Snohomish Regional Fire & Rescue

Station 31

Monroe, Washington

PROJECT MANUAL – Bid Set

Prepared By

Rice Fergus Miller Inc. Architects

275 5th Street, Suite 100

Bremerton, WA. 98337

March 22, 2024

RICEfergusMILLER

ARCHITECTURE INTERIORS PLANNING VIZLAB

TABLE OF CONTENTS

DIVISION 10 – SPECIALTIES

DIVISION 11 - EQUIPMENT

NOT USED

DIVISION 12 - FURNISHINGS

NOT USED

DIVISION 14 - CONVEYING EQUIPMENT

NOT USED

DIVISION 21 - FIRE SUPPRESSION

DIVISION 22 - PLUMBING

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING

END OF TABLE OF CONTENTS

SECTION 00 1113

ADVERTISEMENT FOR BIDS

A . This section is for use for a public bid, lump sum, single prime contract. This Section is designed for use with AIA A701-1997 Instructions to Bidders, AIA A101-2017 Standard Form of Agreement between Owner and Contractor where the basis of payment is a Stipulated Sum, A201-2017 General Conditions of the Contract for Construction, and Supplemental Conditions Section 007300 ONLY.

B . This Advertisement for Bids SHALL BE reviewed and approved by the Owner and the Owner's Legal Council. DO NOT use this document without careful review and approval by the Owner.

C . Carefully coordinate this section with project specific Instruction to Bidders Section 002113 and Bid Form 004113.

D . Use the RFM Division 00/01 Checklist and AIA G612™–2001, Owner's Instructions to the Architect for assistance with preparing this section. AIA G612 Part A relates to contracts, Part B relates to insurance and bonds, and Part C deals with bidding procedures.

E . Coordinate this Section with Division 01 Sections for items like Substitution Procedures.

F . PUBLIC NOTICE

G . ADVERTISEMENT FOR BIDS

1. Snohomish Regional Fire and Rescue
2. Station 31 – Shop Addition
3. Snohomish, WA
4. Project No: 2022073.00

H . Sealed bids will be received by Snohomish Regional Fire and Rescue up to but not later than 2:00 pm, April 22, 2024 at the address listed below, for Station 31. Bids will be opened and recorded at 2:15pm at Snohomish Regional Fire and Rescue Station 31, 163 Village Court Monroe, WA 98272.

1. Include the above if the bid opening is public, or modify for project specific bid opening requirements.
2. Provide very brief project description. Round off building area and round off estimated costs.

I . The contract includes general trades, mechanical, plumbing, electrical and related site work for a maintenance bay addition, approximately 3,000sf, to the north of existing facility**.** A new pre-engineered carport structure, approximately 2,000sf (alternate bid / deferred submittal), is planned at where existing storage containers are located at northwest corner of the project site. Other alternate bid scope includes replacement of entire existing roof with new.

J . This project is subject to Washington State prevailing wages rates. All work performed on the project will be subject to the approved wage determination rates in the bid documents.

K . Insert Owner EEO statement, non-discrimination requirements as required.

L . Equal Opportunity/Affirmative Action: Owner is an equal opportunity and affirmative action employer. Minority-owned and women-owned businesses are encouraged to submit bids.

M . The following is typical for hard copy bid set distribution with a refundable bid set deposit. Coordinate bid document distribution requirements with Instructions to Bidders Section 002113. Bid documents may be hard copy and/or electronic. If electronic, provide web site and instructions for access/web site registration, costs, if any. Verify project specific costs and requirements for plan deposits and shipping and include below.

N . Contractors may obtain bid documents from ARC Tacoma - 632 Broadway Tacoma, WA 98402, Tacoma.bidservices@e-arc.com, 1-800-337-8103 or 253-383-6363, upon depositing a refundable sum of $250.00 made payable to Snohomish Regional Fire and Rescue. General Contractors: maximum of 2 sets; subcontractors and material suppliers: maximum of 1 set. To download or view complete PDF bid documents for the project free of charge, go to www.e-arc.com/location/tacoma and click the link to “Enter Public Planroom.” Search by “PUT THE PROJECT NAME IN HERE.” Select all folders of the bid documents by placing a check mark in each shopping cart and click on the button for Instant Download.

1. Bid documents may be viewed at the following plan centers: Builders Exchange of Washington; Dodge

O . Data and Analytics; Southwest Washington Contractors Association, Olympia

1. Insert any special requirements for the pre-bid such as directions, parking instructions, safety clothing or equipment for visitors, security badging/access requirements, restrictions on photography.

P . A mandatory pre-bid conference will be held at the Station 31, 163 Village Court Monroe, WA 98272 at 11:00 AM, March 28, 2024. The conference is intended to provide bidders a general review of the project. The meeting is followed by the walk-through of the project site.

1. A Bid Security must accompany each bid in accordance with the Instructions to Bidders.
2. Envelopes containing the sealed bids shall be marked “Bid for Snohomish Regional Fire and Rescue Station 31 – Shop Addition” and sent or delivered to:

Q . Provide Address for various delivery methods if they are different:

1. Physical / Mailing Address
    a. Attention: Ron Rasmussen, Snohomish Regional Fire and Rescue Station 31, 163 Village Court, Monroe, WA 98272

R . The owner reserves the right to reject any or all bids, waive minor irregularities in the bidding process, and to accept the bid deemed best for them.

S . All questions must be submitted in writing to Rice Fergus Miller, Inc., 275 5th Street, Bremerton, WA 98337, Charles Krimmert, ckrimmert@rfmarch.com, Phone: (360) 362-1437; Hiroshi Inoue, hinoue@rfmarch.com, Phone: (360) 362-1424.

T . The following is typical – coordinate with Instructions to Bidders and Division 01

1. Substitution Requests: Architect will consider requests for substitution received no later than ten working days prior to receipt of Bids. Requests received after that time may be considered or rejected at the discretion of the Architect. The project requires use of specified Substitution Request Form. See specification section 01 2500 for more information.

2. Bid Advertisement Dates: March 23, 2024
3. Publications: Everett Herald & DJC
4. If no bid is received pursuant to this first call, the Commissioners may re-advertise or enter into a contract without a further call for bids.
5. This notice will be posted on Snohomish Regional Fire and Rescue web site. (https://srfr.org/)
6. The successful bidder shall enter into a contract in accordance with the bid and shall furnish a Performance Bond, separate Labor & Material Payment Bond in the amount of 100% of the bid amount, and insurance. All bid proposals shall be deemed to be offers to enter into a contract and shall be irrevocable for a period of thirty (30) days from the date of the opening of the bids.

END OF SECTION

SECTION 00 2113

INSTRUCTION TO BIDDERS

1. TO BE ENTITLED TO CONSIDERATION, PROPOSALS SHALL BE MADE IN ACCORDANCE WITH THE FOLLOWING INSTRUCTIONS:

2. EXAMINATION OF SITE CONDITIONS

Before submitting a proposal, the bidder shall:

A. Carefully examine all Contract Documents (drawings, and summary of work/bid items).

B. Visit the site of the Work.

C. Fully inform bidder of all existing conditions, limitations, and existing site and surrounding improvements including all items to be removed and protected in the course of executing the Contract.

D. Rely upon bidder's own judgment in preparing the Proposal.

E. Include in the Bid a sum sufficient to cover all items required by the Contract.

F. It is mutually agreed that submission of a proposal shall be considered prima facie evidence that the bidder has made such examination and is satisfied as to the conditions to be encountered, and as to the requirements of the Drawings, Summary of Work/bid Items and other Contract Documents.

G. Failure of the bidder to take the above-noted precaution will not release the successful bidder from entering into contracts, nor excuse bidder from performing the Work in strict accordance with the terms of the Contract. No extra payment will be allowed for additional work due to failure to obtain this information. No statement made by any officer, agent or employee of the Owner in relation to the physical conditions pertaining to the site of the Work will be binding on the Owner.

3. INTERPRETATION OF CONTRACT DOCUMENTS

Any person contemplating submitting a Bid for the proposed contract, who is in doubt as to the true meaning of any part of the Plans, Summary of Work/bid Items, or other proposed Contract Documents, shall submit to the Architect a request for an interpretation. The person submitting the request shall be responsible for its prompt delivery. Any interpretation of the proposed Contract Documents will be made only by a duly issued Addendum.

4. LAWS AND REGULATIONS

The bidder is assumed to be familiar with all Federal, State and County laws and regulations, which in any manner affect those engaged or employed in the work, or the materials and equipment used in the proposed work or which in any way affect the conduct of the work, and no pleas of misunderstanding will be considered on account of ignorance thereof.

Should the Bidder discover any provision in the Drawings, Summary of Work/bid Items or other Contract Document, which is contrary to or inconsistent with any law or regulation, the bidder shall report any such inconsistency forthwith to the Architect. Any required amendment to the Drawings, Summary of Work/bid Items or other Contract Document resulting from such discovery will be revised by a duly issued Addendum.

5. BIDS

Bids shall be submitted in lump sum form, using the Form of Proposal included in these contract documents. Bids shall be in a sealed envelope and shall be delivered to the address specified in the Advertisement for Bids no later than the deadline for submittal listed in the Advertisement for Bids. No bid may be withdrawn after the deadline or before the award of contract unless said award is delayed for a period of 60 days.

6. BID DEPOSIT

As a guarantee of good faith and as required by law, each bid shall be accompanied by a Bid Deposit in the form of a certified check, cashier's check, or surety bond, payable to the order of Snohomish Regional Fire and Rescue, for an amount not less than 5 percent of the total amount of the bid. Deposits of the three low bidders will be retained until a contract has been executed between the successful bidder and the Fire District and until a Performance and Payment Bond in an amount of 100 percent of the contract price has been filed as required in these contract documents. Each bidder shall submit its Bid Deposit and Performance and Payment Bond on forms furnished in the Bid Document package. All blank spaces in the Bid Deposit and Performance and Payment Bond Forms shall be properly filled in, "typed" or "written" in ink and stated in "words" and "numerical figures."

7. RETAINAGE

Pursuant to RCW 60.28, the District (Snohomish Regional Fire and Rescue) will retain five percent (5%) of the moneys earned by the contractor on any estimates during the progress of the improvement or work, as a trust fund for the protection and payment of claims of persons arising under the contract and the state for taxes duly imposed pursuant to law. The retainage and all other provisions of RCW 60.28 shall be followed by the District in administering this contract.

8. EVIDENCE OF QUALIFICATION

A bidder whose Proposal is under consideration shall, upon request, promptly furnish satisfactory evidence of bidder's financial resources, bidder's experience, and the organization and equipment bidder has available for the performance of the Contract. The competency and responsibility of the Bidder will be considered in making the "Award of Contract". The party submitting a Proposal shall be registered with the state of Washington as a general contractor (in accordance with CHAPTER 18.27 RCW) and shall furnish state registration number and local permits as required by the Contract Documents.

9. EXECUTION OF PROPOSAL FORMS

The PROPOSAL FORM invites bids on definite Plans and Summary of Work/bid Items. Only the amounts and information asked for on the PROPSAL FORM furnished will be considered as the BID. Each Bidder shall bid upon the Work exactly as described by the Contract Documents, and as provided for in the PROPOSAL FORM. The Bidder shall bid upon all Alternate Bid and/or Unit Price items requested on the PROPOSAL FORM as provided herein.

A. Form of Proposal:

The Bidder shall submit the PROPOSAL on the forms furnished in the Bid Document package. **All blank spaces in the PROPOSAL FORM shall be properly filled in.** All FORM OF PROPOSAL bid amounts shall be stated in "words" and in "numerical figures".

All Bid Amounts shall be "typed" or "written" in ink.

No oral proposals will be considered or accepted.

B. Prohibition of Alterations:

Except as otherwise provided herein. Proposals which are incomplete, which are conditioned in any way, which contain erasures, alterations, items not called for in the Proposal, or which are not in conformity to the law, may be rejected as non-responsive.

C. Proposal Sums:

Any sum of money written in by the bidder on the PROPOSAL FORM shall cover all Work and costs identified by the Bid Item Description as defined by the Bidding and Proposed Contract Documents, together with any Addenda thereto. All Bid Proposal Sums furnished by the bidder shall include all "Direct and "Indirect" costs of labor, material, equipment, overhead, profit, and any form of compensation sufficient to complete all of the Work under each particular description.

When bidding an Alternate Bid Item for which there is no charge or no change from the Base Bid Amount, the Bidder shall write in the words 'NO CHARGE" in the space provided.

No Washington State Sales Tax shall be included in the Proposal Sums.

D. Taxes:

Any sum of money written in by the Bidder on the Proposal Form, and any agreed variations thereof, shall include all taxes imposed by law, **excepting** only Washington State Sales Tax. Washington State Sales Tax will be collected from the Owner and shall be paid to the State of Washington by the contractor in conformance with the law. The contractor shall furnish the Owner with proof of payment of all taxes required by law.

