin American Spanish, Portuguese and/or Canadian French.

o. The DACS shall support flash firmware upgrades of systems firmware for the control panel and peripherals, allowing for future updates.

p. Integrated real time clock, calendar, test timer and programmable scheduling capability for relay control and automatic execution of system functions based on a time / event.

q. Provide 1.4 amps of power for standby operation and 2.0 amps of alarm power, both rated at 12 VDC.

r. 3 configurable form ‘C’ wet or dry-contact relay outputs with expansion capability for up to an additional 472 dry-contact relay outputs.

s. Integrated battery charger with reverse hook up protection, battery supervision and battery deep discharge protection.

t. Supervision of peripheral devices and communications interface(s).

B. Point Functionality and Expansion:

1. Each point in the system shall be programmable to provide the following type of response in the system:

   a. Always on (24 hour response).
   b. On when the system is Master Armed.
   c. Only on when the system is Perimeter Armed.
   d. Displays / Does Not Display at the ACC when the point is activated.
   e. Provides / Does Not Provide entry warning tone.
   f. Sounds / Does Not Sound audible alarm indication.
   g. The Point is bypassable / not bypassable.
h. Alarm Verification with programmable verification time.
i. Fire Alarm Point
j. Relay activation by Point.
k. Provides / Does Not Provide "watch point" capability.
l. Provides Swinger Bypass.
m. Defers Bypass Report.
n. Can return to the system after being force armed and then restoring.
o. Can return to the system after being bypassed and then restoring.
p. Keyswitch arming (maintained or momentary)
q. Activate by Custom Function
r. Activate following an output
s. Gas Alarm

2. The system shall support a programmable Monitor delay functionality for supervision of points during disarmed periods. These points may be programmed to ignore status from 1 to 60 minutes and will activate only if the point is off-normal for this time period.

3. The system shall support a programmable delay response functionality for supervision of points during armed or disarmed periods. These points may be programmed to ignore status from 1 to 60 minutes and will activate only if the point is off-normal for this time period.

4. The system shall support virtual points and outputs for customized programming of events

5. The DACS shall be capable of supporting "group zoning." Group zoning refers to the combining of points into a separately identifiable and separately annunciated (programmable text) areas.

6. The DACS shall be capable of allowing variable point response times via programming. Point response times shall be programmable over a range of 300 milliseconds to 4.5 seconds.

7. The DACS shall have the capability to expand up to 599 separately identifiable points, of which 8 are on-board and 472 are off-board wired, addressable or wireless points.
   a. The 8 on-board points shall be able to accommodate powered class B functionality using a powered loop interface module.
   b. Point Expansion Modules (Wired and Wireless) shall be able to be located remote to the main panel to a maximum distance of 1000 feet.
   c. Addressable modules shall be able to be located remote to the panel to a maximum of 500 feet.

8. The DACS shall have the capability to expand up to 99 separately identifiable points, of which 8 are on-board and 91 are off-board addressable points connected to multiplexed backbone trunks via wired modules and/or wireless receivers.
   a. The 8 on-board points shall be able to accommodate powered class B functionality using a powered loop interface module.
   b. Point Expansion Modules (Wired and Wireless) shall be able to be located remote to the main panel to a maximum distance of 1000 feet.
   c. Addressable modules shall be able to be located remote to the panel to a maximum of 500 feet.

C. Areas/Accounts:
1. The DACS shall support 32 independent areas. Each of the 32 areas shall have custom text associated with the armed state, disarmed state and point-off-normal state.

2. The DACS shall be capable of assigning 1 to 4 account identifiers to the areas depending on the distribution of areas per account.

3. The DACS shall be capable of assigning 1 to 2 account identifiers to the areas depending on the distribution of areas per account.

4. All of the areas must be capable of Master (All) and/or Perimeter (Part) arming (excluding predefined Interior protection).

5. The DACS shall be capable of logically grouping 1 or more points into an area, or conversely, dividing 2 or more points into two or more areas.

6. Any area shall be configurable to allow arming by specific users when a programmable number of devices are faulted or bypassed.

7. Areas shall be independently controlled by their corresponding ACC.

8. Area(s) shall accommodate assignment of independent account numbers to define annunciation, control, and reporting functions.

9. The DACS shall be capable of linking multiple areas to a shared area which may be automatically controlled (hallway or lobby).

10. The DACS shall accommodate conditional area arming dependant on the state of other areas (master or associate). Any area can be configured for perimeter and interior arming, not requiring a separate area for this function.

D. Output Relay Expansion: The DACS shall provide the capability for output relay expansion using relay expansion modules. Independent control of relay functions by area shall be possible through programming assignments.

1. The DACS shall be capable of activating 472 additional relay outputs for auxiliary functions based on its classifications (area vs. panel wide). Output Expansion Modules shall be able to be located remote to the main panel to a maximum distance of 1000 feet. 8 relays (Form C) are to be provided per octo-relay module.

2. ** NOTE TO SPECIFIER ** B8512G. Delete if not required.

3. The DACS shall be capable of activating 64 additional relay outputs for auxiliary functions based on its classifications (area vs. panel wide). Output Expansion Modules shall be able to be located remote to the main panel to a maximum distance of 1000 feet. 8 relays (Form C) are to be provided per octo-relay module.

4. The DACS shall be capable of controlling relays and automatically executing system functions based on a time / event scheduling program. The program can be hour, day of week or day of month based.

5. Relays and other outputs may be programmed to follow up to 14 different area conditions or up to 12 panel conditions. Relays may also be programmed to follow individual points or groups of points.


E. Scheduling: The DACS shall support scheduling capabilities with the following characteristics:

1. Arm / Disarm specific area(s) based on open/close windows.

2. Bypass / Unbypass point(s).
3. Activate / Deactivate relay(s).
4. Send test reports.
5. Up to 4 programmable holiday schedules of 366 days each (includes leap year). Based on the holiday settings, different time windows for open/close and other system functions can be executed.
6. Automatic adjustment of system clock for daylight savings time.

F. Alarm Keypads:
1. The DACS shall accommodate connection with up to 32 ACCs, each capable of displaying custom English, Latin American Spanish, Portuguese or Canadian French text on a liquid crystal display.
2. **NOTE TO SPECIFIER** Delete if not required.
3. The Alarm Keypads shall accommodate viewing and configuration of system parameters including:
   a. Network Parameters:
      1) DHCP Enable/Disable for the selected network module.
      2) UPnP Enable/Disable for the selected network module.
      3) IP Address for the selected network module.
      4) Subnet Mask for the selected network module.
      5) Default Gateway for the selected network module.
      6) Port Number for the selected network module - The module's port number shall range from 0 to 65,535.
      7) DNS Server Address for the selected module's DNS server IP address.
      8) DNS Host Name for the selected module. The DNS host name shall contain up to 63 characters.
      9) AES Encryption Key Size – Enable/Disable encryption by selecting the AES encryption key size for the selected network module.
     10) AES Encryption Key String - The user shall be able to display, add and modify the AES encryption string based upon the key size previously configured for the selected network module.
   b. Point Parameters:
      1) Point Selection between one and the maximum number of points in the control panel.
      2) Point Registration to allow system response from a specific physical point on any one of the expansion modules; On-board or Point expansion modules (wired or wireless).
      3) Wireless points shall be able to be enrolled in the system via an auto enrollment feature.
   c. Event Routing Parameters to allow programming of up to 4 report routing groups as well as configuration of primary and secondary paths.

G. User Passcodes and Authority: Passcodes shall be programmable with authority levels to allow users to operate any or all areas.
1. Up to 500 different passcodes shall be accommodated.
2. Each passcode shall be 3 to 6 digits (variable) and be assigned a 32-character user name.
3. User access to System features and functions shall be configurable based on individually programmable levels of authority assigned to the user passcode. Additionally, the system shall have the capability to assign to the user passcode, a different authority level in each of the areas. A service passcode can be assigned to the servicing agent allowing the agent limited access to system functions. User-programmable / activated functions include:
   a. Arming the system: All areas, specific area(s) only, perimeter instant, perimeter delayed, perimeter partial, watch mode, and arming the system with a duress passcode.
   b. Disarming the system: All areas, specific area(s) only and disarming with a duress passcode.
4. Viewing system status: Faulted points, event memory, bypassed points, area status and point status.
5. Implementation functions: Bypass a point, unbypass a point, reset sensors, silence bell, activating relays, initiating the remote programming function locally to allow programming the system from a remote location.
6. Testing the system: Local Walk test, Service Walk test, Fire test, send report to remote DACR to check the telephone link, and programming the time and date for the next test report transmission.
7. Change system parameters: ACC display brightness, system time and date, and add/delete/change passcodes.
8. Extend the closing time of the system.
9. Transmitting special alerts and activating audible and visible signals.
10. Executing multiple commands / ACC keystrokes from a single Menu / Command List item. This function shall be able to have a 32 character (alphanumeric) title to identify it on the ACC display.
11. Editing of time / event based scheduling program from the ACC.
12. The DACS shall also provide a "service menu" to implement functions such as viewing and printing the system log, displaying the system firmware revision number, and defaulting (toggling) text displays between custom and default text displays for troubleshooting.
13. The DACS shall allow users to change their own user passcode from the Alarm Keypad (ACC). Managers shall be capable of changing the user passcodes and authority assignments by area of other users from the ACC.
14. The DACS shall incorporate a programmable "Passcode Follows Scope" feature to allow users to arm or disarm only the area they are entering with one simple command or control all areas from one ACC.

H. Communication: The DACS shall be capable of reporting system events and supervisory reports including alarm, trouble, missing modules, restorals, system status, AC failure, battery status to primary and secondary off-site DACR’s. The following features shall be supported.
   1. The DACS shall be capable of communicating via dial-up analog telephone lines, over a LAN/WAN/Internet using a wired network interface module, or over a cellular network using a CDMA Cellular interface module.
   2. The Bosch Modem4 communications format shall be utilized for optimum system performance. The Modem4 format provides the maximum data information to the receiver for alarms, troubles, restorals, bypasses, relay activation, opening/closings, and card access. The detailed information includes
the point numbers with text, peripheral device numbers, user numbers with text, and area information. As an alternative format, Contact ID may be used although it will include less detailed information like point or user text.

3. The DACS shall be capable of sending text (SMS) messages to compatible devices without requiring that these messages are sent to a monitoring center.

4. The DACS shall have the capability of communicating with up to 8 different DACRs using up to 4 different phone numbers, up to 24-digits in length and/or 4 URL/IP addresses over a network.

5. The DACS shall report to a Commercial Central Station that is using a Bosch D6600 Receiver/Gateway or a Bosch D6100i Receiver using Modem4 as a preferred format or Contact ID as an alternate format.

6. The DACR shall provide the transmission information sent from the DACS that includes alarms, troubles, restorals, bypasses, relay activation, opening/closings, and card access. When using the ModemIIIa² format the detailed information includes the point numbers with text, peripheral device numbers, user numbers with text, and area information.

7. The DACS reports shall be classified, by event, into eleven subcategories or "report groups." Each group represents similar types of events. Individual events within each group shall be selectively enabled or disabled for transmission. The eleven report groups shall be as follows:
   a. Fire Reports.
   b. Burglar Reports.
   c. User Reports.
   d. Test Reports.
   e. Diagnostic Reports.
   f. Relay Reports.
   g. Auto Function Reports.
   h. RPS Reports.
   i. Point Reports.
   j. User Change Reports.
   k. Access Reports.

8. The DACS shall have the capability to verify the integrity of the remote communications path and switch to alternate paths when a communications failure occurs.

9. The DACS shall be capable of unattended mode of operation whereby programming and configuration updates are automatically transferred using the Remote Programming Software (RPS). These updates can initiate from either the control panel or the remote computer using RPS.

10. Network Communication: The DACS shall be capable of network communications over a LAN, WAN, Intranet, or the Internet. The system shall include supervision of the network communication utilizing configurable periodic heartbeats to the Digital Alarm Communications Receiver (DACR). The DACR shall provide notification of the loss of communications from a networked system after a programmable timeframe since the last communication. The notification options shall be programmable and include local annunciation or indication to automation software.

11. The network interface module shall be capable of supporting Dynamic Host Communication Protocol (DHCP) to obtain an IP Address.
12. The system shall support a method of authentication between the control panel and the receiver to ensure that the control panel has not been compromised or replaced.