E. Signatures:

If the Proposal is made by a partnership, it shall be so stated and it shall contain the names of each partner and shall be signed in the firm name, followed by the signatures of the partners. If the Proposal is made by a corporation, it shall be signed by the name of the corporation, followed by the written signature of the officer signing, and the printed or typewritten designation of the office he or she holds in the corporation. The address of the Bidder shall by typed or printed on the Proposal Form in the space provided.

F. Registration Numbers:

Bidder's Washington State Contractor's License Registration number shall be stated in the space provided.

10. SUBMISSION OF PROPOSAL

No oral proposals will be considered. Proposal Forms should be mailed or delivered in person to the Owner at the following address:

A. **Mailing Address:**
163 Village Court
Monroe, WA. 98272

B. **Proposal Title: Snohomish Regional Fire and Rescue Station 31 - Shop Addition**
13717 Division Street
Snohomish, WA 98290

C. **Time, Date, and Location of Proposal Opening:**

Bids will be accepted until 2:00 pm on April 22, 2024. Bids will be read aloud at 2:15 pm on April 22, 2024. in the meeting room located at 163 Village Court, Monroe WA. 98272.

11. MODIFICATION AND WITHDRAWAL OF PROPOSAL

At any time prior to closing time for receipt of proposals, any Bidder may modify or withdraw Bidder's Proposal. All such modifications or withdrawals must by made in writing on the Bidder's company letterhead and over the signature of the Bidder.

12. SUBSTITUTIONS

Bids shall be based upon the materials and equipment names in the contract Documents.

13. OPENING OF BIDS

Proposals will be reviewed at a joint meeting of the Owner and Architect.

14. ACCEPTANCE OR REJECTION OF PROPOSAL

The Owner reserves the right to reject any and/or all Proposals. The Owner also reserves the right to waive any informality in conjunction with said Proposal or Bids. The Owner will act to accept proposal from the lowest responsive, responsible Bidder. If the proposal includes a supplemental schedule of predetermined unit prices for labor and material, or other Items for the purpose of establishing a cost basis on unforeseen contract changes, the Owner reserves the right to reject, without impairing the balance of the proposal, any or all predetermined unit prices on such supplemental schedules which the Owner may consider excessive or unreasonable. The acceptance of the Bid will be evidenced by a written "Notice to Award Contract" to the Bidder whose bid is under consideration for acceptance, together with a request to furnish bond, evidence of insurance to execute the agreement set forth in the Contract Documents.

15. CONFLICTS OF INTEREST

Bidders must certify that no officer, agent, or employee of Snohomish Regional Fire and Rescue who has participated in the contract negotiations on the part of Snohomish Regional Fire and Rescue has a pecuniary interest in the bid proposal and that the proposal is made in good faith without fraud, collusion, or participation of any kind by any other bidder under the same call for bids and that the bidder is submitting the bid in its own behalf and not as an undisclosed agent of any person or firm.

The Contract Price will be determined by selection among the various proposed Bid Items as approved by the Owner.

Bid documents received by Owner in response to this Invitation for Bids become public records that are subject to Chapter 42.56 RCW, the Public Records Act. The Bidder should clearly identify in its submittal any specific information that it claims to be confidential or proprietary. After a decision to award the contract has been made, the submittals will be available for inspection and

copying by the public. If Owner receives a Public Records Act request to view the information marked confidential or propriety in a Bidder's submittal following an award, Owner's sole obligation shall be to notify the Bidder (1) of the request and (2) of the date upon which such information will be released to the requester unless the Bidder obtains a court order to enjoin that disclosure pursuant to RCW 42.56.540. If the Bidder fails to timely obtain a court order enjoining disclosure, Owner will release the requested records on the date specified.

END OF SECTION

SECTION 00 3100

INFORMATION AVAILABLE TO BIDDERS

PART 1 GENERAL

1.1 SNOHOMISH COUNTY PREVAILING WAGE RATES:

A. The following documents are not bound into this Project Manual as an attachment to this Section, for reference only:

1. PREVAILING WAGE RATES:
   Contractor to verify current Prevailing Wage Rates and Benefit Code Key as required per RCW 39.12 and as furnished by the State of Washington Department of Labor and Industries (Employment Standards Section) Department of Labor & Industries website is Prevailing Wage Rates. Contractor to verify apprenticeship requirements as required by Contract Documents. Department of Labor and Industries website is: Apprentice Wage Rates for Public Works Contracts. Section 2 of WAC 296-127-011 states that for all contracts, except Building Service Maintenance Contracts, the prevailing Wage Rates which are in effect on the date when the bids by the Prime Contractor are required to be submitted to the Contract Awarding Public Agency are the prevailing wage rates which must be paid for the duration of the contract.

1.2 REPORT & DOCUMENTS

A. The following documents are included as attachments to this section.

1. GEOTECHNICAL ENGINEERING SERVICES
   a. Geotechnical report, prepared by Geo Engineers Inc., dated June 16, 2023 (62 Pages)

PART 2 PRODUCTS

A. Not Used.

PART 3 EXECUTION

A. Not Used.

END OF SECTION

Geotechnical Engineering Services

Snohomish Regional Fire and Rescue
No. 31 Shop Addition
Monroe, Washington

for
Snohomish Regional Fire and Rescue

June 16, 2023

GeoEngineers
Earth Science + Technology

Geotechnical Engineering Services

Snohomish Regional Fire and Rescue
No. 31 Shop Addition
Monroe, Washington

for
Snohomish Regional Fire and Rescue

June 16, 2023

GeoEngineers

1101 South Fawcett Avenue, Suite 200
Tacoma, Washington 98402
253.383.4940

Geotechnical Engineering Services

Snohomish Regional Fire and Rescue
No. 31 Shop Addition
Monroe, Washington

File No. 26703-001-00

June 16, 2023

Prepared for:

Snohomish Regional Fire and Rescue
163 Village Court
Monroe, Washington 98272

Attention: Ron Rasmussen

Prepared by:

GeoEngineers, Inc.
1101 South Fawcett Avenue, Suite 200
Tacoma, Washington 98402
253.383.4940

6/16/23

Dennis (D.J.) Thompson, PE
Associate Geotechnical Engineer

DJT:leh

Table of Contents

LIST OF FIGURES

APPENDICES

1.0 INTRODUCTION AND PROJECT UNDERSTANDING

This report presents the results of our geotechnical engineering services to support the design and construction of the Snohomish Regional Fire and Rescue (SRFR) 31 shop addition. The site is located at 163 Village Court in Monroe, Washington. Our understanding of this project is based on our review of a preliminary site plan, and discussions with Rice Fergus Miller (project architect) and Reid Middleton (project structural engineer).

Proposed improvements include adding approximately 3,100 square feet of new building footprint on the north side of the existing facility. The existing structure is conventional slab on grade and shallow spread footing construction. The new addition will encompass the north side and be connected to the existing structure. Building addition support is envisioned to comprise slab-on-grade construction with shallow spread and strip footings. Additional improvements include construction of subgrade and concrete aprons into the new building area, landscaping, and minor stormwater improvements.

Our scope of services was presented in our first agreement (March 27, 2023) which was signed on April 11, 2023. During project review and discovery, it was determined that subsurface explorations should be added to further address the potential for liquefaction. As such, we provided a new scope of services dated April 10, 2023. We have interpreted the intent of the signed agreement (April 11, 2023) was to have the April 10, 2023, scope completed. Our abbreviated scope of services for this project is as follows:

1. Review readily available subsurface information.
2. Coordinate and manage subcontractor exploration services comprised of cone penetration test (CPT) soundings.
3. Provide this geotechnical study report which includes:
    a. A general discussion on surface and subsurface conditions.
    b. Seismic design criteria consistent with the current version of the International Building Code (IBC), including site class.
    c. Recommendations for shallow foundation support and preparation of foundation bearing surface soil.
    d. General discussion on earthwork criteria for anticipated construction, including subgrade preparation, overexcavation, slope construction, fill and compaction requirements.
    e. The addition of lateral pressures and retaining/below grade wall design recommendations, where necessary and appropriate for use.
    f. Suggestions for pavement section design and the preparation of pavement subgrades.
    g. Supporting information obtained from our study.

2.0 SITE CONDITIONS

2.1. Surface Conditions

The project site is located in the central city area of Monroe Washington, north of the Skykomish River/Centennial Park. Surrounding developments generally comprise commercial and city government

facilities, landscaping, arterial throughways (Village Way) and parking lots. Some single family and multi-family residential units are located farther south and east of the fire station. Topography is relatively flat, generally around average elevation of 55 to 60 feet based on internet mapping programs (datum unknown).

2.2. Literature Review

Review of web-based mapping, MapView by the National Geologic Map Databases national archives (https://ngmdb.usgs.gov/mapview) indicates that the site is underlain by recessional outwash delta deposits (Qgod) described as sand and pebble to cobble/gravel, minimal silty sand and rare boulders; well sorted; predominately unweathered; deposited where meltwater streams encountered standing water. The presence of alluvium (Qa) is also indicated nearby (Dragovich et. al. 2011) and described as loose, stratified to massively bedded, fluvial silt, sand, and gravel; locally includes sandy and silty estuarine deposits.

We reviewed data from our in-house files, including:

- "Geotechnical Engineering Services, 179th Avenue Sidewalk Improvements, Monroe, Washington" dated October 14, 2022 (October 2022 Report). Explorations reviewed consisted of test pits and pilot infiltration testing in alluvial soils.
- "Geotechnical Engineering Services, US 2 Non-Motorized Shared Path, Monroe, Washington" dated March 21, 2022 (March 2022 Report). Explorations reviewed consisted of four CPTs advanced to 17 to 20 feet below ground surface (bgs).

We also reviewed the following document:

- Associated Earth Sciences, Inc. "Subsurface Exploration, Geologic Hazards, and Preliminary Geotechnical Engineering Report", Park Place Middle School, Monroe, Washington prepared for: Monroe Public Schools, dated July 31, 2015. Explorations included 14 borings with three converted to monitoring wells; nominal depths of the explorations were reported to 21.5 feet bgs.

2.3. Subsurface Explorations

ConeTec Inc. (ConeTec), under subcontract to GeoEngineers, advanced two CPT soundings (CPT-01 and CPT-02) to about 8 feet bgs on April 19, 2023 at the north end of the fire station at the approximate locations are shown on the Site plan, Figure 1. The locations were approximated by our field staff and also by ConeTec using handheld global positioning system (GPS) mobile equipment and should be considered approximate.

The CPT sounding involves pushing an instrumented steel probe into the ground and continuously recording soil friction, tip resistance and dynamic pore pressure using electronic methods. No soil samples are obtained during CPT soundings. Soil types and equivalent SPT "N" values are interpreted based on empirical relationships between measured CPT parameters described above. The CPT method generally provides more detailed information on soil layering than conventional drilling and sampling methods. The CPT data results are included in Appendix A as is a report prepared by ConeTec. Electronic data files of the CPT data can also be made available.

2.4. Subsurface Conditions

Practical refusal was encountered at approximately 8 feet with the CPT equipment. Based on our studies, we interpret the project site to be underlain by medium dense or better sand and gravel recessional deposits, similar to that described in the geology literature. Some granular fills may be present at the surface, as the site has undergone some grading and past alterations during construction of the present facilities.

Our interpretation of conditions within the upper 8 feet (after pre-drilling through asphalt and crushed rock) indicates very dense granular soil to a depth of about 2 to 3 feet, underlain by 2 to 3 feet thick, of medium stiff or medium dense sandy silt or silty sand, grading into a dense and very dense, sand and gravel to depths explored. Based on review of other nearby studies, we anticipate that groundwater is more than 20 feet below surrounding site grade.

Although not noted, the interface between more permeable and less permeable zones within fill and/or between weathered and unweathered materials are likely locations for accumulation of perched groundwater. Conditions at this site may present perched groundwater, depending on the time of excavation. The presence of perched groundwater can depend on rainfall amounts, irrigation activities, and other factors. We anticipate that perched groundwater levels will generally be highest during the wet season, typically October through May.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1. Seismic Design

We understand that seismic design will be performed in accordance with the 2021 IBC. Structures designed in accordance with the 2021 IBC shall be designed and constructed to resist the effects of earthquake motions in accordance with American Society of Civil Engineers (ASCE) 7-16. The ASCE 7-16 design level earthquake is based on a return period of 2,475 years (2 percent exceedance in 50 years).

Table 1 below provides recommended seismic design parameters for Site Class D, which is the recommended site class for this project. Because the mapped S_1 value for this site is greater than or equal to 0.2g, use of the seismic design parameters provided in Table 1 is contingent on the exceptions provided in ASCE 7-16, Supplement 3 being met. The exceptions applicable to a Site Class D site listed in ASCE 7-16 Supplement 3 are provided below for reference. If it is desirable to avoid these exceptions, a ground motion hazard analysis would need to be completed to determine the design seismic parameters for the site. The seismic design parameters presented in Table 1 below assume the exceptions above will be taken and the indicated parameters have been increased accordingly.