13. The network interface modules shall be capable of supporting encryption using a minimum of 256-bit AES Encryption (Rijndael) certified by NIST (National Institute of Standards and Technology) utilizing the Cipher Block Chaining (CBC) method.

14. The network interface module shall support a 10/100BaseT connection to an Ethernet network.

15. The control panel shall be capable of network communication with a programmable poll time to send periodic heartbeats to the receiver, programmable ACK Wait time, and programmable retry time. In the situation where a communication path is unsuccessful, the control panel shall be capable of attempting backup communication through an available communication method to the same receiver or a backup receiver.

a. The control panel shall have the ability to automatically adjust the heartbeat rate of a backup path that is using cellular to the heartbeat rate of the primary path in case of a primary path failure. Upon restoral of the primary path, the heartbeat rate of the backup path shall automatically restore to the original rate. This allows a system utilizing cellular communications to keep the wireless charges low.

b. The network communication between the control panel and the receiver shall use Modem4 or Contact ID.

c. The control panel shall be capable of two-way communication using a wired network interface module with a 10/100BaseT on a LAN/WAN/Internet configuration or with a cellular module on the Internet.

d. The control panel shall be capable of configuring the destination of the receiver using a URL or static IP Address.

e. The control panel shall be capable of using DNS to lookup the IP Address of the receiver when programmed with a URL.

f. The control panel shall support UPnP for automated Port Forward configuration in the router where the control panel is installed.

g. The control panel shall support AutoIP to enable the RPS software to connect to the control panel locally using an IP Direct connection.

h. The control panel shall support configuration of the IP parameters from the keypad eliminating the need for a PC to configure the IP device.

i. The control panel shall support network diagnostics from a keypad to allow local testing of network connectivity. The diagnostics should include, Ethernet cable connected, gateway configuration ok, DNS lookup operational, and external network connectivity (such as the Internet) operational.

j. The system shall be capable of meeting DCID 6/9 and UL 2050 standards.

I. Event Log: The DACS shall maintain a log of events indicating time, day, month, year type of event, account number, area number, user ID, point text, user text and primary/secondary event route. The system shall allow the following characteristics:

1. The DACS shall be capable of storing up to 10,000 events
2. **NOTE TO SPECIFIER** Delete if not required.
3. The DACS shall support viewing of logs locally at the ACC and remotely via an upload to a remote central station computer running the RPS software.
4. The DACS shall provide notification via a report to the DACR when the event log reaches a programmable “percent full capacity”. This allows retrieval of stored events via RPS to prevent any loss of event history.
5. Group, signal type and area can route events to specific receivers.
6. Each DACR shall be designated as a primary, backup, or duplicate destination for each report group. Assigning an event to multiple routing groups provides for duplicate destinations for the event. The transmission of grouped events allows the reporting of different types of information to different remote DACRs.

J. Testing, Diagnostic, and Programming Facilities: The DACS shall be capable of sending (manually or automatically) test and status reports to remote DACRs.
1. The DACS shall be capable of sending automatic tests daily, weekly or once every 28 days. Automatic test times shall be programmable to provide an offset of up to 24 hours from the current time.
2. Automatic test reports shall be programmable to be deferred by one test interval if any other report is transmitted in the current interval.
3. Automatic test reports and remote system access for diagnostics shall be supported via a remote central station computer with Remote Programming Software (RPS).
4. The DACS shall be programmable locally or remotely. Programming shall be accomplished via a Keypad or a computer with a remote programmer and diagnostic software package (RPS).
5. The DACS shall allow an on-site user to initiate remote programming while online with the servicing location. The remote programming device must provide a compare feature and allow for downloading either the stored program or the (un)modified program copied from the panel.
6. The DACS shall allow the local programming option to be disabled and must provide a method to program a panel while no one is on premises, when the panel shares a line with an answering machine.
7. The DACS shall accommodate IP Diagnostic to verify settings and operation of the network interface modules; Host name, MAC address, IPV4 address assignment. The IP Connection test shall include; Link test to verify physical cable integrity, Ping test to verify gateway response, ping test to verify address on the internet.
8. Wireless point diagnostics shall include signal strength and device states of registered wireless points in the system.
9. The number of system testing and programming sessions shall be restricted via the use of program locking features and passwords. Passcode protection in excess of sixteen million combinations is required.
10. New modules support enhanced diagnostics through RPS

K. Miscellaneous Features: Programmable alarm output timer, 4 programmable entry delay times, exit delay programmable by area, individually programmable point of protection text, point bypassing, key switch arming capability with LED outputs, and fire verification.
L. False Alarm Reduction: The DACS shall comply with all ANSI SIA CP-01 2010 requirements for false alarm reduction.

M. Area Re-Arm: The System shall support programmable area re-arm time of 1 minute to 24 hour.

N. User-Programmable Features: The DACS shall provide a menu driven interface to provide a user-friendly command structure for programming / customizing the system to the operational criteria of the application. The DACS shall be capable of being operated via:
   1. The Command Structure.

2.3 SYSTEM INTERFACE REQUIREMENTS

A. Grounding: The Contractor shall properly earth ground the DACS to prevent electrostatic charges and other transient electrical surges from damaging the DACS panel.

B. Primary power: The Contractor shall provide a dedicated 120 VAC power circuit to the DACS system. This circuit shall be connected to the emergency power system. The 120 VAC is stepped down to power the DACS panel using a class two, plug-in transformer. This power circuit shall be properly rated to continuously power all points and functions indefinitely in full alarm condition.

C. Primary power supervision: When the primary power source fails, the system can be configured to report an "AC Fail" message to a commercial central station.
   1. The message can also be programmed to "tag-along" with another message transmitted to the central station.
   2. The system will always display a loss of primary power on the ACC and may be configured to provide additional audible warning.

D. Secondary power (standby battery): The Contractor shall provide adequate battery power as defined by the relevant application criteria, (UL 864 and UL 985 for alarm installations or NFPA 72 chapters for fire applications). Appropriate battery chargers shall be provided consistent with the battery back-up capacity. The most current accepted version of NFPA 72 and any applicable local codes or AHJ requirements must be met accordingly.

E. Secondary power supervision: When the secondary power source experiences a 85 percent depletion of its standby capacity, the system can be configured to report a "Low Battery" message to a commercial central station. The system will always display a low battery condition on the ACC and may be configured to provide additional audible warning.

F. Telephone interface: The control panel in the DACS shall be equipped with an optional phone line monitor and shall interface with the phone lines via RJ-31X jacks for supervision of the telephone line connection.
   1. The telephone line interface shall conform with FCC rules (Title 47 C.F.R. part 68).
   2. ** NOTE TO SPECIFIER ** Delete if not required.
   3. When a telephone line is determined to be out of service by the DACS panel, the event will be annunciated locally on the ACC and transmitted to the central station over the alternate communications interface. The transmission delay of this message is programmable from ten to two-hundred forty seconds.
G. Ethernet Interface: The DACS shall include an integrated Ethernet interface module as the primary, or back-up means of communicating to a DACR.
   1. Built-in IP-based alarm transport, programming, and control
   2. The module shall accommodate 128 and 256-bit AES encryption using CBC (Cipher Block Chaining) mode.
   3. 10BASE T or 100BASE T network connection
   4. Full-duplex and half-duplex support

H. Cellular Interface: The DACS may use a cellular radio module as the primary, or backup, means of communicating to a DACR. Up to 4 IP Addresses shall be available for routing system events. The supervision time shall be programmable with a range of 5 to 65,535 seconds. The module shall accommodate 128 and 256-bit AES encryption using CBC (Cipher Block Chaining) mode.

I. Auxiliary Function Control Interfaces: The DACS shall accommodate auxiliary functions such as activating bells, strobes, or lights and shall be accomplished using the optional application specific relay modules. These auxiliary interfaces shall be electrically isolated to avoid inter-system interferences or damage to the system.

J. Wiring: The contractor shall provide cables consistent with the manufacturer's recommendations. The following general guidelines shall be followed for wiring installation:
   1. Wiring shall be appropriately color-coded with permanent wire markers. Copper conductors shall be used.
   2. All signal cables provided under this contract shall be Class II, plenum-rated cable where required. Where subject to mechanical damage, wiring shall be enclosed in metal conduits or surface metallic raceway.
   3. Data wires shall not be enclosed in conduit or raceways containing AC power wires.
   4. Where EMI may interfere with the proper operation of the DACS circuits, twisted/shielded cable shall be used.

K. Environmental Conditions: The DACS shall be designed to meet the following environmental conditions:
   1. The system shall be designed for a storage temperature of -10° C to 70°C (14° F to 158°F).
   2. The system shall be designed for an operating temperature of 0° C to 50°C (32° F to 120°F).
   3. The system shall be designed for normal operation in an 85% relative humidity environment.
   4. The system shall meet or exceed the requirements of FCC rules Title 47 C.F.R. Part 15, Class B devices, and Part 68, IEC EMC directive

2.4 INTERCOM SYSTEM PRODUCTS

A. Master station to be IS-IPMV.
B. Provide IS-SOFT master station software.
C. Audio sub-station to be IS-SS.
D. Video door station to be IS-IPDVF.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive devices and notify adverse conditions affecting installation or subsequent operation.
B. Do not begin installation until unacceptable conditions are corrected.
C. If preparation is the responsibility of another installer, notify architect of unsatisfactory preparation before proceeding.
D. Ensure selected location is secure and offers protection from accidental damage.
E. Location shall provide reasonable temperature and humidity conditions, free from sources of electrical and electromagnetic interference.
F. Ensure power source is protected against accidental shutoff.
G. Install all equipment and materials in accordance with the "current" recommendations of the manufacturer. The work shall also be in accordance with:
   1. Installation criteria defined in these specifications and in the construction documents.
   2. Factory Representative can be the Bosch Security Systems Inc Security Dealer.
   3. Approved submittals.
   4. Applicable requirements of referenced standards.
H. The contractor shall provide the following services as part of the contract:
   1. Supervision of sub-contractors.
   2. Coordination of other contractors for system-related work (electrical contractor, finish hardware contractor, architect, and general contractor).
   3. Attending site construction/coordination meetings.
   4. Keeping updated construction drawings at the construction site.
   5. Meeting construction deadlines per the construction schedule.
I. Programming of the system shall include the following tasks:
   1. Programming system configuration parameters (hardware and software, zone/circuit numbers, communication parameters).
   2. Programming operational parameters such as opening/closing reports and windows, system response text (custom English) displays of events, activation of relays that drive auxiliary devices, and identifying types of zones/loops.
   3. Programming passcodes according to the authorities and functions defined by the owner.
   4. Other system programming tasks required by the owner. These additional programming requirements shall be coordinated between the owner and the contractor.
   5. Operational Testing: The contractor shall perform thorough operational testing and verify that all system components are fully operational.
   6. Hard-copy System Printout: The contractor shall submit a hard-copy system printout of all components tested and certify 100 percent operation indicating all devices/panels/units have passed the test criteria set forth by the manufacturer.
   7. Acceptance Test Plan Form: An acceptance test plan form shall be prepared/provided by the contractor prior to the acceptance walk-through.
8. This form shall include separate sections for each device/panel/unit as well as a column indicating the manufacturer's performance allowance/margin, a column indicating the result of the testing performed by the contractor (pass/fail), and an empty column for recording findings during the walk-through.


J. The contractor shall certify completion in writing and schedule the commissioning walk-through. The contractor shall provide all the tools and personnel needed to conduct an efficient commissioning process.

3.2 FIELD QUALITY CONTROL

A. Installation contractor shall submit a written test report that the system has been 100 percent tested and approved. Final test shall be witnessed by the owner, engineer, electrical contractor, chief security officer, and performed by the installation contractor. Final test report shall be received and acknowledged by the owner prior to request for final payment.

B. Provide instruction to the owner's satisfaction with regard to proper use and operation of the system.

C. Determine and report all problems to the manufacturer's customer service department.

3.3 ADJUSTING

A. System maintenance and repair of system or workmanship defects during the warranty period shall be provided by the Contractor free of charge (parts and labor).

B. Periodic testing of the system shall be carried out on a monthly or quarterly basis to ensure the integrity of the control panel, the sensing devices, and the telephone lines.

C. The installer shall correct any system defect within six hours of receipt of call from the Owner.

3.4 DEMONSTRATION

A. Demonstrate at final inspection that surveillance system, devices and intercom system function properly.

1. The Contractor upon completion of installation shall furnish training in the complete operation of the systems.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before substantial completion.

END OF SECTION
SECTION 28 31 00 – FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Owner-Contractor Agreement, the General and Supplementary Conditions
      and Modifications to General Conditions apply to the work specified in this section.

1.2 DESCRIPTION
   A. Relocate existing fire alarm notification and detection devices in common corridor spaces.
   B. Install detection and notification devices in new spaces and detection to protect fire alarm
      circuits and system per local codes.
   C. Extend fire alarm circuits as required.

1.3 CODES
   A. System shall meet the International Fire Code, with City of Bellevue amendments, requirements
      for residential buildings.

PART 2 - PRODUCTS

2.1 SYSTEM COMPONENTS
   A. All devices to be compatible with the existing conventional Silent Knight System.

PART 3 - EXECUTION

3.1 GENERAL
   A. Install low voltage wiring as required to interlink detectors. Wiring as required by
      manufacturer.
   B. Install per manufacturer’s recommendations.

3.2 TESTING
   A. Install system complete for operation and test in presence of Fire Marshal.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to following:
   1. Furnishing and installing water service lines downstream of water meters.
   2. Providing temporary connections to existing systems as needed.
   3. Coordination of work with City of Bellevue.
   4. Coordination of work with Design Build Plumbing and Fire Sprinkler Contractor.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Specifications, including but not limited to following:

   Section 31 20 00 - Earthwork

1.3 REFERENCES

WSDOT-APWA 2018 Standard Specifications for Road, Bridge and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.

COB City of Bellevue Code and Engineering Development Manual and Standard Plans


The International Association of Plumbing and Mechanical Officials (IAMPO) Standards.

Underwriters Laboratories Fire Protection Equipment Directory

Factory Mutual Approval Guide

American Water Works Association (AWWA) Standards.

1.4 SUBMITTALS

A. Submit manufacturer's data for products.

1.5 DIMENSIONS AND LAYOUT

A. All layout shall be provided by the Contractor. Layout work shall be performed in accordance with COB. Also see Paragraph 31 10 00 - 1.7.

B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.
C. The Contractor is responsible for review of all records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities damaged as a result of the Contractor’s operations at its own expense.

D. The Contractor is to notify the Engineer immediately of underground utilities encountered, which are not shown on the plans.

1.6 CONTRACTOR REQUIREMENTS

A. All Contractors installing, inspecting, servicing or maintain fire protection systems shall be licensed by the State Director of Fire Protection Services in accordance with Chapter 18.106 RCW.

B. Contractor is responsible for coordinating all water system and fire system work with COB

C. State of Washington Level 3 Fire Protection Sprinkler Contractor shall design and prepare the underground submittal drawings per the state of Washington WAC 212-80-043(9).

D. A State of Washington Level U underground contractor shall perform the installation of the underground piping per the State of Washington WAC 212-80-043(2)

1.7 GENERAL STANDARDS

A. All work and materials shall be in conformance with COB requirements, except as modified herein.

PART 2 PRODUCTS

2.1 GENERAL MATERIAL STANDARDS

A. Materials for fire sprinkler supply lines shall be UL listed and labeled, Factory Mutual approved, and approved for use in the fire protection system by the local Fire Marshall, codes, and agencies.

B. All materials shall meet the requirements of COB, except as modified herein.

2.2 PIPE AND FITTINGS

A. Pipe 4 Inches in Diameter and Larger
   1. Ductile iron manufactured in accordance with the requirements of AWWA C151 and cement-mortar lining conforming to AWWA C104. Pipe thickness shall be Standard Thickness Class 52, unless otherwise noted. Fittings shall be ductile iron conforming to AWWA C110 and C111. Fittings shall be cement mortar lined conforming to AWWA C104. Fittings may be ductile iron compact body class 350 conforming to AWWA C-153. Flange-type fittings shall meet the requirements of AWWA C-115 and shall be ductile iron. Flanges shall be faced and drilled to 125 pound ANSI template. Bolts shall be steel as specified in the appendix of AWWA C-115.
   2. Joints shall be flanged, mechanical or push-on, unless otherwise noted. Pipe with push-on joints shall be furnished with a single rubber ring gasket. All gaskets, including MJ shall be lubricated to effect the seal. Pipe with mechanical joints shall be furnished with a mechanical joint of the stuffing box type, including rubber gasket, cast-iron gland, and tee-head bolts and nuts to effect the seal. All joints shall conform to ANSI Standard A21.11 (AWWA C-111). Flanged joints shall conform to ANSI Standard A21.15 (AWWA C115).
   3. Restained joints shall be Mega Lug or approved equivalent.

B. Domestic service pipe smaller than 4 inches in diameter: Copper Tubing Type K for buried piping. Tubing shall be joined by wrought copper fittings with soldered joints per ASTM B828 for potable water.
2. High density polyethylene (PE) pipe with a standard thermoplastic material designation code of PE4710. Pipe shall meet the requirements of NSF 14/61 and AWWA C901-08. Pipe shall be permanently marked in accordance with all applicable standards per this specification. Marking shall be heat stamped indent print and shall remain legible under normal handling and installation practices. Pipe shall be IPS, SDR11 meeting ASTM D3035. Pipe and fittings shall be joined by thermal fusion per the Manufacturer’s recommended procedures.

2.3 BEDDING AND BACKFILL MATERIAL

A. Bedding material shall be per Section 31 20 00.

B. Backfill material shall be per Section 31 20 00.

2.4 BUILDING CONNECTIONS

A. Service connections 2-inches and smaller shall be per APWA/WSDOT Section 9-30.6, except as modified herein.

B. Fire protection connections shall be in accordance with NFPA-13 and NFPA-20. Coordinate with building sprinkler connections shown on mechanical drawings and as constructed by the building sprinkler installer.

2.5 FIRE DEPARTMENT CONNECTIONS

A. Fire hydrants shall comply with COB requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to beginning any water line construction or ordering materials, Contractor shall excavate and expose existing facilities at proposed points of connection and verify required materials for connection and depth of connection points. Notify Engineer of any discrepancies.

B. Beginning of installation means acceptance of existing conditions.

3.2 TRENCHING

A. Excavation and preparation of the trench shall be in accordance with Section 31 20 00.

B. The trench shall be kept free from water until pipe is laid and backfilled. Surface water shall be diverted so as not to enter trench. Boulders, rocks, and other obstructions shall be removed or cut out to the width of the trench and to a depth of 6 inches below the elevation of bottom of pipe.

C. Dewatering shall be accomplished by using ditches, sumps and pumps depending on the groundwater level at the time of construction.

3.3 WATER SERVICE INSTALLATION

A. Water service lines downstream of meter:
1. Pipe shall be installed and joined in accordance with manufacturers' recommendations. Pipe sections shall be installed and joined in such a manner as not to damage the pipe. Any damage shall be repaired by the Contractor at the Contractor's expense. All touch-up coating for DI pipe accessories shall be made with epoxy coal tar. Inside parts of the pipe accessories shall be touched up with asphaltic varnish, Royston Roykote #612XM, or approved equivalent.

2. Domestic pipe terminations shall be coordinated with plumbing and fire sprinkler installer. Provide temporary plug and blocking as required.

3. Polyethylene pipe shall be joined to other materials through the use of electrofusion fittings, flange adapters with back-up rings, or mechanical couplings designed for connecting polyethylene pipe to another material. Installation procedures shall be per the recommendations of the manufacturer of the joining device.

4. Provide all transition fittings and materials required to connect to existing meter setter or service termination.

3.4 BEDDING AND BACKFILLING

A. Bedding shall be installed in accordance with Section 31 20 00.

B. Backfilling of trenches shall be in accordance Section 31 20 00. Install detectable warning tape for non-metallic pipe for full length of each pipe run. Tape shall be installed eighteen inches above the pipe crown.

3.4 TESTING, FLUSHING AND DISINFECTION

A. All water lines shall be flushed, hydrostatically tested, and disinfected. Final flushing of service pipe shall be in accordance with WSDOT-APWA Section 7-09 and AHJ. Contractor shall provide for proper collection, discharge and disposal of flushing water in accordance with COB requirements.

END OF SECTION
Limited Hazardous Materials Survey Report

Bellevue Manor Apartments
143 Bellevue Way Southeast
Bellevue, Washington

Prepared for:
King County Housing Authority
600 Andover Park West
Seattle, WA 98188

June 25, 2019
PBS Project No. 40573.183
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## APPENDICES

**APPENDIX A: PLM Bulk Sampling Information**
- PLM Bulk Sample Inventory
- PLM Bulk Sample Laboratory Data Sheets and Chain of Custody Documentation

**APPENDIX B: Lead in Paint Chip Sampling Information**
- Paint Chip Sample Inventory
- Paint Chip Laboratory Data Sheets and Chain of Custody Documentation

**APPENDIX C: Certifications**
1 INTRODUCTION

1.1 Background
PBS Engineering and Environmental, Inc. (PBS) performed a hazardous materials survey of the Bellevue Manor Apartments located at 143 Bellevue, Washington. Accessible building areas included in the scope of work were inspected for the presence of asbestos-containing materials (ACMs) and lead-containing paint (LCP). The intent of this investigation is to ensure that the King County Housing Authority (KCHA) is in compliance with applicable regulatory requirements that a "good faith inspection" for ACMs be performed prior to renovation activities.

PBS understands that interior and exterior renovations are planned for the subject property. At the request of KCHA, PBS inspected all accessible areas of Bellevue Manor Apartments.

1.2 Building Description
Bellevue Manor Apartments consists of a three-story residential building with a community/recreation center and parking garage. The building is a wood-framed structure with a crawlspace and attic. Renovation areas typically consist of the following finishes: either sheet vinyl flooring or carpet. Walls and ceilings are comprised of textured gypsum wallboard. Exterior finishes include wood siding, wood door frames, vinyl window frames.

1.3 Survey Process
Accessible areas of the Bellevue Manor Apartments included in the project scope were inspected by AHERA-certified building inspector Janet Murphy (Cert. No. 172986 Exp. 5/1/2020) on June 4, 5 and 6, 2019.

When observed, suspect materials were sampled. All samples were assigned a unique identification number and transmitted for analysis to Seattle Asbestos Test, LLC (NVLAP # 200768-0) for analysis. All samples were analyzed by polarized light microscopy (PLM), which has a reliable limit of quantification of one percent asbestos by volume. Information regarding the type and location of sampled materials can be found on the attached PLM Sample Inventory.

Destructive investigation was not performed to access inaccessible areas. Inaccessible spaces are defined as those requiring selective demolition, fall protection or confined-space entry protocols to gain access. While PBS has endeavored to identify concealed ACM, additional unidentified materials may be present in concealed locations that were not accessed during this survey. Any materials encountered during renovation that have not been previously sampled should be sampled for asbestos content prior to impact.
FINDINGS

2.1 Asbestos-Containing Materials (ACMs)
PBS collected and analyzed representative suspect materials for asbestos content.

- **Brown Exterior Sealant** (Under Brown Paint and/or White Sealant) – caulk joints associated with siding, window and entry door frames (between frame and rough opening) throughout, Approximately 5,000 LF;

- **“Popcorn” Ceiling Texture** – living rooms, bedrooms, foyers and closets of all units, Community/Recreation Room, storage/maintenance rooms and common hallways. Overspray is present under carpet throughout. Approximately 51,743 SF;

- **Sheet Vinyl Flooring (Yellow, Orange, Pink with Gray and Brown Patterns)** – bottom layer under one to three layers of non-asbestos sheet vinyl sheet flooring in each unit in the foyers, foyer closets, kitchens and bathrooms. And in the following common areas - laundry rooms, on each floor and the Community/Recreational Room kitchen and restrooms. Approximately 10,000 SF;

- **Sheet Vinyl Flooring (Yellow, Orange, Pink with Gray and Brown Patterns)** – under carpet in Community/Recreational Room, Approximately 722 SF;

- **Sheet Vinyl Flooring (Yellow, Orange, Pink with Gray and Brown Patterns)** - maintenance and storage rooms on each floor, Approximately 1,800 SF;

- **Fire Doors (assumed)** – all hallway doors and unit entry doors, Approximately 80 EA.