From ASCE 7-16 Supplement 3
Exception: A ground motion hazard analysis not required:

1. Where the values of the parameter S_{M1} determined by Eq. (11.4-2) is increased by 50% for all applications of S_{M1} in the standard. And:
2. The resulting value of the parameter S_{D1} determined by Eq. (11.4-4) shall be used for all applications of S_{D1} in the standard.

TABLE 1. 2021 IBC SEISMIC DESIGN PARAMETERS

2021 IBC Parameters[1]	Value
Site Class	D
Mapped MCE_R Spectral Response Acceleration at Short Period, S_s (g)	1.165
Mapped MCE_R Spectral Response Acceleration at 1-second period, S_1 (g)	0.41
Site Modified Peak Ground Acceleration, PGA_M	0.549
Short Period Site Coefficient, F_a	1.034
Long Period Site Coefficient, F_v	1.89
Site Modified Earthquake Spectral Response Acceleration at Short Periods, S_{MS} (g)	1.205
Site Modified Considered Earthquake Spectral Response Acceleration at 1-Second Periods, S_{M1} (g)	1.16[2]
Design Spectral Acceleration at 0.2-second period, S_{DS} (g)	0.803
Design Spectral Acceleration at 1.0-second period, S_{D1} (g)	0.77[2]

Notes:

[1] Parameters developed based on latitude 47.8643897 and longitude -122.9893310 using the Applied Technology Council (ATC) Hazards online tool (https://hazards.atcouncil.org/)

[2] Per ASCE 7-16, Supplement 3, parameter has been increased 50 percent or has increased by 50 percent as a result of the adjusted S_{M1} value.

3.1.1. Liquefaction Potential and Settlement

Liquefaction refers to the condition by which vibration or shaking of the ground, usually from earthquake forces, causes a soil to rapidly lose its strength and as a result, cause settlement at the surface, and potential damage to structures. In general, soils that are susceptible to liquefaction include very loose to medium dense, "clean" to silty sands that are below the water table. Based on our review of nearby CPT data and geologic reporting of soil types and groundwater conditions, it is our opinion that the potential for liquefaction at the site is relatively low and our review and exploration efforts do not suggest the presence of liquefiable soils.

3.1.2. Lateral Spreading Potential

Lateral spreading related to seismic activity typically involves lateral displacement of large, surficial blocks of non-liquefied soil when a layer of underlying soil loses strength during seismic shaking. Lateral spreading usually develops in areas where sloping ground or large grade changes (including retaining walls) are present. Based on our understanding of the proposed improvements, current site topography, and our assessment of liquefaction risk at the site, it is our opinion that the risk of lateral spreading is low.

3.1.3. Surface Rupture Potential

According to the Washington Department of Natural Resources (DNR) website's Geologic Information Portal (accessed November 2, 2022), traces related to the South Whidbey Island Fault Zone and the Monroe Fault are mapped about 1.8 miles southwest and southeast of the project site, respectively. The fault does not appear to have any surface manifestations at the site and bedrock in the area is ultimately covered by a thick section of glacially consolidated sediments. Based on the lack of surface evidence of the fault, the uncertainty in the location of the fault, in conjunction with reported subsurface conditions, it is our opinion that the risk of fault rupture occurring at the site is low.

3.2. Shallow Foundation and Slab-on-Grade Support

3.2.1. General

The proposed structures at the site can be satisfactorily supported on mat foundations and spread footings. Mat foundations and spread footings should be established at least 18 inches below the lowest adjacent grade, primarily for frost protection, but also to expose presumed denser soil. Isolated spread footings should have a minimum width of 24 inches. Continuous spread footings for walls should be at least 18 inches wide. The sections below provide our recommendations for foundation bearing surface preparation and foundation design parameters. We have assumed that foundation elements will bear no greater than about 8 feet below surrounding grade. As such, it is our opinion footing drains are not necessary to maintain bearing support as provided in this report. Footing drains are recommended for consideration by the project team for general maintenance and to maintain dryer conditions around the building structure, especially where landscaping and other surrounding exposed conditions may exist.

3.2.2. Foundation Bearing Surface Preparation

Mat foundations and spread footings can bear on existing site fill or natural soil conditions provided the bearing surfaces can be adequately compacted to a uniformly firm and unyielding condition. Foundation excavations should be performed using a smooth-edged bucket to limit bearing disturbance. Any roots, organics, and debris should be completely removed from below proposed foundation areas. If relatively looser fill soil is present at or below foundation grades, we recommend it be either overexcavated and replaced with compacted structural fill, or scarified, dried, and recompacted. The bearing surface should be compacted as necessary to a firm, dense, uniform, unyielding condition.

If structural fill is placed below foundations as either replacement of overexcavated soils or to establish a bearing pad, we recommend the structural fill extend laterally beyond the foundation perimeter a distance equal to the depth of fill (measured from the base of the footing), or 2 feet, whichever is less.

Foundation bearing surfaces should not be exposed to standing water. If water is present in the excavation, it must be removed before placing formwork and reinforcing steel. Where protection is needed, a 6-inch-thick layer of crushed rock or a 3- to 4-inch-thick layer of lean-mix concrete could be considered at the base of excavations. This will also limit disturbance to bearing surfaces from construction traffic.

Prepared foundation bearing surfaces should be evaluated by a member of our firm prior to placement of formwork or reinforcing steel to verify that the bearing surface has been prepared in accordance with our recommendations or to provide recommendations for remediating unsuitable bearing soils.

3.2.3. Allowable Soil Bearing Pressure for Spread Footings

Spread footings bearing on subgrades and bearing surfaces prepared as recommended may be designed using an allowable soil bearing pressure of 3,000 pounds per square foot (psf). This bearing pressure applies to the total of dead and long-term live loads and may be increased by one-third when considering total loads, including earthquake or wind loads. This is a net bearing pressure. The weight of the foundation and overlying backfill can be ignored in calculating foundation sizes.

3.2.4. Modulus of Subgrade Reaction (Mat Foundations and Slabs-on-Grade)

A modulus of subgrade reaction of 250 pounds per cubic inch (pci) may be used for structural design of mat foundations and slabs-on-grade, provided that the bearing surface has been prepared as recommended and consists of thoroughly compacted existing site soil or structural fill extending to such soil.

3.2.5. Static Foundation Settlement (Mats Foundations and Spread Footings)

To limit foundation settlement, disturbed soil must be removed from the base of foundation excavations and the bearing surface should be prepared as recommended. Provided these measures are taken, we estimate the total static settlement of mat foundations and spread footings will be on the order of 1 inch or less for the bearing pressures and/or modulus values presented above. Differential settlements could be on the order of ¼ to ½ inch between similarly loaded foundations or over a distance of about 20 feet across a foundation dimension. The settlements should occur rapidly, essentially as loads are applied. Settlements could be greater than estimated if disturbed or saturated soil conditions are present below foundations.

3.2.6. Slab-on-Grade Settlement and Capillary Break and Underslab Drainage

We recommend the slab-on-grade floors be underlain by a minimum 4- to 6- inch-thick capillary break layer consisting of clean sand and gravel, crushed rock, or washed rock. The capillary break material should contain less than 3 percent fines material based on the minus ¾-inch sieve size fraction. WSDOT Specification 9-03.9 (Aggregates for Ballast and Crushed Surfacing, i.e., crushed surfacing base course [CSBC]) can also be considered for use as a capillary break material. We estimate that settlement for slabs-on-grade constructed as recommended will be less than ¾ inch for a floor load of up to 500 psf.

Based on our understanding of soil and groundwater conditions at the site and proposed construction, it is our opinion that an underslab drain system is not necessary. If dry slabs are required (e.g., where adhesives are used to anchor carpet or tile to slab), a waterproof liner may be placed as a vapor barrier below the slab.

3.2.7. Lateral Resistance

The ability of the soil to resist lateral loads is a function of the base friction, which develops on the base of foundations, mats and slabs, and the passive resistance, which develops on the face of below-grade elements of the structure as these elements move into the soil. For cast-in-place foundations supported in accordance with the recommendations presented above, the allowable frictional resistance on the base of the foundation may be computed using a coefficient of friction of 0.40 applied to the vertical dead-load forces. If precast foundations are included as part of project plans, we can provide specific recommendations for base friction resistance for precast foundations. The allowable passive resistance on the face of the foundation or other embedded foundation elements may be computed using an equivalent fluid density of 275 pounds per cubic foot (pcf). The top foot of this resistance should be ignored where void of long-term pavements or slabs.

These values include a factor of safety of about 1.5. The passive earth pressure and friction components may be combined provided that the passive component does not exceed two-thirds of the total. The top foot of soil should be neglected when calculating passive lateral earth pressure unless the area adjacent to the foundation is covered with pavement or a slab-on-grade.

3.3. Retaining Walls and Below-Grade Structures

3.3.1. Design Considerations

We understand that retaining structures are not anticipated for design. If necessary, level backfilled (maximum of 3V:1V [horizontal to vertical] backslope or shallower) and drained conditions, and active soil

pressure may be estimated using an equivalent fluid density of 36 pcf and at-rest soil pressure may be estimated using an equivalent fluid density of 55 pcf for the similar grading and drained condition. For seismic considerations, a uniform lateral pressure of 12*H psf (where H is the height of the retaining structure or the depth of a structure below ground surface) should be added to the lateral earth pressure. Foundation bearing preparation and design considerations previously presented for building foundations may be followed for retaining wall foundation design.

A typical traffic surcharge of 250 psf should be included if vehicles are allowed to operate within ½ the height of the retaining walls. This surcharge may be represented by an additional 2 feet of soil. Other surcharge loads should be considered on a case-by-case basis. We recommend use of hand- operated compaction equipment and maximum 6-inch loose lift thickness when compacting fill within about 5 feet behind retaining walls and below-grade structures.

3.3.2. Drainage

For the above design, a drainage system behind the structure must be constructed to collect water and prevent the buildup of hydrostatic pressures behind the wall. We recommend the drainage system include a zone of free-draining backfill a minimum of 18 inches in width against the back of the wall. The drainage material should consist of coarse sand and gravel containing less than 5 percent fines by weight based on the fraction of material passing the ¾-inch sieve. A perforated, rigid, smooth-walled drainpipe with a minimum diameter of 4 inches should be placed along the base of the structure within the free-draining backfill and extend for the entire wall length. The drainpipe should be metal or rigid polyvinyl chloride (PVC) pipe and be sloped to drain by gravity. Discharge should be routed to appropriate discharge areas and to reduce erosion potential. Cleanouts should be provided to allow routine maintenance.

3.4. Site Development and Earthwork

3.4.1. General

We anticipate that site development and earthwork will include grading, removal of pavement and hardscape, excavating for shallow foundations, utilities, and other improvements, establishing subgrades for foundations and roadways and placing and compacting fill and backfill materials. We expect that site grading and earthwork can be accomplished with conventional earthmoving equipment. The following sections provide specific recommendations for site development and earthwork.

3.4.2. Clearing and Stripping

During stripping operations, excessive disturbance of surficial soils can occur, especially if occurring in, and/or left exposed to wet conditions. Disturbed soils may require additional remediation during final site grading and construction. We anticipate that clearing and stripping depths at the site will typically be on the order of about 3 to 6 inches to remove sod and the associated root network at the surface. Asphalt and other pavement removal may be thicker. It is likely that greater stripping depths will be required in areas of heavier vegetation, lower lying areas or in areas containing trees.

Cobbles and boulders may be present in the glacial deposits reported in the project vicinity. As such, the contractor should be prepared to remove cobbles and boulders, if encountered during grading or excavation. Boulders may be removed from the site or used in landscape areas. Voids caused by boulder removal should be backfilled with compacted structural fill.

3.4.3. Erosion and Sedimentation Control

Erosion and sedimentation rates and quantities can be influenced by construction methods, slope length and gradient, amount of soil exposed and/or disturbed, soil type, construction sequencing and weather. Implementing an Erosion and Sedimentation Control Plan will reduce impacts to the project where erosion-prone areas are present. The plan should be designed in accordance with applicable county and/or state standards. The plan should incorporate basic planning principles, including:

- Scheduling grading and construction to reduce soil exposure;
- Re-vegetating or mulching denuded areas;
- Directing runoff away from exposed soils;
- Reducing the length and steepness of slopes with exposed soils;
- Decreasing runoff velocities;
- Preparing drainage ways and outlets to handle concentrated or increased runoff;
- Confining sediment to the project site; and
- Inspecting and maintaining control measures frequently.

Temporary erosion protection should be used and maintained in areas with exposed or disturbed soils to help reduce erosion and reduce transport of sediment to adjacent areas and receiving waters. Permanent erosion protection should be provided by paving, structure construction or landscape planting.