The following materials were sampled and **did not** contain detectable asbestos.

- Gypsum Wallboard and Joint Compound – throughout;
- 3-Tab Shingle Roofing/Mastic/Black Paper – roofs throughout;
- Compressed Fiberboard Shingles – exterior, 3rd floor roof;
- Black Vapor Barrier -under wood siding;
- White Caulk – inside units around vinyl window frames, kitchen counters and bathroom tub inserts;
- Tan and Brown Cove Base Mastic – in units, maintenance/storage rooms and halls;
- Yellow Carpet Mastic – under carpets throughout;
- Light Weight Concrete – throughout under all flooring;
- Laminate Counters and Yellow Mastic – Kitchens, bathrooms and Community/Recreation room;
- Texture on Gypsum Wallboard – Garage walls;
- Texture on Gypsum Wallboard – walls throughout, kitchen and bathroom ceilings throughout;
- Black Pads and Gray Sink Undercoats – Kitchen sinks of all units;
- Fiberglas Insulation – throughout attic and in crawl space around pipes;
- White Sealant – exterior window, door, and sliding door frames throughout;
- **Sheet Vinyl (Wood Pattern, Gray Square Pattern, Tan with brown Spots, White)** – over asbestos-containing sheet vinyl flooring in the foyer, foyer closet, kitchen and bathroom of all units.

Refer to Appendix A for a complete listing of representative bulk sampling and associated laboratory analysis.
2.2 **Lead-Containing Paint**

Sixteen (16) representative painted coatings were sampled for lead content. The samples were assigned a unique identification number and transmitted to EMSL Analytical, Inc. (AIHA #101748) in San Leandro, California under chain-of-custody protocols for analysis using Flame Atomic Absorption (EPA 3050B/7000B).

Detectable concentrations of lead were present in the following samples.

- Brown Paint - Unit 104 kitchen cabinets - 0.56% Lead

See the FAAS Lead Paint Chip Sample Inventory included in Appendix B for additional information including specific sample locations and results of paint sampling.

3 **RECOMMENDATIONS**

3.1 **Asbestos-Containing Materials (ACM)**

PBS recommends that ACMs to be impacted by renovation or demolition activities be removed prior to construction or only be impacted by properly trained and protected personnel in accordance with applicable local, state and federal regulations. A qualified asbestos abatement contractor licensed in the State of Washington should be employed for any removal and proper disposal of ACM in accordance with all applicable local, state and federal regulations.

The possibility exist that suspect ACM may be present in equipment, wall and ceiling cavities, and in select areas included in the scope of renovations. These may include, but are not limited to pipe insulation, below slab components vapor barriers, and construction adhesives and wall mastics. In the event that suspect ACM is 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.

3.2 **Lead-Containing Paint (LCP)**

Brown paint on kitchen cabinets in Unit 104 was found to contain detectable lead. Consider all similar paint to be lead-containing. Paint coatings may exist in inaccessible areas of the building or in secondary coatings on building components. Any previously unidentified painted coatings should be considered lead containing until sampled and proven otherwise.

Impact of paint with detectable concentrations of lead requires construction activities to be performed in accordance with the State of Washington Department of Labor and Industries regulation for Lead in Construction (WAC 296-155-176).

All construction activities performed in pre-1978 residential buildings require compliance with the EPA and State of Washington lead paint regulations including but not limited to 40 CFR 745 Renovation, Repair and Painting (RRP) program regulations and 24 CFR 35 Lead-Based Paint Poisoning in Certain Residential Structures.

The paint sampling performed as part of this survey was not intended to meet the requirements of the HUD Guidelines for the Evaluation and Control of Lead-Based Paint in Housing.
Report prepared by:

Janet Murphy
AHERA Building Inspector
Cert. No. 172986 Exp. 5/1/2020

Report reviewed by:

Mark Hiley
Senior Project Manager
APPENDIX A

PLM Bulk Sampling Information
PLM Bulk Sample Inventory
PLM Bulk Sample Laboratory Data Sheets
PLM Bulk Sample Chain of Custody Documentation
<table>
<thead>
<tr>
<th>PBS Sample #</th>
<th>Material Type</th>
<th>Sample Location</th>
<th>Lab Description</th>
<th>Lab Result</th>
<th>Lab</th>
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<td>40573.183 -001</td>
<td>Compressed board siding</td>
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June 25, 2019

NAD - No Asbestos Detected
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<td>Yellow carpet mastic on light weight concrete</td>
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June 25, 2019

NAD - No Asbestos Detected
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June 25, 2019  
NAD - No Asbestos Detected  
PBS Project #40573.183  
5 of 20
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<td>Layer 1: White soft/lumpy material with paint 3% Chrysotile</td>
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<td>Popcorn text debris</td>
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<td>Popcorn text debris</td>
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NAD - No Asbestos Detected
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<td>40573.183 -060</td>
<td>Fluffy white and pink insulation</td>
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June 25, 2019  NAD - No Asbestos Detected  9 of 20
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NAD - No Asbestos Detected
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<td>Orange, yellow, pink, brown sheet vinyl, white backing</td>
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<td>Layer 2: White fibrous material with mastic</td>
<td>NAD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Layer 4: White fibrous material with mastic</td>
<td></td>
<td>Layer 4: White fibrous material with mastic</td>
<td>NAD</td>
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</tr>
<tr>
<td></td>
<td>Layer 5: Gray hard sandy/brittle material</td>
<td></td>
<td>Layer 5: Gray hard sandy/brittle material</td>
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</tr>
<tr>
<td>40573.183 -118</td>
<td>Gray square sheet vinyl</td>
<td>3rd Floor Laundry</td>
<td>Layer 1: Gray square sheet vinyl</td>
<td>NAD</td>
<td>SAT</td>
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<tr>
<td></td>
<td>Gray and green sheet vinyl</td>
<td></td>
<td>Layer 2: Gray fibrous material with mastic</td>
<td>NAD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Orange, yellow, pink, brown sheet vinyl</td>
<td></td>
<td>Layer 3: Gray/green sheet vinyl</td>
<td>NAD</td>
<td></td>
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<tr>
<td></td>
<td>Layer 4: Gray fibrous material with mastic</td>
<td></td>
<td>Layer 4: Gray fibrous material with mastic</td>
<td>NAD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Layer 5: Orange/yellow/pink/brown sheet vinyl</td>
<td></td>
<td>Layer 5: Orange/yellow/pink/brown sheet vinyl</td>
<td>NAD</td>
<td></td>
</tr>
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<td></td>
<td>Layer 6: Gray fibrous material with mastic</td>
<td></td>
<td>Layer 6: Gray fibrous material with mastic</td>
<td>NAD</td>
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<tr>
<td></td>
<td>Layer 7: Gray hard sandy/brittle material</td>
<td></td>
<td>Layer 7: Gray hard sandy/brittle material</td>
<td>NAD</td>
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<tr>
<td>40573.183 -119</td>
<td>Tan square sheet vinyl</td>
<td>Unit 301 kitchen</td>
<td>Layer 1: Tan square sheet vinyl</td>
<td>NAD</td>
<td>SAT</td>
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June 25, 2019 NAD - No Asbestos Detected
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<th>PBS Sample #</th>
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<tr>
<td>40573.183 -120</td>
<td>Tan sheet vinyl with brown spots</td>
<td>Unit 310 foyer</td>
<td>Layer 1: Tan/brown sheet vinyl                                            Layer 2: Yellow sheet vinyl with white backing Layer 3: Yellow sheet vinyl with mastic Layer 4: White fibrous material with mastic</td>
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<td>Yellow sheet vinyl</td>
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<td>Layer 5: Gray soft/loose material                                         Layer 6: Orange/yellow/pink/brown sheet vinyl</td>
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<td></td>
<td></td>
<td></td>
<td>Layer 7: White fibrous material with mastic                                Layer 8: Gray hard sandy/brittle material</td>
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<tr>
<td>40573.183 -121</td>
<td>Tan with brown spots</td>
<td>Unit 302 foyer closet</td>
<td>Layer 1: Tan/brown sheet vinyl                                            Layer 2: Yellow mastic</td>
</tr>
<tr>
<td></td>
<td>Yellow sheet vinyl with white backing</td>
<td></td>
<td>Layer 3: Yellow sheet vinyl with mastic                                    Layer 4: White fibrous material with mastic</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Layer 5: Gray hard sandy/brittle material                                  Layer 6: Orange/yellow/pink/brown sheet vinyl</td>
</tr>
<tr>
<td>40573.183 -122</td>
<td>Tan with brown spots</td>
<td>Unit 310 kitchen</td>
<td>Layer 1: Tan/brown sheet vinyl                                            Layer 2: Yellow mastic</td>
</tr>
<tr>
<td></td>
<td>Yellow sheet vinyl with white backing</td>
<td></td>
<td>Layer 3: Yellow sheet vinyl with mastic                                    Layer 4: White fibrous material with mastic</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Layer 5: Gray hard sandy/brittle material                                  Layer 6: Orange/yellow/pink/brown sheet vinyl</td>
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### Bellevue Manor Apartments
King County Housing Authority

<table>
<thead>
<tr>
<th>PBS Sample #</th>
<th>Material Type</th>
<th>Sample Location</th>
<th>Lab Description</th>
<th>Lab Result</th>
<th>Lab</th>
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<tbody>
<tr>
<td>40573.183 -123</td>
<td>White texture on gypsum wallboard</td>
<td>Parking garage</td>
<td>Layer 1: White powdery material with paint</td>
<td>NAD</td>
<td>SAT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Layer 2: Trace brown fibrous material</td>
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<td></td>
</tr>
<tr>
<td>40573.183 -124</td>
<td>White texture on gypsum wallboard</td>
<td>Parking garage</td>
<td>Layer 1: White powdery material with paint</td>
<td>NAD</td>
<td>SAT</td>
</tr>
<tr>
<td>40573.183 -125</td>
<td>White texture on gypsum wallboard</td>
<td>Parking garage</td>
<td>Layer 1: White powdery material with paint</td>
<td>NAD</td>
<td>SAT</td>
</tr>
</tbody>
</table>

June 25, 2019

NAD - No Asbestos Detected
## SAMPLE DATA FORM

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<thead>
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<th>Sample #</th>
<th>Material</th>
<th>Location</th>
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<tbody>
<tr>
<td>1</td>
<td>Compressed Board Siding</td>
<td>N. Elevation Roof Level</td>
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<td>2</td>
<td>3-Tub Shingle with Black Mastic and Paper</td>
<td>N. Elevation Roof Level</td>
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<tr>
<td>3</td>
<td>Black Paper Under Siding</td>
<td>Low Roof Over Entry</td>
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<tr>
<td>4</td>
<td>Caulk Around Counter</td>
<td>N. Exterior Elevation</td>
<td></td>
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<tr>
<td>5</td>
<td>Caulk Around Counter</td>
<td>Unit 311 Kitchen</td>
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<tr>
<td>6</td>
<td>Caulk Around Counter</td>
<td>Unit 305 Kitchen</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Caulk Around Tub Insert</td>
<td>Unit 315 Bathroom</td>
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<td>8</td>
<td>Caulk Around Vinyl Window Frame</td>
<td>Unit 108 Living Room</td>
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<td>9</td>
<td>Caulk Around Vinyl Window Frame</td>
<td>Unit 305 Living Room</td>
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<td>10</td>
<td>Caulk Around Vinyl Window Frame</td>
<td>South Bldg Entry Foyer</td>
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<td>11</td>
<td>Caulk Around Vinyl Window Frame</td>
<td>Unit 201 Bedroom</td>
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<tr>
<td>12</td>
<td>Tan Cove Base Mastic</td>
<td>3rd Fl Entry Hall</td>
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<tr>
<td>13</td>
<td>Gray Rubber Cove base and Tan Mastic</td>
<td>3rd Floor Laundry Room</td>
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<tr>
<td>14</td>
<td>Tan Cove Base Mastic</td>
<td>Unit 104 Foyer</td>
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<tr>
<td>15</td>
<td>Brown Cove Base Mastic</td>
<td>Community/Rec Room</td>
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<tr>
<td>16</td>
<td>Tan and Black Sink Pad</td>
<td>Unit 118 Kitchen</td>
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<tr>
<td>17</td>
<td>Tan and Black Sink Pad</td>
<td>Unit 102 Kitchen</td>
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<tr>
<td>18</td>
<td>Gray Sink Undercoat</td>
<td>Unit 101 Kitchen</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Gray Sink Undercoat</td>
<td>Community/Rec Room Kitchen</td>
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### SAMPLE DATA FORM