Until the permanent erosion protection is established, and the site is stabilized, site monitoring may be required by qualified personnel to evaluate the effectiveness of the erosion control measures and to repair and/or modify them as appropriate. Provisions for modifications to the erosion control system based on monitoring observations should be included in the erosion and sedimentation control plan. Where sloped areas are present, some sloughing and raveling of exposed or disturbed soil on slopes should be expected. We recommend that disturbed soil be restored promptly so that surface runoff does not become channeled.

3.4.4. Temporary Excavations and Cut Slopes

Based on observations made during excavation of our test pits and our experience with other projects in similar soil conditions, we anticipate that shallow excavations could experience minor to moderate caving. Excavations deeper than 4 feet should be shored or laid back at a stable slope if workers are required to enter. Shoring and temporary slope inclinations must conform to the provisions of Title 296 Washington Administrative Code (WAC), Part N, "Excavation, Trenching and Shoring." Regardless of the soil type encountered in the excavation shoring, trench boxes or sloped sidewalls will be required under Washington Industrial Safety and Health Act (WISHA). We recommend contract documents specify that the contractor is responsible for selecting excavation and dewatering methods, monitoring the excavations for safety and providing shoring, as required, to protect personnel and structures.

In general, we recommend that for planning purposes all temporary cut slopes be inclined no steeper than about 1½H:1V. This guideline assumes all surface loads are kept at a minimum distance of at least one-half the depth of the cut away from the top of the slope and that seepage is not present on the slope face. Flatter cut slopes will be necessary where seepage occurs or if surface surcharge loads are anticipated.

Temporary covering with heavy plastic sheeting should be used to protect these slopes during periods of wet weather.

3.4.5. Permanent Cut and Fill Slopes

We recommend permanent slopes be constructed at a maximum inclination of 2H:1V to manage erosion. Where 2H:1V permanent slopes are not feasible, protective facings and/or retaining structures should be considered.

To achieve uniform compaction, we recommend fill slopes be overbuilt and subsequently cut back to expose well-compacted fill. Fill placement on existing slopes steeper than 5H:1V should be benched into the slope face. The configuration of benches depends on the equipment being used and the inclination of the existing slope. Bench excavations should be level and extend into the slope face at least half the width of the compaction equipment used. Exposed areas should be re-vegetated as soon as practical to reduce surface erosion and sloughing. Temporary protection should be used until permanent protection is established.

3.4.6. Groundwater Handling Considerations

Based on our understanding of the proposed site improvements we do not anticipate that the regional groundwater table will be encountered during excavations at the site. For design purposes, and as described above, we recommend that static groundwater be considered at a depth of 20 feet below grade.

Areas of perched groundwater could be encountered at the site depending on the time of year and other factors previously described. Groundwater handling needs will typically be lower during the summer and early fall months. We anticipate that shallow perched groundwater can be handled adequately with sumps, pumps, and/or diversion ditches, as necessary. Ultimately, we recommend that the contractor performing the work be made responsible for controlling and collecting groundwater encountered.

3.4.7. Surface Drainage

Surface water from roof downspouts, driveways and landscape areas should be collected and controlled. Curbs or other appropriate measures such as sloping pavements, sidewalks and landscape areas should be used to direct surface flow away from buildings, erosion sensitive areas and from behind retaining structures. Roof and catchment drains should not be connected to wall or foundation drains.

3.4.8. Subgrade Preparation

Subgrades that will support pavements and gravel-surfaced areas should be thoroughly compacted to a uniformly firm and unyielding condition on completion of stripping and before placing structural fill. We recommend that subgrades for pavements and gravel-surfaced areas be evaluated to identify areas of yielding or soft soil. Probing with a steel probe rod or proof-rolling with a heavy piece of wheeled construction equipment are appropriate methods of evaluation.

If soft or otherwise unsuitable subgrade areas are revealed during evaluation that cannot be compacted to a stable and uniformly firm condition, we recommend that: (1) the unsuitable soils be scarified (e.g., with a ripper or farmer's disc), aerated and recompacted, if practical; or (2) the unsuitable soils be removed and replaced with compacted structural fill, as needed.

3.4.9. Subgrade Protection and Wet Weather Considerations

The wet weather season generally begins in October and continues through May in western Washington; however, periods of wet weather can occur during any month of the year. Near surface silty sands observed and reported and contain a significant quantity of fines and will be susceptible to disturbance during periods of wet weather. It should be expected that this zone of soil at the near surface will become easily disturbed and difficult to manage when wet. If earthwork is scheduled during the wet weather months, we offer the following recommendations:

- Measures should be implemented to remove or eliminate the accumulation of surface water from work areas. The ground surface in and around the work area should be sloped so that surface water is directed away and graded so that areas of ponded water do not develop. Measures should be taken by the contractor to prevent surface water from collecting in excavations and trenches.
- Earthwork activities should not take place during periods of heavy precipitation.
- Slopes with exposed soils should be covered with plastic sheeting.
- The contractor should take necessary measures to prevent on-site soils and other soils to be used as fill from becoming wet or unstable. These measures may include the use of plastic sheeting, sumps with pumps and grading. The site soils should not be left uncompacted and exposed to moisture. Sealing exposed soils by rolling with a smooth-drum roller prior to periods of precipitation will help reduce the extent to which these soils become wet or unstable.
- Construction traffic should be restricted to specific areas of the site, preferably areas that are surfaced with working pad materials not susceptible to wet weather disturbance.
- Construction activities should be scheduled so that the length of time that soils are left exposed to moisture is reduced to the extent practical.
- Protective surfacing such as placing asphalt-treated base (ATB) or haul roads made of quarry spalls or a layer of free-draining material such as well-graded pit-run sand and gravel may be considered to limit disturbance to completed areas. Minimum quarry spall thicknesses should be on the order of 12 to 18 inches. Typically, minimum gravel thicknesses on the order of 24 inches are necessary to provide adequate subgrade protection.

3.5. Fill Materials

3.5.1. Structural Fill and Backfill

The workability of material for use as structural fill will depend on the gradation and moisture content of the soil. Material used for structural fill should be free of debris, organic contaminants, and rock fragments larger than 6 inches. For most applications, structural fill consisting of material similar to “Select Borrow” or “Gravel Borrow” as described in Section 9-03.14 of the Washington State Department of Transportation (WSDOT) Standard Specifications will be appropriate.

Weather and site conditions should be considered when determining the type of import fill materials purchased and brought to the site for use as structural fill. If earthwork activities are scheduled during the wet weather months (typically October through May) or during prolonged periods of wet weather, we recommend that washed crushed rock or select granular fill be used for structural fill.

Select granular fill should consist of well-graded sand and gravel or crushed rock with a maximum particle size of 6 inches and less than 5 percent fines by weight based on the minus ¾-inch fraction. Organic matter, debris or other deleterious material should not be present. In our opinion, material with gradation characteristics similar to WSDOT Specification 9-03.9 (Aggregates for Ballast and Crushed Surfacing), or 9-03.14 (Borrow) is suitable for use as select granular fill, provided that the fines content is less than 5 percent (based on the minus ¾-inch fraction) and the maximum particle size does not exceed 6 inches.

Other materials imported to the site, for example pipe bedding materials, specific drainage conditions, road base paving materials, etc. should also consider and comply with any manufacturer's recommendations and requirements that pertain to their product specifications.

3.5.2. On-Site Soil

The fill soil and natural soil, SM, SP-SM, GM, GP-GM, are moisture sensitive and will be difficult to work with when wet; we also envision these materials to be generated at or above the optimum moisture content (OMC). Based on our subsurface explorations and experience, and the proposed design, we generally recommend against the use of on-site material as a structural fill. We recommend that the project budget include provisions for all imported select granular materials where needed and used at the site.

3.6. Fill Placement and Compaction

To obtain proper compaction, fill and backfill soil should be compacted near the OMC and in uniform horizontal lifts. Lift thickness and compaction procedures will depend on the moisture content and gradation characteristics of the soil and the type of equipment used. The maximum allowable moisture content varies with the soil gradation and should be evaluated during construction. Generally, 8- to 12-inch loose lifts are appropriate for steel-drum vibratory roller compaction equipment. Compaction should be achieved by mechanical means. During fill and backfill placement, sufficient testing of in-place density should be conducted to check that adequate compaction is being achieved.

Fill placed to raise site grades and materials under pavements, gravel-surfaced areas and structural areas should be placed on subgrades prepared as previously recommended. Fill material placed below structures and footings should be compacted to at least 95 percent of the theoretical maximum dry density (MDD) per ASTM International (ASTM) D 1557. Fill material placed less than 2 feet below subgrades for driveways and gravel-surfaced areas should be compacted to at least 95 percent of the MDD. Compaction of fill placed deeper than 2 feet below subgrade in these areas can be reduced to 90 percent of the MDD, if necessary. Fill material placed in landscaping areas should be compacted to a firm condition that will support construction equipment, as necessary, typically around 85 to 90 percent of the MDD.

Backfill behind retaining walls or below-grade structures should be compacted to between 90 and 92 percent of the MDD. Overcompaction of fill placed directly behind retaining walls or below-grade structures should be avoided. We recommend use of hand-operated compaction equipment and maximum 6-inch loose lift thickness when compacting fill within about 5 feet behind retaining walls or below-grade structures.

For utility excavations, we recommend that the initial lift of fill over the pipe be thick enough to reduce the potential for damage during compaction, but generally should not be greater than about 18 inches above the pipe. In addition, rock fragments greater than about 1 inch in maximum dimension should be excluded from this lift.

3.7. Pavement Recommendations

3.7.1. General

We provide recommended pavement sections for the new driveways/aprons and parking areas below. We have assumed that the driveway/aprons that will be subjected to heavy vehicle loads from fire trucks and other emergency vehicles will comprise Portland Cement Concrete (PCC) and that parking area will be used primarily for automobile parking and that the preferred pavement type for the parking areas are asphalt concrete (AC). City requirements should also be reviewed and may need consideration in the project documents.

Our scope did not include specific pavement design for AC pavements and fire truck loads related to turning and similar heavy vehicle loading conditions. As such our recommendations below may not be adequate for these conditions, or similar equipment for heavy construction such as those imposed by concrete transit mixers, dump trucks or cranes as concrete trucks. We expect that these AC sections will require additional considerations, specific aggregate standards/requirements, and/or thicker sections. Typically, similar studies with similar container vehicles, we see more coarse aggregate and AC pavement thicknesses range from 9-to 14- inches depending on durability and longevity expectations.

The recommended sections assume that final improvements surrounding the conventional AC will be designed and constructed such that stormwater or excess irrigation water from landscape areas is properly controlled and collected and does not accumulate below the pavement section or pond on pavement surfaces.

Pavement subgrade should be prepared, placed, and observed as described previously. Crushed surfacing base course and subbase should be moisture conditioned to near optimum moisture content and compacted to at least 95 percent of the MDD (ASTM D 1577). Crushed surfacing base course should conform to applicable sections of 4-04 and 9-03.9(3) of the WSDOT Standard Specifications. Hot mix asphalt should conform to applicable sections of 5-04, 9-02 and 9-03 of the WSDOT Standard Specifications. Select granular fill requirements are as described previously.

Standard-Duty AC Section – Automobile Driveways and Parking Areas Subject to Automobile Traffic Only

- 2 inches of hot mix asphalt, class ½ inch, PG 58-22.
- 4 inches of crushed surfacing base course.
- 6 inches of subbase consisting of imported select granular fill as previously described.
- Existing site soils or structural fill prepared in accordance with the “Subgrade Preparation” section of our original geotechnical report.

Heavy-Duty AC Section – Automobile Driveways and Parking Areas Subject to Heavy Traffic or Emergency Vehicles

- 3 inches of hot mix asphalt, class ½ inch, PG 58-22.
- 6 inches of crushed surfacing base course.
- 6 inches of subbase consisting of imported select granular fill as previously described.
- Existing site soils or structural fill prepared in accordance with the “Subgrade Preparation” section of our original geotechnical report.

3.8. Portland Cement Concrete Pavements

We recommend that PCC pavements be used in driveway and parking areas where heavy emergency vehicles will regularly operate. We recommend that concrete pavements be jointed and that dowel bars be included at the joints to assist in load transfer. Dowels should not be included between exterior pavement slabs and interior pavement slabs to reduce the risk of cracking occurring due to differential settlements. Our recommended PCC section is provided below and is based on our experience and minimum pavement thickness recommendations described in the 2018 WSDOT Pavement Policy manual. PCC mix design should conform with Section 5-05.3(1) of the WSDOT Standard Specifications.

3.8.1. Portland Cement Concrete Section

- 9 inches of PCC –with a minimum 14-day flexural strength of 650 pounds per square inch (psi).
- 4 inches of crushed surfacing base course.
- 6 inches of subbase consisting of imported select granular fill as previously described.
- Existing site soils or structural fill prepared in accordance with the "Subgrade Preparation" section of our original geotechnical report, expected to achieve a California Bearing Ratio (CBR) of at least 10 percent.

Some areas of pavement may exhibit settlement and subsequent cracking over time. Cracks in the pavement will allow water to infiltrate to the underlying base course, which could increase the amount of pavement damage caused by traffic loads. To prolong the effective life of the pavement, cracks should be sealed as soon as possible.

4.0 LIMITATIONS

We have prepared this report for the Snohomish Regional Fire and Rescue 31 shop addition project. The site is located at 163 Village Court in Monroe, Washington. SRFR may distribute copies of this report to the owner's authorized agents and regulatory agencies as may be required for the Project.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices for geotechnical engineering in this area at the time this report was prepared. The conclusions, recommendations, and opinions presented in this report are based on our professional knowledge, judgment, and experience. No warranty, express or implied, applies to the services or this report.

Please refer to Appendix B titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

FIGURES

GeoEngineers

Legend

Site Boundary

CPT-01 Boring by ConeTec, 2023

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Aerial from Google Earth Pro dated 2020/08/14.

Projection: NAD83 Washington State Planes, North Zone, US Foot

N S W E

60 0 60
Feet

Site Plan

Snohomish Regional Fire and Rescue (SRFR) 31 shop addition, Monroe, Washington

GeoEngineers

Figure 1

P:\26\26703001\CAD\00\Geotech\26703001OO_F01_Site Plan.dwg F01 Date Exported:6/15/2023 2:26 PM - by Jackson N. Fellows

APPENDICES

GeoEngineers

APPENDIX A
Cone Penetration Testing Results

PRESENTATION OF SITE INVESTIGATION RESULTS

Snohomish Fire & Rescue CPT

Prepared for:

GeoEngineers, Inc.

ConeTec Job No: 23-59-25656

Project Start Date: 19-Apr-2023
Project End Date: 19-Apr-2023
Report Date: 02-May-2023

Prepared by:

ConeTec Inc.
1237 S Director St.
Seattle, WA 98108

Tel: (253) 397-4861

ConeTecWA@conetec.com
www.conetec.com
www.conetecdataservices.com

Introduction

The enclosed report presents the results of the site investigation program conducted by ConeTec Inc. for GeoEngineers, Inc. at 163 Village Ct, Monroe, WA 98272 . The program consisted of two (2) seismic cone penetration tests. Please note that this report, which also includes all accompanying data, are subject to the 3rd Party Disclaimer and Client Disclaimer that follow in the 'Limitations' section of this report.

Project Information

Project	
Client	GeoEngineers, Inc.
Project	Snohomish Fire & Rescue CPT
ConeTec project number	23-59-25656

An aerial overview from Google Earth including the CPTu test locations is presented below.

Rig Description	Deployment System	Test Type
C05-026_20-Ton Track Rig	Integrated Push Cylinders	CPTu

Coordinates		
Test Type	Collection Method	EPSG Number
CPTu	Consumer grade GPS	4326

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (bar)
730:T1500F15U35	730	15	225	1500	15	35
Cone 730 was used for all CPTu soundings						

Cone Penetration Test (CPTu)	
Depth reference	Depths are referenced to the existing ground surface at the time of each test.
Tip and sleeve data offset	0.1 meter This has been accounted for in the CPT data files.
Additional plots	• Advanced plots with Ic, Su(Nkt)/Su(Ndu), Phi and N(60)/N1(60) • Soil Behaviour Type (SBT) scatter plots • Seismic shear wave (Vs) plots • Seismic shear wave (Vs) Wave Trace plots

Calculated Geotechnical Parameter Tables	
Additional information	The Normalized Soil Behaviour Type Chart based on Q_{tn} (SBT Q_{tn}) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPTu parameters have been generated and are provided in Excel format files in the release folder. The CPTu parameter calculations are based on values of corrected tip resistance (q_t) sleeve friction (f_s) and pore pressure (u_2). Effective stresses are calculated based on unit weights that have been assigned to the individual soil behaviour type zones and the assumed equilibrium pore pressure profile.

Limitations

3rd Party Disclaimer

This report titled “Snohomish Fire & Rescue CPT”, referred to as the (“Report”), was prepared by ConeTec for GeoEngineers, Inc.. The Report is confidential and may not be distributed to or relied upon by any third parties without the express written consent of ConeTec. Any third parties gaining access to the Report do not acquire any rights as a result of such access. Any use which a third party makes of the Report, or any reliance on or decisions made based on it, are the responsibility of such third parties. ConeTec accepts no responsibility for loss, damage and/or expense, if any, suffered by any third parties as a result of decisions made, or actions taken or not taken, which are in any way based on, or related to, the Report or any portion(s) thereof.

Client Disclaimer

ConeTec was retained by GeoEngineers, Inc. to collect and provide the raw data (“Data”) which is included in this report titled “Snohomish Fire & Rescue CPT”, which is referred to as the (“Report”). ConeTec has collected and reported the Data in accordance with current industry standards. No other warranty, express or implied, with respect to the Data is made by ConeTec. In order to properly understand the Data included in the Report, reference must be made to the documents accompanying and other sources referenced in the Report in their entirety. Any analysis, interpretation, judgment, calculations and/or geotechnical parameters (collectively “Interpretations”) included in the Report, including those based on the Data, are outside the scope of ConeTec’s retainer and are included in the Report as a courtesy only. Other than the Data, the contents of the Report (including any Interpretations) should not be relied upon in any fashion without independent verification and ConeTec is in no way responsible for any loss, damage or expense resulting from the use of, and/or reliance on, such material by any party.

Cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and two geophone sensors for recording seismic signals. All signals are amplified and measured with minimum sixteen-bit resolution down hole within the cone body, and the signals are sent to the surface using a high bandwidth, error corrected digital interface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first appendix. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 millimeters diameter over a length of 32 millimeters with tapered leading and trailing edges) located at a distance of 585 millimeters above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is six millimeters thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

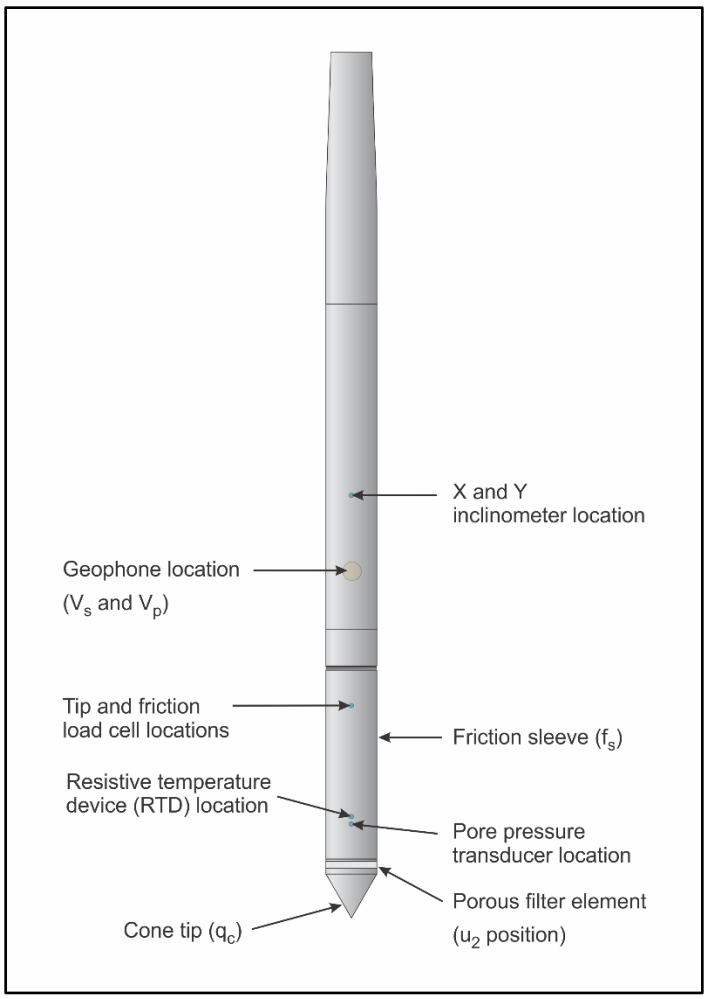


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal interface box and power supply. The signal interface combines depth increment signals, seismic trigger signals and the downhole digital data. This combined data is then sent to the Windows based computer for collection and presentation. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording interval is 2.5 centimeters; custom recording intervals are possible.

The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPTu operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of two centimeters per second, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches (38.1 millimeters) are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson et al. (1986) and Robertson (1990, 2009). It should be noted that it is not always possible to accurately identify a soil behavior type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al. (1986):

$$q_t = q_c + (1\text{-}a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (R_f) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of files with calculated geotechnical parameters were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the methods used is also included in the data release folder.

For additional information on CPTu interpretations and calculated geotechnical parameters, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

Shear wave velocity (Vs) testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave velocity (Vp) testing is also performed.

ConeTec's 15 cm^2 piezocone penetrometers are manufactured with one horizontally active geophone (28 hertz) and one vertically active geophone (28 hertz). Both geophones are rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip. The vertically mounted geophone is more sensitive to compression waves; however, it is often affected by the compression wave travelling through the cone rods.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances, an auger source or an imbedded impulsive source may be used for both shear waves and compression waves. The hammer and beam act as a contact trigger that initiates the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded in the memory of the cone using a fast analog to digital converter. The seismic trace is then transmitted digitally uphole to a Windows based computer through a signal interface box for recording and analysis. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

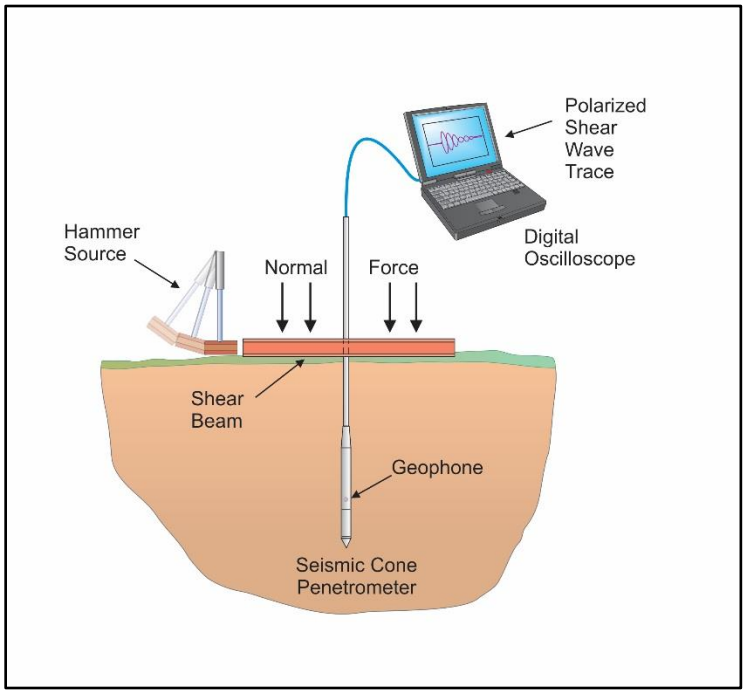


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures which are in general accordance with the current ASTM D5778 and ASTM D7400 standards.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Typically, five wave traces for each orientation are recorded for quality control and uncertainty analysis purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et al. (1986).

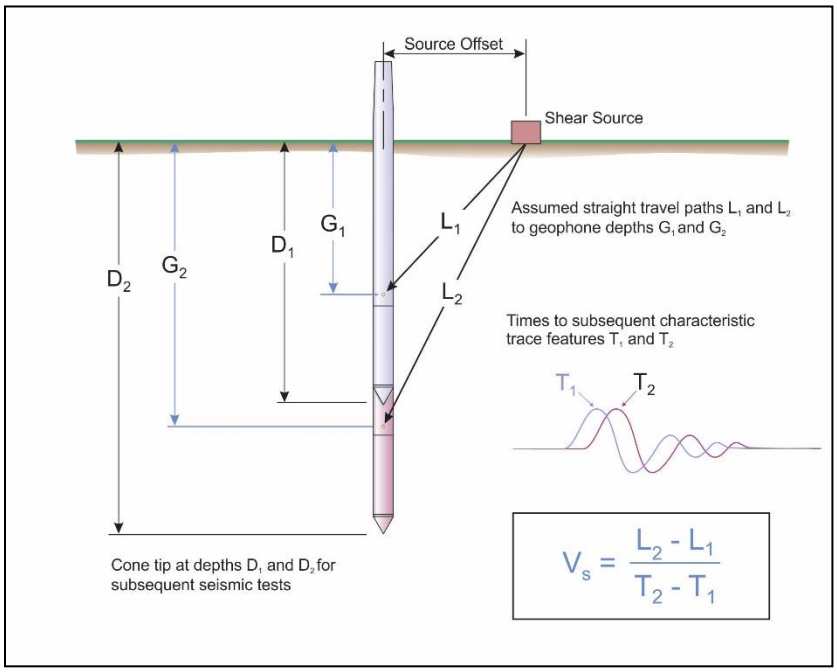


Figure SCPTu-2. Illustration of a seismic cone penetration test

For the determination of interval travel times the wave traces from all depths are displayed in analysis software. The results of the interval picks are supplied in the relevant appendix of this report. Standard practice for ConeTec is to record five wave traces for each source direction at each test depth. Outlier impacts are identified in the field and the impacts are repeated. For the final wave trace profile, the traces are stacked in the time domain to display a single average trace.