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Material</th>
<th>Location</th>
<th>Lab</th>
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<tbody>
<tr>
<td>20</td>
<td>Yellow Carpet Mastic on light weight concrete</td>
<td>Unit 108 Livingroom</td>
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<tr>
<td>21</td>
<td>Textured Overspray and light weight concrete</td>
<td>Unit 110 Bedroom</td>
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<tr>
<td>22</td>
<td>Yellow Carpet Mastic with Texture &amp; Overspray and Light Weight Concrete</td>
<td>1ST Fl. N/15 Hallway</td>
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<tr>
<td>23</td>
<td>Yellow Carpet Mastic and Textured Overspray and Light Weight Concrete</td>
<td>2nd Fl. Stair Landing</td>
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<td>24</td>
<td>Yellow Carpet Mastic and Textured Overspray and Light Weight Concrete</td>
<td>2nd Fl. Hall X/AS</td>
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<td>25</td>
<td>Light Weight Concrete</td>
<td>Water Heater Room between units 303/304</td>
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<td>26</td>
<td>Blue Laminate and Yellow Mastic</td>
<td>Rec. Room Kitchen</td>
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<tr>
<td>27</td>
<td>Yellow Laminate and Yellow Mastic</td>
<td>Unit 207 Kitchen</td>
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<td>28</td>
<td>Yellow Laminate and Yellow Mastic</td>
<td>Unit 220 Kitchen</td>
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<tr>
<td>29</td>
<td>Gray Laminate and Yellow Mastic</td>
<td>Unit 305 Kitchen</td>
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</tr>
<tr>
<td>30</td>
<td>White Laminate and Yellow Mastic</td>
<td>Unit 323 Kitchen</td>
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<tr>
<td>31</td>
<td>Composite Joint Compound and Wallboard</td>
<td>Unit 301 Bedroom</td>
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<tr>
<td>32</td>
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<td>3rd Fl. Hall N/S</td>
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<tr>
<td>33</td>
<td></td>
<td>Floor 2 Stairwell</td>
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<td>34</td>
<td></td>
<td>Water Heater Closet for 201-202</td>
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<td>35</td>
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<td>Unit 102 Bedroom</td>
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<td>36</td>
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<td>Unit 104 Maintenance/Storage</td>
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<td>37</td>
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<tr>
<td>38</td>
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**PBS**

**KCHA**

**Project:** Bellevue Manor Apts  
**Analysis requested:** PLM

**Relinqu'd by/Signature:** Janet Murphy  
**Received by/Signature:** Carolyn Yes Greenlee

**E-mail results to:**
- Brian Stanford
- Willem Mager
- Gregg Middaugh
- Mark Hiley
- Tim Ogden
- Prudy Stout-McRae

**E-mail all invoices to:** seattleap@pbsusa.com  
**TURN AROUND TIME:**
- ☑ 24 Hours
- 48 Hours
- 1 Hour
- 2 Hours
- 4 Hours
- 3-5 Days
- ☑ Other 3 Days

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### SAMPLE DATA FORM

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<thead>
<tr>
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<th>Location</th>
<th>Lab</th>
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<tbody>
<tr>
<td>39</td>
<td>White Sealant</td>
<td>On Roof Hatch, wood frame</td>
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<tr>
<td>40</td>
<td>White and Brown Sealant</td>
<td>W. Elevation Trim To Siding Sawn</td>
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<td>41</td>
<td>White and Brown Sealant</td>
<td>N. Elevation Trim To Siding Sawn</td>
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<td>42</td>
<td>White Sealant</td>
<td>Eav. Comm / Rec Rm / Window frame</td>
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<td>43</td>
<td>White Sealant</td>
<td>S. Elevation Rm 117 Ext. Head Trim</td>
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<td>White Sealant</td>
<td>S. Elevation Entry Lobby, Window Frame</td>
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<td>45</td>
<td>&quot;Popcorn&quot; Ceiling Texture</td>
<td>Community / Rec Room</td>
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<tr>
<td>46</td>
<td>&quot;&quot;</td>
<td>Unit 101 Foyer</td>
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<tr>
<td>47</td>
<td>&quot;&quot;</td>
<td>Unit 103 Foyer</td>
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<tr>
<td>48</td>
<td>&quot;&quot;</td>
<td>Unit 102 Living Room</td>
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<td>49</td>
<td>&quot;&quot;</td>
<td>Unit 104 Bedroom</td>
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<td>50</td>
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<td>Unit 110 Closet Ceiling</td>
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<td>Fl. 2 Maint / Storage Rm</td>
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<td>3rd Floor Hall</td>
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<td>&quot;&quot;</td>
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# SAMPLE DATA FORM

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<th>Lab</th>
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<tr>
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<td>Pop Corn Text Debris</td>
<td>Unit 301 Under Bedroom Carpet</td>
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<td>58</td>
<td>Pop Corn Text Debris</td>
<td>Unit 201 Under Livingroom Carpet</td>
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<td>59</td>
<td>Floppy White Insulation</td>
<td>In Attic</td>
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<tr>
<td>60</td>
<td>Floppy White and Pink Insulation</td>
<td>On Pipe in Crawlspace</td>
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<tr>
<td>61</td>
<td>Floppy White Insulation</td>
<td>On Pipe in Crawlspace</td>
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<td>62</td>
<td>Texture on Gypsum Wallboard</td>
<td>Unit 207 Kitchen Ceiling</td>
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<tr>
<td>63</td>
<td>Texture on Gypsum Wallboard</td>
<td>Unit 209 Kitchen Ceiling</td>
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<tr>
<td>64</td>
<td>Texture on Gypsum Wallboard</td>
<td>Unit 208 Kitchen Ceiling</td>
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<td>65</td>
<td>Texture on Gypsum Wallboard</td>
<td>Unit 323 Kitchen Ceiling</td>
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<td>66</td>
<td>Texture on Gypsum Wallboard</td>
<td>Unit 318 Kitchen Ceiling</td>
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<td>Texture on Gypsum Wallboard</td>
<td>Unit 301 Bathroom Ceiling</td>
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<td>Texture on Gypsum Wallboard</td>
<td>5th Entry Foyer Wall</td>
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<td>Texture on Gypsum Wallboard</td>
<td>Unit 107 Foyer Closet Wall</td>
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<tr>
<td>70</td>
<td>Texture on Gypsum Wallboard</td>
<td>Unit 101 Foyer Closet Wall</td>
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<tr>
<td>71</td>
<td>Texture on Gypsum Wallboard</td>
<td>Unit 102 Bedroom Wall</td>
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<tr>
<td>72</td>
<td>Texture on Gypsum Wallboard</td>
<td>Unit 103 Foyer Wall</td>
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<tr>
<td>73</td>
<td>Texture on Gypsum Wallboard</td>
<td>1st Fl. Hall W/S</td>
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<td>74</td>
<td>Texture on Gypsum Wallboard</td>
<td>Unit 104 Bedroom Wall</td>
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<tr>
<td>75</td>
<td>Texture on Gypsum Wallboard</td>
<td>Unit 110 Bedroom Closet Wall</td>
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<tr>
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<td>Material</td>
<td>Location</td>
<td>Lab</td>
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<td>76</td>
<td>Texture on Gypsum Wallboard</td>
<td>Unit 221 Bedroom Wall</td>
<td>2nd Fl. Office Wall</td>
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<td>78</td>
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<td>2nd Fl. Office Wall</td>
<td>Unit 207 Foyer Wall</td>
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<td>83</td>
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<td>Unit 315 Bathroom</td>
<td>3rd Fl. Hall E/1W</td>
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<tr>
<td>84</td>
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<td>Unit 301 Bedroom Wall</td>
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<td></td>
<td>Unit 310 Bedroom Wall</td>
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<tr>
<td>86</td>
<td>1st Fl. E/1W Hall</td>
<td>Community/Rec Room</td>
<td>Under-carpet at Unit 118 Bedroom Entryway</td>
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<tr>
<td>87</td>
<td>Yellow Sheet Vinyl</td>
<td>Community/Rec Room</td>
<td>Unit 118 Bedroom Entryway</td>
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<tr>
<td>88</td>
<td>Layer one: grey square sheet Vinyl</td>
<td>Community/Rec Room</td>
<td>Women's RR</td>
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<tr>
<td>89</td>
<td>Layer two: Tan Sheet Vinyl</td>
<td>Layer three: Yellow Sheet Vinyl</td>
<td>Unit 124 Bathroom Floor</td>
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<tr>
<td>90</td>
<td>Layer 1: Grey Square Sheet</td>
<td>Unit 120</td>
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<tr>
<td>91</td>
<td>Painted</td>
<td>Layer 2: Painted</td>
<td>Sheet Vinyl</td>
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</table>
**PBS**

**KCHA**

**Project:** Bellevue Manor Apts  
**Analysis requested:** PLM  
**Relinq'd by/Signature:** Janet Murphy  
**Received by/Signature:** Carew Yale Cumby

---

**Project #: 40573.183**  
**Date:** June 6, 2019  
**Date/Time:** June 6, 2019  
**Date/Time:** 6/6/19 14:55

**E-mail results to:**  
- Cel Alvarez  
- Janet Murphy  
- Kaitlin Soukup  
- Martin Estria  
- Justin Day  
- Fimon Embaye  
- Mike Smith  
- Ferman Fletcher  
- Holly Tuttle  
- Ryan Hunter  
- Eman Jabali

**E-mail all invoices to:** seattleap@pbsusa.com

**TURN AROUND TIME:**  
- 1 Hour  
- 2 Hours  
- 4 Hours  
- 24 Hours  
- 48 Hours  
- 3-5 Days  
- Other 3 Days

---

**SAMPLE DATA FORM**

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Material Description</th>
<th>Location</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>41 cont.</td>
<td>Layer 3 Tan Sheet Vinyl with Brown Spots</td>
<td>Unit 120 Kitchen</td>
<td></td>
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</tbody>
</table>
| 42       | Layer 1 Tan Sheet Vinyl with brown spots  
Layer 2, Orange and Brown Sheet Vinyl  
Layer 3, White backing | Unit 102 Foyer closet |     |
| 43       | Layer 1 Tan Square Sheet Vinyl  
Layer 2 Tan Sheet Vinyl with brown spots  
Layer 3, Yellow Orange and Brown Sheet Vinyl | Unit 103 Kitchen |     |
| 44       | Layer 1 Tan Sheet Vinyl with brown spots  
Layer 2 Gray Sheet Vinyl with gray spots  
Layer 3, Orange, Yellow, Brown Sheet Vinyl | Unit 102 Foyer |     |
### Sample Data Form

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Material</th>
<th>Location</th>
<th>Lab</th>
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<tbody>
<tr>
<td>95</td>
<td>Layer 1: Gray Square Sheet Vinyl</td>
<td>Unit 101 Bathroom</td>
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</tr>
<tr>
<td></td>
<td>Layer 2: Yellow, Orange Brown Sheet Vinyl</td>
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<tr>
<td>96</td>
<td>Layer 1: Tan Sheet Vinyl with brown spots</td>
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<td>Layer 2: Orange, Yellow Brown Sheet Vinyl</td>
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<td>Layer 3: White backing</td>
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<tr>
<td>97</td>
<td>Layer 1: Gray Square Sheet Vinyl</td>
<td>Unit 103 Bathroom</td>
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<td>Layer 2: Orange, Yellow Brown Sheet Vinyl</td>
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<td>Layer 3: White backing on concrete</td>
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<tr>
<td>98</td>
<td>Layer 1: Plastic Spotted Paper</td>
<td>Unit 119</td>
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<td>Layer 2: Tan S/S with Brown spots</td>
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<td></td>
<td>Layer 4: Orange, Yellow Brown Sheets</td>
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### SAMPLE DATA FORM

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<td>Unit 202 Kitchen</td>
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<td>103</td>
<td>Brown Wood Laminate and yellow mast'c</td>
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| 104     | Layer 1: White Sheet Vinyl  
Layer 2: Orange, yellow, pink and brown sheet vinyl  
Layer 3: Yellow on concrete | Unit 207 Fayer closet |              |
| 105     | Orange, yellow, pink and brown Sheet Vinyl | Fl. 2 Main/Storage Room |              |
| 106     | Layer 2: Gray Square  
Sheet Vinyl  
Layer 2: Tan Sheet Vinyl with Brown spots  
Layer 3: Orange, yellow, pink and brown sheet vinyl | Unit 2/2 Kitchen |              |
| 107     | Layer 1: Tan Brown spots  
Layer 2: Brown Sheet Vinyl  
Layer 3: Gray Sheet Vinyl | Unit 201 Kitchen |              |
## SAMPLE DATA FORM

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<td>Unit 208, Layer closer</td>
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<td>109</td>
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<td>Unit 210, Kitchen</td>
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**SAMPLE DATA FORM**

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<td>Unit 322 Foyer closet</td>
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<td>Layer 2: Yellow, Orange, Pink</td>
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<td>Unit 321 Bathroom</td>
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</tr>
<tr>
<td></td>
<td>with brown spots</td>
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<td></td>
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<td></td>
<td>Layer 2: Yellow, Orange, Pink</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>and brown sheet vinyl</td>
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<td>114</td>
<td>Layer 1: Gray sheet vinyl with blue and orange spots</td>
<td>Unit 3/6 Foyer</td>
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<td>Layer 2: Tan sheet Vinyl</td>
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</tr>
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<td></td>
<td>Layer 3: Yellow, Orange, Pink</td>
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<td></td>
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<td>Layer 2: Brown sheet vinyl</td>
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<td></td>
<td>with brown spots</td>
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<td></td>
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<td></td>
<td>Layer 3: Yellow, orange, pink</td>
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</tr>
<tr>
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</table>
| 116      | Layer 1: White Sheet Vinyl  
Layer 2: Brown Sheet Vinyl  
Layer 3: Pebble Pattern Sheet Vinyl | Unit 318 Kitchen |     |
| 117      | Layer 1: Tea Sheet vinyl with brown spots, white backing  
Layer 2: Orange, yellow, pink, brown Sheet Vinyl  
Layer 3: White backing | Unit 320 Foyer Closet |     |
| 118      | Layer 1: Gray Square Sheet Vinyl  
Layer 2: Gray and Green Sheet Vinyl  
Layer 3: Orange, yellow, pink, brown Sheet Vinyl | |     |
| 119      | Layer 1: Tea Square Sheet Vinyl  
Layer 2: Tea Sheet Vinyl  
Layer 3: Orange, yellow, pink, brown Sheet Vinyl with white backing | Unit 301 Kitchen |     |
**SAMPLE DATA FORM**

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Material</th>
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<th>Lab</th>
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</thead>
</table>
| 120      | Layer 1: Tan sheet vinyl with brown spots  
Layer 2: Yellow sheet vinyl | Unit 310 Foyer |          |
| 121      | Layer 1: Tan with brown spots  
Layer 2: Yellow sheet vinyl with white backing | Unit 302 Foyer closet |          |
| 122      | Layer 1: Tan with brown spots  
Layer 2: Yellow sheet vinyl with white backing | Unit 310 Kitchen |          |
| 123      | White Texture on Gus | Parking Garage |          |
| 124      | White Texture on Gus | Parking Garage |          |
| 125      | White Texture on Gus | Parking Garage |          |
# SEATTLE ASBESTOS TEST

Lynnwood Laboratory: 19701 Scriber Lake Road, Suite 103, Lynnwood, WA 98036. Tel: 425.673.9850, Fax: 425.673.9810. NVLAP Lab Code: 201768-0

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 by Method EPA/660/R-93/116**

<table>
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<tr>
<th>Lab ID</th>
<th>Client Sample ID</th>
<th>Layer</th>
<th>Description</th>
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<th>Non-fibrous Components</th>
<th>% Non-asbestos Fibers</th>
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<td>Asphalt/binder, Sand</td>
<td>24 Glass fibers</td>
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<td></td>
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<td>Asphalt/binder</td>
<td>3 Cellulose</td>
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EXHIBIT A
## Analytical Laboratory Report

**Client:** PBS Engineering and Environmental, Seattle  
**Address:** 214 E. Color Street, Suite 300, Seattle, WA 98102

**Job #:** 40573, 183  
**Date Analyzed:** 6/11/2019  
**Job #:** 40573, 183  
**Date Analyzed:** 6/11/2019

### Sample Analysis

<table>
<thead>
<tr>
<th>Sample</th>
<th>Material Description</th>
<th>Analysis</th>
<th>Notes</th>
<th>Results</th>
<th>Primary Constituents</th>
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<td>Cellulose</td>
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<tr>
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<td>White soft/elastic material with trace paint</td>
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<td>Binder, Filler, Paint</td>
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**ANALYTICAL LABORATORY REPORT**

**PLM by Method EPA/800/R-83/116**

**Project Loc.:** KCHA Bellevue Manor Apts

**Analyzed by:** Sherrie No / Carolyn Yee / Yajie Gao

**Reviewed by:** Steve (Fanqian) Zhang, President

**Samples Rec'd:** 125

**Date Analyzed:** 6/11/2019

**Samples Analyzed:** 125

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

**Date Received:** 6/6/2019
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<th>Sample</th>
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<th>Detected Components</th>
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**Analytical Laboratory Report**

**Methodology:** EPA/600/R-93/116

**Analyzed by:** Sherry Ma / Carolyn Yoo / Valerie Gao

**Reviewed by:** Steve (Saruco) Chang, President

**Client:** PBS Engineering and Environmental, Seattle

**Project Site:** KCHA Bellevue Manor Apts
# SEATTLE ASBESTOS TEST

Lynnwood Laboratory: 19701 Scriber Lake Road, Suite 103, Lynnwood, WA 98036, Tel: 425.673.9850, Fax: 425.673.9810, NVLAP Lab Code: 200765-0

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 by Method EPA/600/R-93/1116**

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<td>Vinyl/binder</td>
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### Analytical Laboratory Report

#### PLM by Method EPA/600/R/93/116

**Client:** PBS Engineering and Environmental, Seattle

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

**Date Analyzed:** 8/11/2019

**Samples Analyzed:** 125

**Received:** 08/10/2019

**Samples Rec'd:** 125

**Project Loc.:** KCHA Bellevue Manor Apts

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## Analytical Laboratory Report

**Method:** PLM by Method EPA/600/R-03/1116

**Client:** PBS Engineering and Environmental, Seattle

**Project Site:** KCHA Bellevue Manor Apts

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</table>

**Exhibit A**

**SEATTLE ASBESTOS TEST**

Lynnwood Laboratory: 19701 Scriber Lake Road, Suite 103, Lynnwood, WA 98036, Tel: 425.673.9885, Fax: 425.673.9810, 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.
<table>
<thead>
<tr>
<th>Sample</th>
<th>Description</th>
<th>Analyzed</th>
<th>Detected Material</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>113</td>
<td>Tan/brown sheet vinyl</td>
<td>None</td>
<td>Vinyl/binder</td>
<td>None detected</td>
</tr>
<tr>
<td></td>
<td>Gray fibrous material with mastic</td>
<td>None</td>
<td>Binder/filler, Mastic/binder</td>
<td>51 Cellulose</td>
</tr>
<tr>
<td></td>
<td>Orange/yellow/pink/brown sheet vinyl</td>
<td>None</td>
<td>Vinyl/binder</td>
<td>None detected</td>
</tr>
<tr>
<td></td>
<td>Gray fibrous material with mastic</td>
<td>45</td>
<td>Chrysotile</td>
<td>23 Cellulose</td>
</tr>
<tr>
<td></td>
<td>Gray hard sandy/brittle material</td>
<td>None</td>
<td>Sand, Filler, Cement/binder</td>
<td>4 Cellulose</td>
</tr>
<tr>
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<td>Gray/orange/blue sheet vinyl</td>
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<tr>
<td></td>
<td>Clear mastic</td>
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<tr>
<td></td>
<td>Tan sheet mastic</td>
<td>None</td>
<td>Vinyl/binder</td>
<td>None detected</td>
</tr>
<tr>
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<td>None</td>
<td>Binder/filler, Mastic/binder</td>
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<tr>
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<td>Vinyl/binder</td>
<td>None detected</td>
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<td>48</td>
<td>Chrysotile</td>
<td>24 Cellulose</td>
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<tr>
<td>115</td>
<td>Tan/brown sheet vinyl</td>
<td>None</td>
<td>Vinyl/binder</td>
<td>None detected</td>
</tr>
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<td>Yellow mastic</td>
<td>None</td>
<td>Mastic/binder</td>
<td>4 Cellulose</td>
</tr>
<tr>
<td></td>
<td>Brown spotted sheet vinyl</td>
<td>None</td>
<td>Vinyl/binder</td>
<td>None detected</td>
</tr>
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<td></td>
<td>Gray fibrous material with mastic</td>
<td>None</td>
<td>Binder/filler, Mastic/binder</td>
<td>53 Cellulose</td>
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<tr>
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<td>Orange/yellow/pink/brown sheet vinyl</td>
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<td>Vinyl/binder</td>
<td>None detected</td>
</tr>
<tr>
<td></td>
<td>Gray fibrous material with mastic</td>
<td>46</td>
<td>Chrysotile</td>
<td>25 Cellulose</td>
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<tr>
<td>116</td>
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<td>None detected</td>
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<td>Binder/filler, Mastic/binder</td>
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<tr>
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<td>None detected</td>
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<tr>
<td>Sample No.</td>
<td>Material Description</td>
<td>Detection Result</td>
<td>Identified Component(s)</td>
<td>Cellulose</td>
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<tr>
<td>------------</td>
<td>---------------------------------------------</td>
<td>------------------</td>
<td>------------------------------------------</td>
<td>-----------</td>
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<td>116</td>
<td>Gray fibrous material with mastic</td>
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<tr>
<td>117</td>
<td>Tan/brown sheet vinyl</td>
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<td>Vinyl/binder</td>
<td>None detected</td>
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<tr>
<td>118</td>
<td>Gray square sheet vinyl</td>
<td>None detected</td>
<td>Vinyl/binder</td>
<td>None detected</td>
</tr>
<tr>
<td>119</td>
<td>Gray square sheet vinyl</td>
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<td>Vinyl/binder</td>
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<td>Test Material Description</td>
<td>Binder/Filler</td>
<td>Analysis No.</td>
<td>Amount (mg/g)</td>
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<td>------------</td>
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<td>---------------</td>
<td>--------------</td>
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<td>Gray fibrous material with mastic</td>
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<td>50 Cellulose</td>
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<td>Gray soft/loose material</td>
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<td>4 Cellulose</td>
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<td>Orange/yellow/pink/brown sheet vinyl</td>
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<td>None detected</td>
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<td></td>
<td>White fibrous material with mastic</td>
<td>45 Chrysotile</td>
<td>7</td>
<td>23 Cellulose</td>
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<tr>
<td></td>
<td>Gray hard sandy/brittle material</td>
<td>None detected</td>
<td>8</td>
<td>3 Cellulose</td>
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<tr>
<td>120</td>
<td>Tan/brown sheet vinyl</td>
<td>None detected</td>
<td>1</td>
<td>None detected</td>
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<td>49 Cellulose</td>
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<tr>
<td></td>
<td>Yellow sheet vinyl</td>
<td>None detected</td>
<td>3</td>
<td>None detected</td>
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<tr>
<td></td>
<td>White fibrous material with mastic</td>
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<td>4</td>
<td>20 Cellulose</td>
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<tr>
<td>121</td>
<td>Tan/brown sheet vinyl</td>
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<td>1</td>
<td>None detected</td>
</tr>
<tr>
<td></td>
<td>Yellow mastic</td>
<td>None detected</td>
<td>2</td>
<td>4 Cellulose</td>
</tr>
<tr>
<td></td>
<td>Yellow sheet vinyl</td>
<td>None detected</td>
<td>3</td>
<td>None detected</td>
</tr>
<tr>
<td></td>
<td>White fibrous material with mastic</td>
<td>46 Chrysotile</td>
<td>4</td>
<td>24 Cellulose</td>
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<td>3 Cellulose</td>
</tr>
<tr>
<td>122</td>
<td>Tan/brown sheet vinyl</td>
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<td>1</td>
<td>None detected</td>
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<tr>
<td></td>
<td>Yellow mastic</td>
<td>None detected</td>
<td>2</td>
<td>4 Cellulose</td>
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<tr>
<td></td>
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<td>45 Chrysotile</td>
<td>4</td>
<td>25 Cellulose</td>
</tr>
<tr>
<td>123</td>
<td>White powdery material with paint</td>
<td>None detected</td>
<td>1</td>
<td>5 Cellulose</td>
</tr>
<tr>
<td></td>
<td>Trace brown fibrous material</td>
<td>None detected</td>
<td>2</td>
<td>75 Cellulose</td>
</tr>
</tbody>
</table>
## SEATTLE ASBESTOS TEST