Determination of the shear wave interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the trace depths and taking the difference in ray path divided by the time difference between features at subsequent depths. The same process is used for compression waves, however the first break is most commonly used for selecting an arrival time. For velocity calculation, the ray path is defined as the straight-line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

In some cases, usually for shear wave velocity testing, more than one characteristic marker may be used. If there is an overlap between different sets of characteristic markers, then the average time value for those sets of interval times is applied to the determination of velocity.

Ideally, all depths are used for the determination of the velocity profile. However, an interval may be skipped if there is some ambiguity or quality concern with a particular depth, resulting in a larger interval.

Tabular velocity results and SCPTu plots are presented in the relevant appendix.

For all SCPTu soundings that have achieved a depth of at least 100 feet (30 meters), the average shear wave velocity to a depth of 100 feet ($\bar{v}_s$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE (2010).

$$\bar{v}_s = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
d_i = the thickness of any layer between 0 and 100 ft (30 m)
v_{si} = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = the total thickness of all layers between 0 and 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30}.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

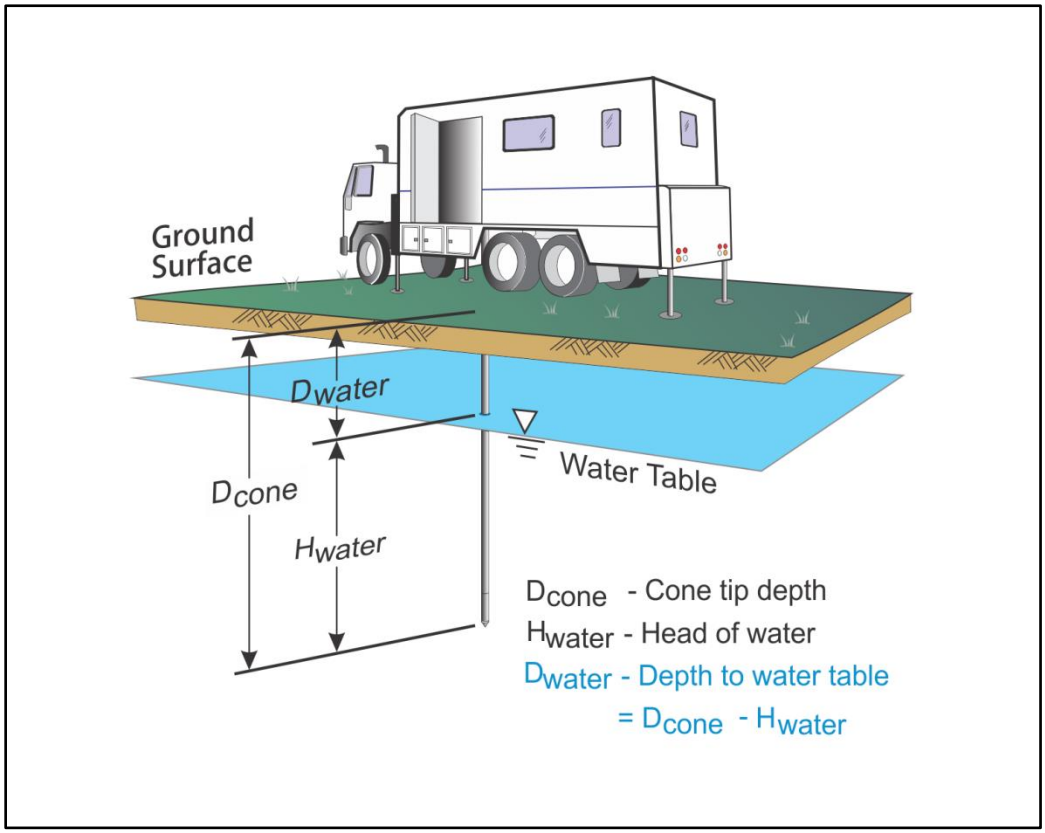


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

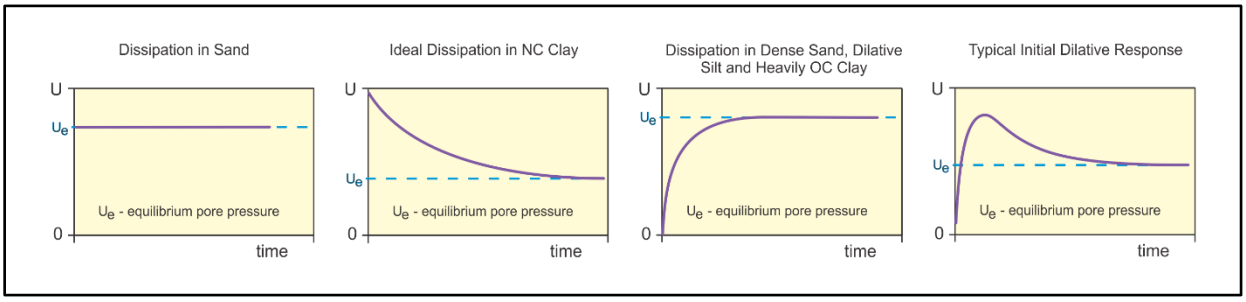


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve in Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100}. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100}. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:
T* is the dimensionless time factor (Table Time Factor)
a is the radius of the cone
I_r is the rigidity index
t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby (1991))

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u_2)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50}, dissipation tests must be taken to a pressure less than u_{50}. The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100}. To estimate u_{50}, both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby (1991)), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50}. In cases where the time to peak is excessive, t_{50} values are not calculated.

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

American Society of Civil Engineers (ASCE), 2010, “Minimum Design Loads for Buildings and Other Structures”, Standard ASCE/SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia. DOI: 10.1061/9780784412916.

ASTM D5778-20, 2020, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM International, West Conshohocken, PA. DOI: 10.1520/D5778-12.

ASTM D7400/D7400M-19, 2019, "Standard Test Methods for Downhole Seismic Testing", ASTM International, West Conshohocken, PA. DOI: 10.1520/D7400_D7400M-19.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, “Cone Penetration Testing in Geotechnical Practice”, Blackie Academic and Professional.

Mayne, P.W., 2013, “Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests”, Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420. DOI: 10.1061/9780784412770.027.

Mayne, P.W. and Peuchen, J., 2012, “Unit weight trends with cone resistance in soft to firm clays”, Geotechnical and Geophysical Site Characterization *4,* Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

Mayne, P.W., 2014, “Interpretation of geotechnical parameters from seismic piezocone tests”, CPT’14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, “Use of Piezometer Cone Data”, Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, “Seismic CPT to Measure In-Situ Shear Wave Velocity”, Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803. DOI: 10.1061/(ASCE)0733-9410(1986)112:8(791).

Robertson, P.K., 1990, “Soil Classification Using the Cone Penetration Test”, Canadian Geotechnical Journal, Volume 27: 151-158. DOI: 10.1139/T90-014.

Robertson, P.K., 2009, “Interpretation of cone penetration tests – a unified approach”, Canadian Geotechnical Journal, Volume 46: 1337-1355. DOI: 10.1139/T09-065.

Teh, C.I., and Houlsby, G.T., 1991, “An analytical study of the cone penetration test in clay”, Geotechnique, 41(1): 17-34. DOI: 10.1680/geot.1991.41.1.17.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Su(Ndu), Phi, N(60) and N1(60)
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Shear Wave (Vs) Tabular Results
- Seismic Cone Penetration Test Shear Wave (Vs) Traces
- Soil Behavior Type (SBT) Scatter Plots

Cone Penetration Test Summary and Standard Cone Penetration Test Plots

CONETEC

Job No:	23-59-25656
Client:	GeoEngineers, Inc.
Project:	Snohomish Fire & Rescue CPT
Start Date:	19-Apr-2023
End Date:	19-Apr-2023

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed [1] Phreatic Surface (ft)	Final Depth (ft)	Shear Wave Velocity Tests	Latitude[2] (deg)	Longitude[2] (deg)	Refer to Notation Number
CPT-01	23-59-25656_SP01	19-Apr-2023	730:T1500F15U35		7.7	2	47.85087	-121.98281	3
CPT-02	23-59-25656_SP02	19-Apr-2023	730:T1500F15U35		7.5	2	47.85087	-121.98267	3
Totals	2 soundings				15.3	4			

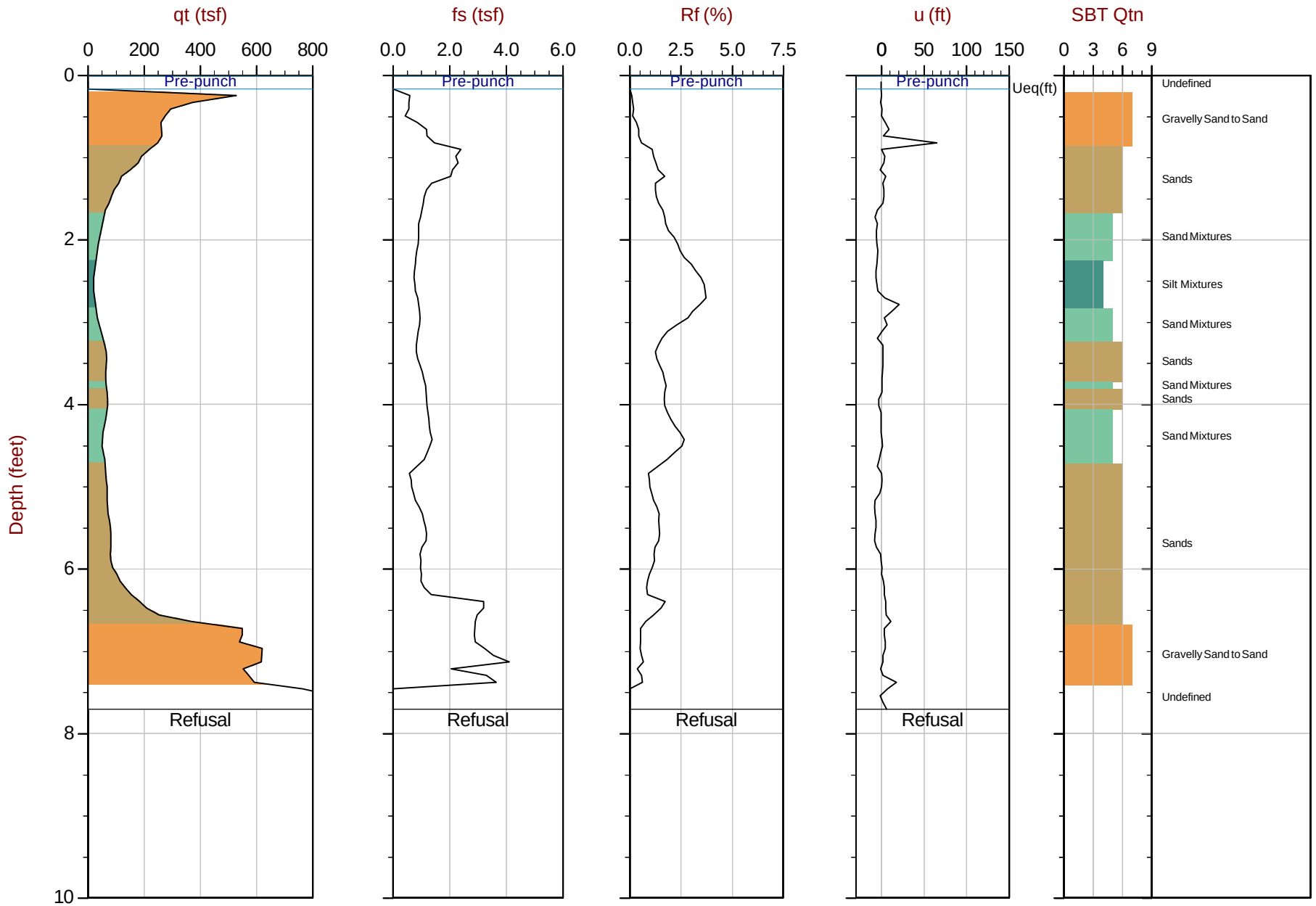
1. Phreatic surface based on pore pressure dissipation test unless otherwise noted. Hydrostatic profile applied to interpretation tables
2. Coordinates were collected consumer grade GPS - WGS 84 Lat/Long
3. Phreatic surface is assumed to be deeper than final sounding depth