Lynnwood Laboratory: 19701 Sable Lake Road, Suite 103, Lynnwood, WA 98036, Tel: 425.673.9850, Fax: 425.673.9810, NVLAP Lab Code: 200768-0

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### ANALYTICAL LABORATORY REPORT

**Client:** PBS Engineering and Environmental, Seattle  
**Address:** 214 E Galer St, Suite 300, Seattle, WA 98102  
**Date Received:** 6/6/2019  
**Date Analyzed:** 6/11/2019  
**Job:** 46573.183  
**Batch:** 201910843  
**Samples Rec’d:** 125  
**Samples Analyzed:** 125  
**Project Loc.:** KCHA Bellevue Manor Apts

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Description</th>
<th>Result</th>
<th>Type</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>124</td>
<td>White powdery material with paint</td>
<td>None detected</td>
<td>Binder/filler, Paint</td>
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<tr>
<td>125</td>
<td>White powdery material with paint</td>
<td>None detected</td>
<td>Binder/filler, Paint</td>
<td>4</td>
</tr>
</tbody>
</table>

Analyst: Sheke Ma / Carolyn Yao / Tapan Gao  
Reviewed by: Steve (Zhang) Zhang, President
APPENDIX B

Lead in Paint Sampling Information
Paint Chip Sample Inventory
Paint Chip Laboratory Data Sheets
Paint Chip Chain of Custody Documentation
### AA LEAD PAINT CHIP SAMPLE INVENTORY

<table>
<thead>
<tr>
<th>PBS Sample #</th>
<th>Paint Color / Component or Substrate</th>
<th>Sample Location</th>
<th>Weight (g)</th>
<th>Results (%)</th>
<th>Lab</th>
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</thead>
<tbody>
<tr>
<td>40573.183 -PB01</td>
<td>Brown / Wood / Trim</td>
<td>South Elevation</td>
<td>0.2625</td>
<td>&lt;0.0080</td>
<td>EMSL</td>
</tr>
<tr>
<td>40573.183 -PB02</td>
<td>Tan / Wood / Siding</td>
<td>North Elevation</td>
<td>0.2652</td>
<td>&lt;0.0080</td>
<td>EMSL</td>
</tr>
<tr>
<td>40573.183 -PB03</td>
<td>Brown / Wood / Trim</td>
<td>North Elevation</td>
<td>0.2447</td>
<td>&lt;0.0082</td>
<td>EMSL</td>
</tr>
<tr>
<td>40573.183 -PB04</td>
<td>White/ GWB / Wall</td>
<td>Garage Wall</td>
<td>0.2646</td>
<td>&lt;0.0080</td>
<td>EMSL</td>
</tr>
<tr>
<td>40573.183 -PB05</td>
<td>Yellow / GWB / Wall</td>
<td>South Entry Foyer</td>
<td>0.0604</td>
<td>&lt;0.033</td>
<td>EMSL</td>
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<tr>
<td>40573.183 -PB06</td>
<td>Yellow / GWB / Wall</td>
<td>Community/Rec. Room</td>
<td>0.168</td>
<td>&lt;0.012</td>
<td>EMSL</td>
</tr>
<tr>
<td>40573.183 -PB07</td>
<td>White / GWB / Wall</td>
<td>Unit 102 Closet</td>
<td>0.1613</td>
<td>&lt;0.012</td>
<td>EMSL</td>
</tr>
<tr>
<td>40573.183 -PB08</td>
<td>White / GWB / Wall</td>
<td>Unit 104 Foyer</td>
<td>0.2539</td>
<td>&lt;0.0080</td>
<td>EMSL</td>
</tr>
<tr>
<td>40573.183 -PB09</td>
<td>Brown / Wood / Cabinets</td>
<td>Unit 104 Kitchen</td>
<td>0.0284</td>
<td>0.56</td>
<td>EMSL</td>
</tr>
<tr>
<td>40573.183 -PB10</td>
<td>White / Wood / Window Frame</td>
<td>Unit 108 Living Room</td>
<td>0.2657</td>
<td>&lt;0.0080</td>
<td>EMSL</td>
</tr>
<tr>
<td>40573.183 -PB11</td>
<td>White / GWB / Wall</td>
<td>Unit 110 Living Room</td>
<td>0.1914</td>
<td>&lt;0.010</td>
<td>EMSL</td>
</tr>
<tr>
<td>40573.183 -PB12</td>
<td>White / Wood / Window Frame</td>
<td>Unit 201 Bedroom</td>
<td>0.2326</td>
<td>&lt;0.0086</td>
<td>EMSL</td>
</tr>
<tr>
<td>40573.183 -PB13</td>
<td>White / GWB/ Wall</td>
<td>Unit 212 Living Room</td>
<td>0.212</td>
<td>&lt;0.0094</td>
<td>EMSL</td>
</tr>
<tr>
<td>40573.183 -PB14</td>
<td>Yellow / GWB / Wall</td>
<td>Unit 218 Bathroom</td>
<td>0.0897</td>
<td>&lt;0.022</td>
<td>EMSL</td>
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<tr>
<td>40573.183 -PB15</td>
<td>White / GWB / Wall</td>
<td>Unit 301 Foyer</td>
<td>0.0915</td>
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<td>EMSL</td>
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<tr>
<td>40573.183 -PB16</td>
<td>White / Wood / Window Sill</td>
<td>Unit 310 Bedroom</td>
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<td>&lt;0.0082</td>
<td>EMSL</td>
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</tbody>
</table>

**mg/kg = Milligrams per kilogram**

<= Less than the Limit of Detection
### SAMPLE DATA FORM

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Material</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>Pb1</td>
<td>Brown/Wood/Trim</td>
<td>South Elevation</td>
</tr>
<tr>
<td>Pb2</td>
<td>Tan/Wood/Siding</td>
<td>North Elevation</td>
</tr>
<tr>
<td>Pb3</td>
<td>Brown/Wood/Trim</td>
<td>North Elevation</td>
</tr>
<tr>
<td>Pb4</td>
<td>White/GWB Wall</td>
<td>Garage Wall</td>
</tr>
<tr>
<td>Pb5</td>
<td>Yellow/GWB Wall</td>
<td>South Entry foyer</td>
</tr>
<tr>
<td>Pb6</td>
<td>Yellow/GWB Wall</td>
<td>Community/Rec. Room</td>
</tr>
<tr>
<td>Pb7</td>
<td>White/GWB Wall</td>
<td>Unit 102 Closet</td>
</tr>
<tr>
<td>Pb8</td>
<td>White/GWB Wall</td>
<td>Unit 104 foyer</td>
</tr>
<tr>
<td>Pb9</td>
<td>Brown/Steel/Cabinets</td>
<td>Unit 104 kitchen</td>
</tr>
<tr>
<td>Pb10</td>
<td>White/Wood/Window Frame</td>
<td>Unit 108 living room</td>
</tr>
<tr>
<td>Pb11</td>
<td>White/GWB Wall</td>
<td>Unit 110 Living Room</td>
</tr>
<tr>
<td>Pb12</td>
<td>White/Wood/Window Frame</td>
<td>Unit 201 bed room</td>
</tr>
<tr>
<td>Pb13</td>
<td>White/GWB Wall</td>
<td>Unit 212 Living Room</td>
</tr>
<tr>
<td>Pb14</td>
<td>Yellow/GWB Wall</td>
<td>Unit 218 Bathroom</td>
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<td>Pb15</td>
<td>White/GWB Wall</td>
<td>Unit 301 Foyer</td>
</tr>
<tr>
<td>Pb16</td>
<td>White/Wood/Window Sill</td>
<td>Unit 310 bedroom</td>
</tr>
</tbody>
</table>

**Received By:** ZA 07/19 8:45am E-Px 7950 9274 9100
Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

<table>
<thead>
<tr>
<th>Client Sample Description</th>
<th>Lab ID</th>
<th>Collected</th>
<th>Analyzed</th>
<th>Weight</th>
<th>Lead Concentration</th>
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<td>PB1</td>
<td>091912748-0001</td>
<td>06/06/2019</td>
<td>06/07/2019</td>
<td>0.2625</td>
<td>&lt;0.0080 % wt</td>
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<tr>
<td>Site: BROWN WOOD TRIM SOUTH ELEVATION</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>PB2</td>
<td>091912748-0002</td>
<td>06/06/2019</td>
<td>06/07/2019</td>
<td>0.2652</td>
<td>&lt;0.0080 % wt</td>
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<td>06/06/2019</td>
<td>06/07/2019</td>
<td>0.2447</td>
<td>&lt;0.0082 % wt</td>
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<td>06/07/2019</td>
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<td>&lt;0.0080 % wt</td>
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<td>Site: WHITE GWB GARAGE WALL</td>
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<td>PB5</td>
<td>091912748-0005</td>
<td>06/06/2019</td>
<td>06/07/2019</td>
<td>0.0604</td>
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<td>091912748-0006</td>
<td>05/06/2019</td>
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<td>0.168</td>
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<td>06/07/2019</td>
<td>0.1613</td>
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<td>06/07/2019</td>
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<td>0.0284</td>
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<td></td>
</tr>
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<td>06/06/2019</td>
<td>06/07/2019</td>
<td>0.2557</td>
<td>&lt;0.0080 % wt</td>
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<td>Site: WHITE WOOD WINDOW FRAME UNIT 108 LIVING ROOM</td>
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<td></td>
</tr>
<tr>
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<td>091912748-0011</td>
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<td>06/07/2019</td>
<td>0.1914</td>
<td>&lt;0.010 % wt</td>
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<td>091912748-0013</td>
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<td>06/07/2019</td>
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</tr>
<tr>
<td>Site: WHITE GWB WALL UNIT 212 LIVING ROOM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PB14</td>
<td>091912748-0014</td>
<td>06/06/2019</td>
<td>06/07/2019</td>
<td>0.0897</td>
<td>&lt;0.022 % wt</td>
</tr>
<tr>
<td>Site: YELLOW GWB WALL UNIT 218 BATHROOM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PB15</td>
<td>091912748-0015</td>
<td>06/06/2019</td>
<td>06/07/2019</td>
<td>0.0915</td>
<td>&lt;0.022 % wt</td>
</tr>
<tr>
<td>Site: WHITE GWB WALL UNIT 301 FOYER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Analysis following Lead in Paint by EMSL. SOP Determination of Environmental Lead by FLAA. Reporting limit is 0.019 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request. Samples analyzed by EMSL Analytical, Inc San Leandro, CA A2LA Accredited Environmental Testing Lab #28443.09

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Initial report from 06/07/2019 13:30:52

Test Report ChmSnglePm/nQC-7.32.3  Printed: 06/07/2019 1:30:52 PM
Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

<table>
<thead>
<tr>
<th>Client Sample Description</th>
<th>Lab ID</th>
<th>Collected</th>
<th>Analyzed</th>
<th>Weight</th>
<th>Lead Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB16</td>
<td>091912748-0016</td>
<td>06/06/2019</td>
<td>06/07/2019</td>
<td>0.2431 g</td>
<td>&lt;0.0082 % wt</td>
</tr>
</tbody>
</table>

Site: WHITE WOOD WINDOW SILL UNIT 310 BATHROOM

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.019 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

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

Initial report from 06/07/2019 13:30:52
APPENDIX C
Certifications
Certificate of Completion

This is to certify that

Janet J. Murphy

has satisfactorily completed

4 hours of refresher training as an

AHERA Building Inspector

to comply with the training requirements of

TSCA Title II, 40 CFR 763 (AHERA)

May 1, 2019

Date(s) of Training

Exam Score: N/A

(f if applicable)

EPA Provider # 1085

Argus Pacific, Inc.