CONETEC

GeoEngineers

Job No: 23-59-25656
Date: 2023-04-19 08:02
Site: Snohomish Fire and Rescue CPT

Sounding: CPT-01
Cone: 730:T1500F15U35



Max Depth: 2.350 m / 7.71 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 23-59-25656_SP01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.85087 Long: -121.98281

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

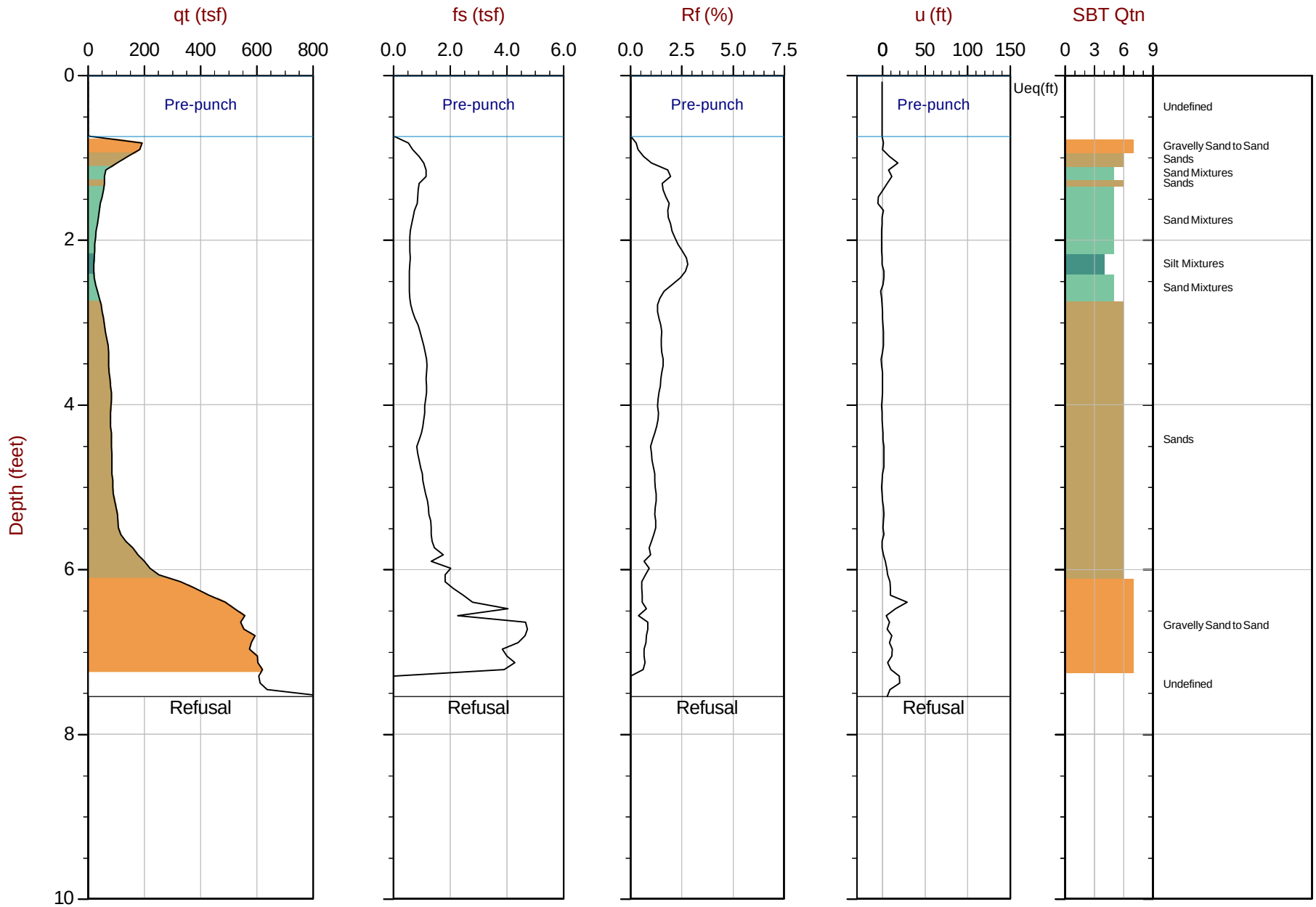
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

GeoEngineers

Job No: 23-59-25656
Date: 2023-04-19 09:47
Site: Snohomish Fire and Rescue CPT

Sounding: CPT-02
Cone: 730:T1500F15U35



Max Depth: 2.300 m / 7.55 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 23-59-25656_SP02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.85087 Long: -121.98267

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Su(Ndu), Phi, N(60) and N1(60)

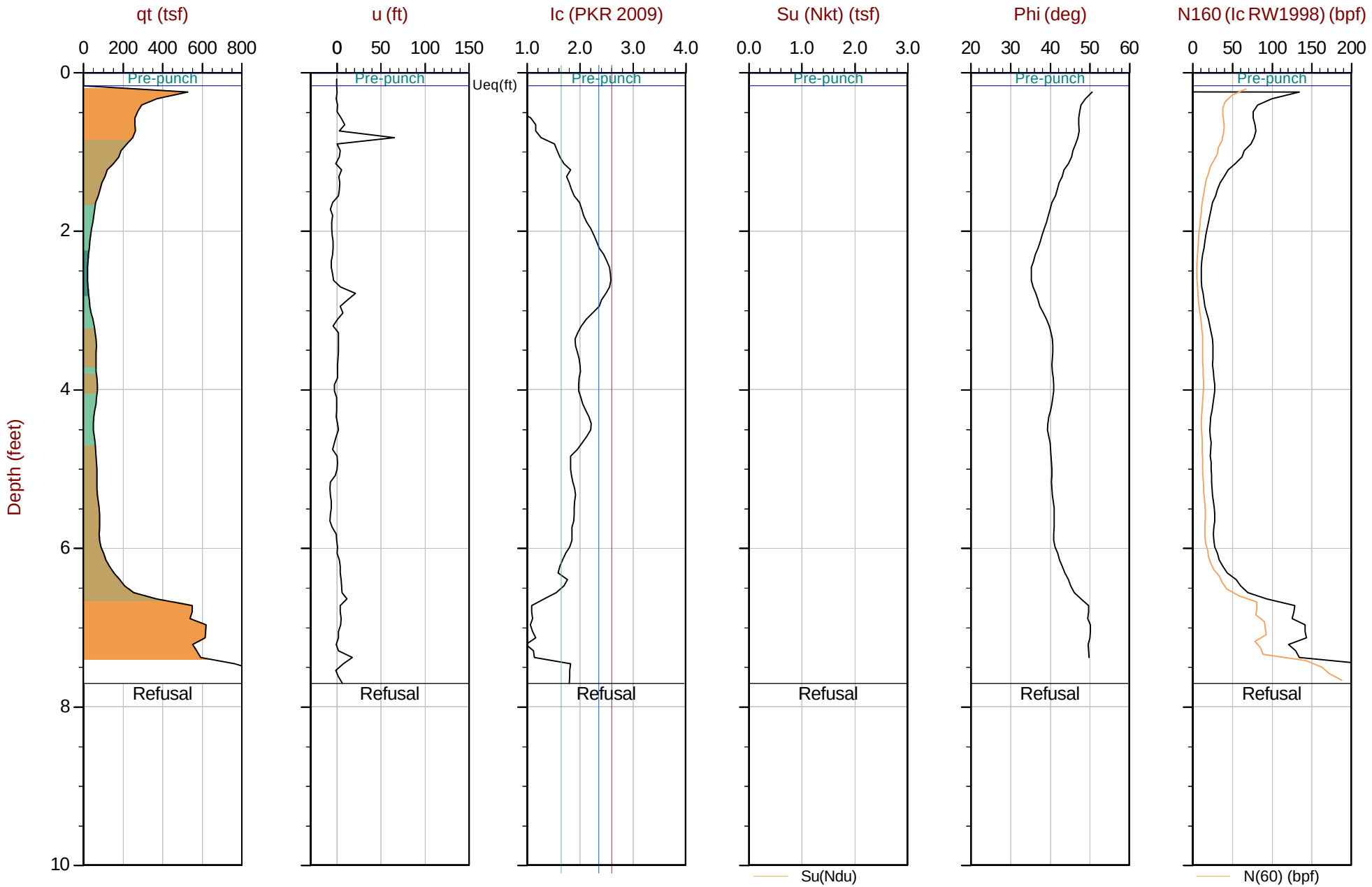
CONETEC

CONETEC

GeoEngineers

Job No: 23-59-25656
Date: 2023-04-19 08:02
Site: Snohomish Fire and Rescue CPT

Sounding: CPT-01
Cone: 730:T1500F15U35



Max Depth: 2.350 m / 7.71 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 23-59-25656_SP01.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 8.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.85087 Long: -121.98281

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

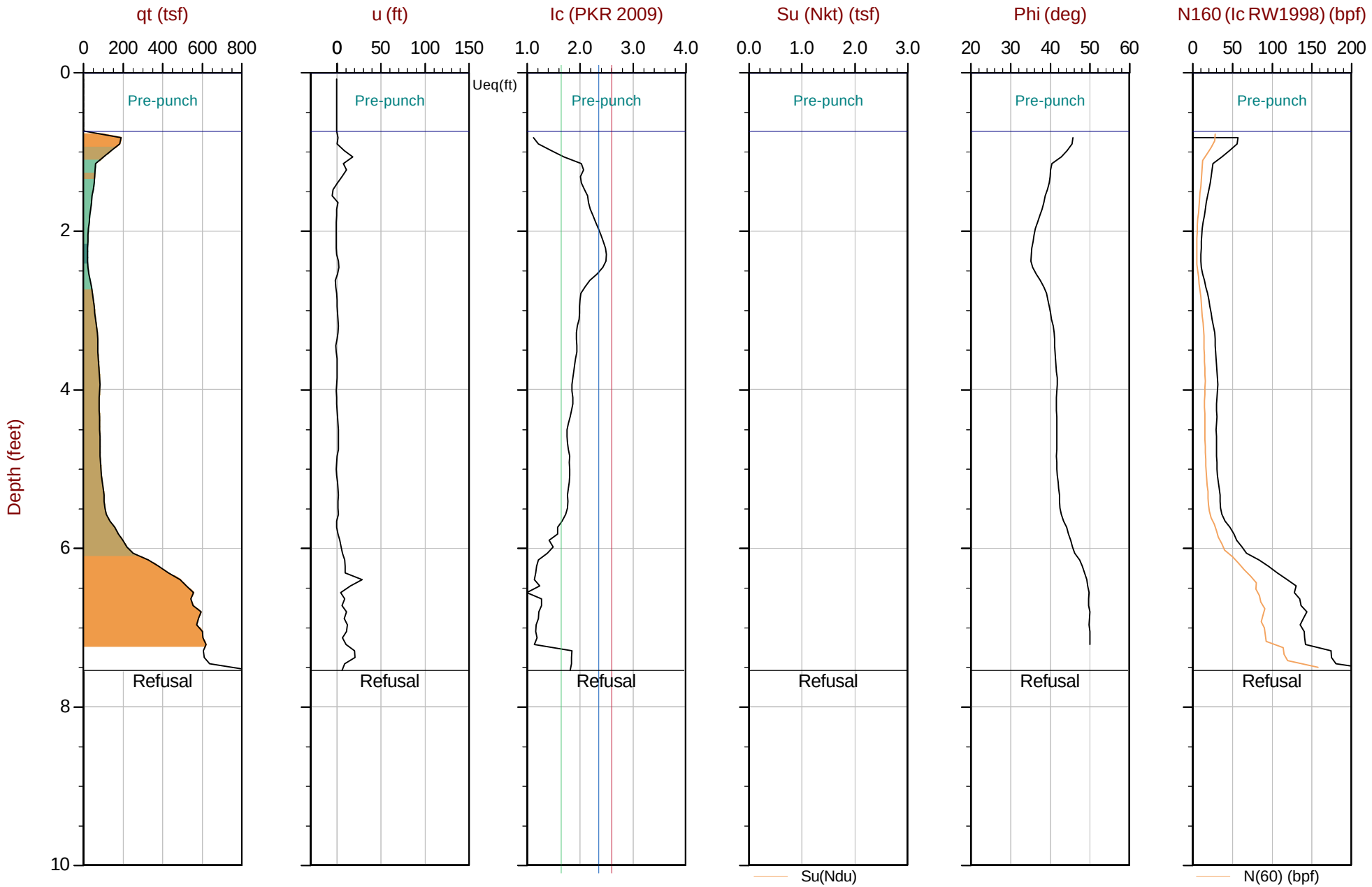
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

GeoEngineers

Job No: 23-59-25656
Date: 2023-04-19 09:47
Site: Snohomish Fire and Rescue CPT

Sounding: CPT-02
Cone: 730:T1500F15U35



Max Depth: 2.300 m / 7.55 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 23-59-25656_SP02.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 8.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.85087 Long: -121.98267