Certificate Number 172986

Instructor
VSE Project Number: U2801-033-181

December 27, 2018

A-R Solar
ATTENTION: Michael O’Brien
3211 Martin Luther king Jr Way S, Suite B
Seattle, WA 98144

REFERENCE: Bellevue Manor Building: 143 Bellevue Way Southeast, Bellevue, WA 98004
Solar Array Installation

To Whom It May Concern:

Per your request, we have reviewed the existing structure at the above referenced site. The purpose of our review was to determine the adequacy of the existing structure to support the proposed installation of solar panels on the roof as shown on the panel layout plan. Based upon our review, we conclude that the existing structure is adequate to support the proposed solar panel installation.

**Design Parameters**

- Risk Category: II
- Design wind speed: 110 mph (3-sec gust) per ASCE 7-10
- Wind exposure category: C
- Ground snow load: 25 psf
- Seismic design category: D

**Existing Roof Structure**

- Roof structure: 2x6 manufactured trusses @ 24" O.C.
- Roofing material: asphalt shingles
- Roof pitch: 5:12

**Conclusions**

Based upon our review, we conclude that the existing structure is adequate to support the proposed solar panel installation. In the area of the solar array, other live loads will not be present or will be greatly reduced (WSBC, Section 1607.12.5). The glass surface of the solar panels allows for a lower slope factor per ASCE 7, resulting in reduced design snow load on the panels. The gravity loads in the area of the solar array are decreased; thus, the stresses of the structural elements are decreased. Therefore, the requirements of Section 807.4 of the 2015 IEBC are met and the structure is permitted to remain unaltered.
The solar array will be flush-mounted (no more than 6” above the roof surface) and parallel to the roof surface. Thus, we conclude that any additional wind loading on the structure related to the addition of the proposed solar array is negligible. Regarding seismic loads, we conclude that any additional forces will be small. With an assumed roof dead load of 10 psf, solar array dead load of 3 psf, and affected roof area of 63% (maximum), the additional dead load (and consequential seismic load) will be 8.7%. Because the increase in lateral forces is less than 10%, this addition meets the requirements of the exception in Section 807.5 of the 2015 IEBC. Thus the existing lateral force resisting system is permitted to remain unaltered.

**Limitations**

Installation of the solar panels must be performed in accordance with manufacturer recommendations. All work performed must be in accordance with accepted industry-wide methods and applicable safety standards. The contractor shall notify Vector Structural Engineering, LLC should any damage, deterioration or discrepancies between the as-built condition of the structure and the condition described in this letter be found. Connections to existing roof framing must be staggered, except at array ends, so as not to overload any existing structural member. The use of solar panel support span tables provided by others is allowed only where the building type, site conditions, site-specific design parameters, and solar panel configuration match the description of the span tables. The design of the solar panel racking (mounts, rails, etc.), the connection of the racking to the roof and electrical engineering is the responsibility of others. Waterproofing around the roof penetrations is the responsibility of others. Vector Structural Engineering assumes no responsibility for improper installation of the solar array.

VECTOR STRUCTURAL ENGINEERING, LLC
WA Firm License: 2202

Wells Holmes, S.E.
WA License: 51006 - Expires: 10/06/2020
Project Engineer

Enclosures

WLH/wic
Components and Cladding Wind Calculations

Label: Solar Panel Array  
Note: Calculations per ASCE 7-10

SITE-SPECIFIC WIND PARAMETERS:

- Basic Wind Speed [mph]: 110
- Exposure Category: C
- Risk Category: II

ADDITIONAL INPUT & CALCULATIONS:

- Height of Roof, \( h \) [ft]: 35 (Approximate)
- Comp/Cladding Location: Gable/Hip Roofs \( 7^\circ < \theta \leq 27^\circ \)
- Enclosure Classification: Enclosed Buildings
- Zone 1 \( GC_p \): 0.9
- Zone 2 \( GC_p \): 1.7
- Zone 3 \( GC_p \): 2.6
- \( \alpha \): 9.5 (enter largest abs. value)
- \( z_g \) [ft]: 900 (enter largest abs. value)
- \( K_h \): 1.01
- \( K_{zt} \): 1
- \( K_d \): 0.85
- Velocity Pressure, \( q_h \) [psf]: 26.7
- \( GC_{pi} \): 0

OUTPUT:

\[
p = q_b \left[ (GC_p) - (GC_{pi}) \right]
\]

- Zone 1 Pressure, \( p \) [psf]: 24.0 psf (1.0 W, Interior Zones*)
- Zone 2 Pressure, \( p \) [psf]: 45.4 psf (1.0 W, End Zones*)
- Zone 3 Pressure, \( p \) [psf]: 69.5 psf (1.0 W, Corner Zones* within \( a \))
  \( a = 3 \) ft

Solar Panel Array
Gable/Hip Roofs \( 7^\circ < \theta \leq 27^\circ \)
Enclosed Buildings

EXHIBIT B
JOB NO.: U2801-033-181  
SUBJECT: SEISMIC LOADS

PROJECT: Bellevue Manor Building

COMPARE WIND & SEISMIC LOADS FOR CONNECTION (1 Sq. Ft. Section)

Wind Load, $W$:

Wind pressure, $p$: 14.4 psf (Zone 1: 0.6 W from wind pressure calculation)  
Height, $h$: 1.0 ft  
Width, $w$: 1.0 ft  
$F_{perp}$: 14.4 lb (Uplift)

Seismic Load, $E$:

Risk category: II  
Seismic Design Category: D  
$F_v$: 1.5  
$S_z$: 1.343  
$S_d$: 0.468

$0.7 \times F_{p,\text{min}}$: 0.564 lb  
$0.7 \times F_{p,\text{max}}$: 3.008 lb  
$0.7 \times F_{p,\text{vert}}$: 0.376 lb  
$0.7 \times F_{p,\text{long}}$: 1.504 lb  
$0.7 \times F_{p,\text{perp}}$: 0.9256 lb (Uplift)

CHECK INCREASE IN OVERALL SEISMIC LOADS

<table>
<thead>
<tr>
<th>SEISMIC:</th>
<th>Estimated Roof Dead Load</th>
<th>10 psf</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max. % of Roof w/ Panels</td>
<td>63 %</td>
</tr>
<tr>
<td></td>
<td>Dead Load from Panels</td>
<td>3 psf</td>
</tr>
<tr>
<td></td>
<td>Total Dead Load</td>
<td>12.1 psf (DL+% of roof w/ Panels*Panel DL)</td>
</tr>
<tr>
<td></td>
<td>Increase in Dead Load</td>
<td>8.7%</td>
</tr>
</tbody>
</table>

The installation of the solar panels represents an increase in the total weight (and resulting seismic load) of 8.7%. Because the increase is less than 10%, this addition meets the requirements of the exception in Section 807.5 of the 2015 IEBC. Thus the existing structure is permitted to remain unaltered.
PROJECT: Bellevue Manor Building

<table>
<thead>
<tr>
<th>Lag Screw Connection</th>
<th>Demand:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capacity:</strong></td>
<td><strong>Demand:</strong></td>
</tr>
<tr>
<td>Lag Screw Size [in]:</td>
<td>Pressure (0.6 Wind) (psf)</td>
</tr>
<tr>
<td>Lag Screw Size [in]:</td>
<td>5/16</td>
</tr>
<tr>
<td><strong>C</strong>:</td>
<td>1.6</td>
</tr>
<tr>
<td>Embedment [in]:</td>
<td>2.5</td>
</tr>
<tr>
<td>Grade:</td>
<td>205</td>
</tr>
<tr>
<td>Capacity [lbs/in]:</td>
<td>205</td>
</tr>
<tr>
<td>Number of Screws:</td>
<td>1</td>
</tr>
<tr>
<td>Prying Coefficient:</td>
<td>1.4</td>
</tr>
<tr>
<td>Total Capacity [lbs]:</td>
<td>586</td>
</tr>
</tbody>
</table>

Demand < Capacity: **CONNECTION OKAY**

1. Embedment is measured from the top of the framing member to the beginning of the tapered tip of the lag screw. Embedment in sheathing or other material is not effective. The length of the tapered tip is not part of the embedment length.

2. 'Max. Trib Area' is the product of the 'Max. Tributary Width' (along the rails) and 1/2 the panel width/height (perpendicular to the rails).
PROJECT: Bellevue Manor Building

CALCULATE ESTIMATED GRAVITY LOADS

<table>
<thead>
<tr>
<th>ROOF DEAD LOAD (D)</th>
<th>Increase due to pitch</th>
<th>Original loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof Pitch/12</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Asphalt Shingles</td>
<td>2.2</td>
<td>1.08</td>
</tr>
<tr>
<td>1/2&quot; Plywood</td>
<td>1.1</td>
<td>1.08</td>
</tr>
<tr>
<td>Framing</td>
<td>3.0</td>
<td>psf</td>
</tr>
<tr>
<td>Insulation</td>
<td>0.5</td>
<td>psf</td>
</tr>
<tr>
<td>1/2&quot; Gypsum Clg.</td>
<td>2.0</td>
<td>psf</td>
</tr>
<tr>
<td>M, E &amp; Misc</td>
<td>1.5</td>
<td>psf</td>
</tr>
<tr>
<td>DL</td>
<td>10</td>
<td>psf</td>
</tr>
<tr>
<td>PV Array DL</td>
<td>3</td>
<td>psf</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ROOF LIVE LOAD (Lr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Design Roof Live Load [psf]</td>
</tr>
<tr>
<td>Roof Live Load With PV Array [psf]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SNOW LOAD (S):</th>
<th>Existing</th>
<th>Array</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof Slope [x:12]:</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Roof Slope [°]:</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Snow Ground Load, p_g [psf]:</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Terrain Category:</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Exposure of Roof:</td>
<td>Fully Exposed</td>
<td>Fully Exposed</td>
</tr>
<tr>
<td>Exposure Factor, C_e:</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Thermal Factor, C_t:</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Risk Category:</td>
<td>II</td>
<td>II</td>
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<tr>
<td>Importance Factor, I_i:</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Flat Roof Snow Load, p_f [psf]:</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Minimum Roof Snow Load, p_m [psf]:</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Unobstructed Slippery Surface?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Slope Factor Figure:</td>
<td>Figure 7-2b</td>
<td>Figure 7-2b</td>
</tr>
<tr>
<td>Roof Slope Factor, C_s:</td>
<td>1.00</td>
<td>0.79</td>
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<tr>
<td>Sloped Roof Snow Load, p_s [psf]:</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Design Snow Load, S [psf]:</td>
<td>17</td>
<td>14</td>
</tr>
</tbody>
</table>
PROJECT:  Bellevue Manor Building

Summary of Loads

<table>
<thead>
<tr>
<th></th>
<th>Existing</th>
<th>With PV Array</th>
</tr>
</thead>
<tbody>
<tr>
<td>D [psf]</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Lr [psf]</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>S [psf]</td>
<td>17</td>
<td>14</td>
</tr>
</tbody>
</table>

Maximum Gravity Loads:

<table>
<thead>
<tr>
<th></th>
<th>Existing</th>
<th>With PV Array</th>
<th>ASCE 7-10, Section 2.4.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>D + Lr [psf]</td>
<td>30</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>D + S [psf]</td>
<td>28</td>
<td>27</td>
<td></td>
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</tbody>
</table>

Maximum Gravity Load [psf]:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>27</td>
</tr>
</tbody>
</table>

Ratio Proposed Loading to Current Loading: 89% OK

The gravity loads in the area of the solar array are decreased; thus, the stresses of the structural elements are decreased. Therefore, the requirements of Section 807.4 of the 2015 IEBC are met and the structure is permitted to remain unaltered.
PROJECT: Bellevue Manor Building

EXHIBIT B