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Plots

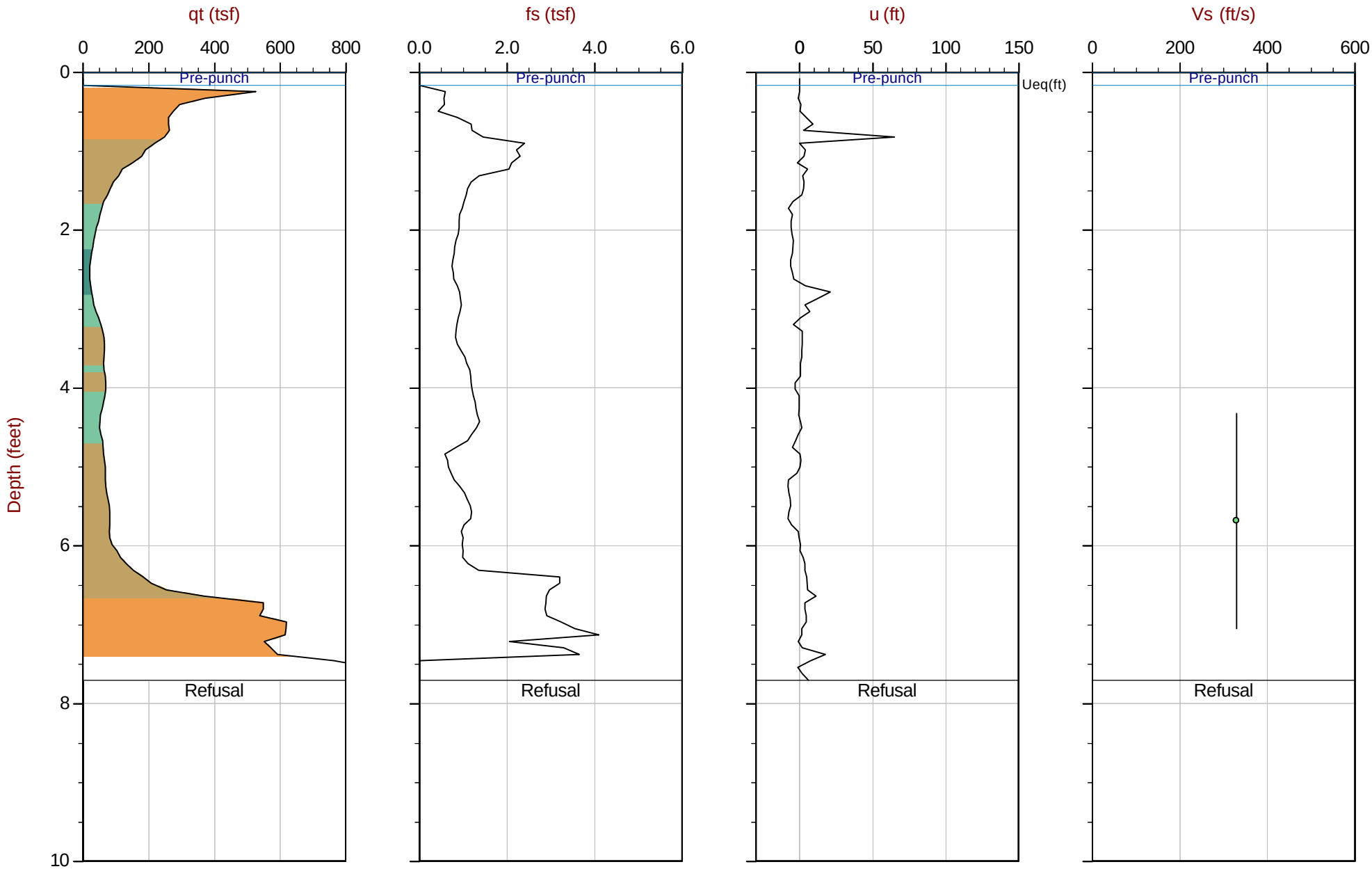
CONETEC

CONETEC

GeoEngineers

Job No: 23-59-25656
Date: 2023-04-19 08:02
Site: Snohomish Fire and Rescue CPT

Sounding: CPT-01
Cone: 730:T1500F15U35



Max Depth: 2.350 m / 7.71 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 23-59-25656_SP01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.85087 Long: -121.98281

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

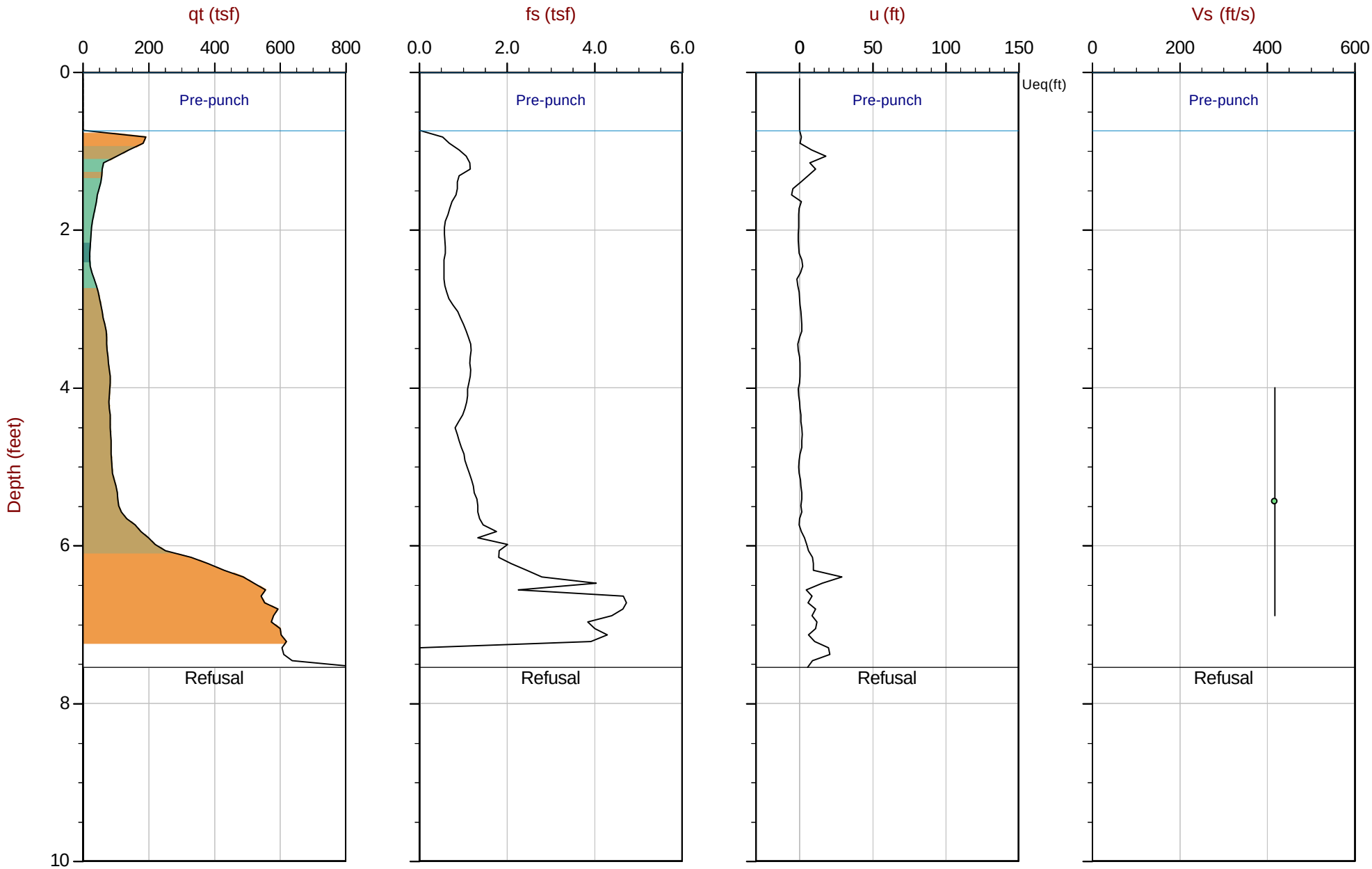
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

GeoEngineers

Job No: 23-59-25656
Date: 2023-04-19 09:47
Site: Snohomish Fire and Rescue CPT

Sounding: CPT-02
Cone: 730:T1500F15U35



Max Depth: 2.300 m / 7.55 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 23-59-25656_SP02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.85087 Long: -121.98267

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Shear Wave (Vs) Tabular Results

CONETEC

Job No:	23-59-25656
Client:	GeoEngineers, Inc.
Project:	Snohomish Fire & Rescue CPT
Sounding ID:	CPT-01
Date:	19-Apr-2023
Seismic Source:	Beam
Source Offset (ft):	10.50
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.99	4.33	11.36			
7.71	7.05	12.65	1.29	3.92	329

Job No:	23-59-25656
Client:	GeoEngineers, Inc.
Project:	Snohomish Fire & Rescue CPT
Sounding ID:	CPT-02
Date:	19-Apr-2023
Seismic Source:	Beam
Source Offset (ft):	10.50
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

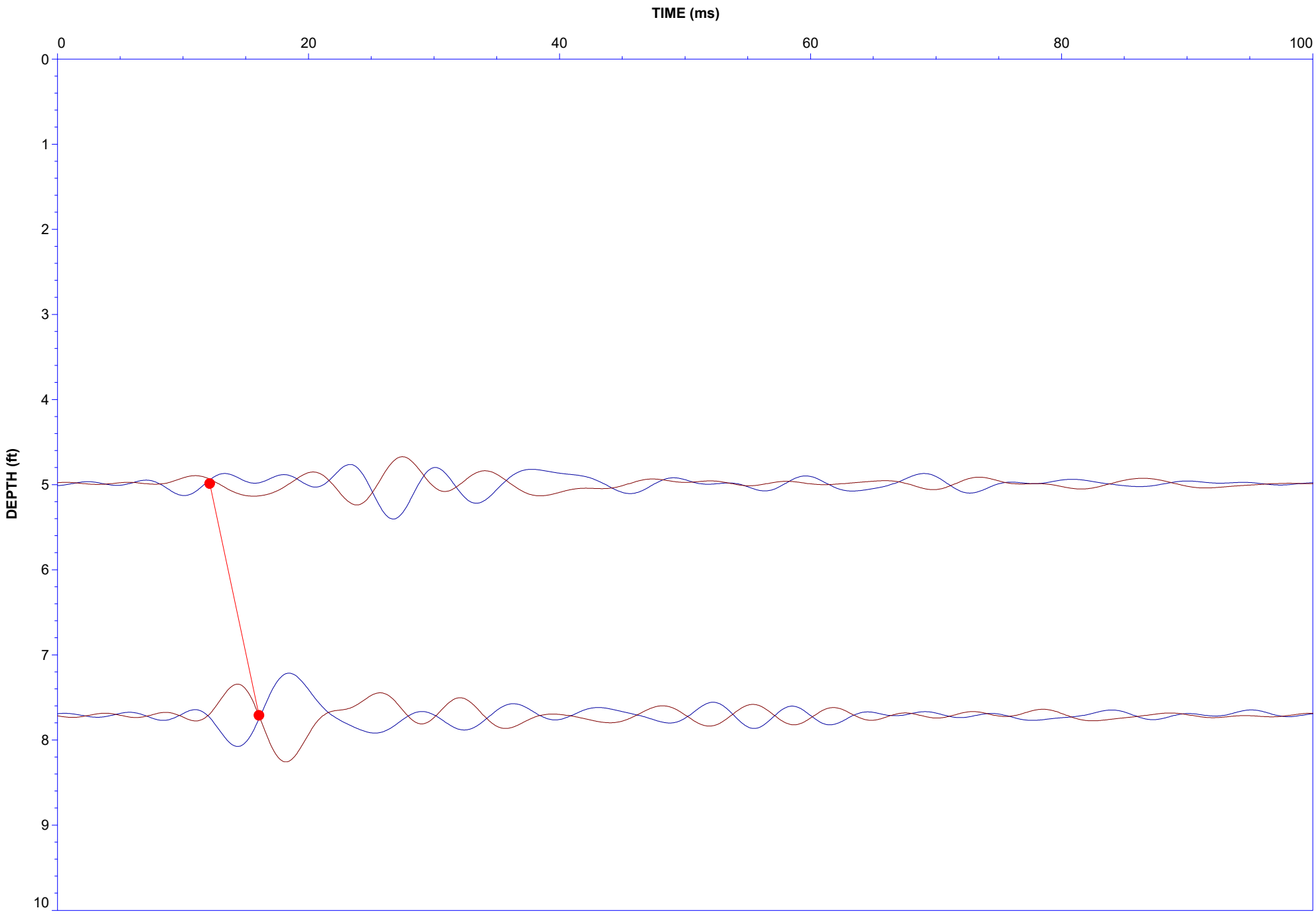
SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.66	4.00	11.24			
7.55	6.89	12.56	1.32	3.17	417

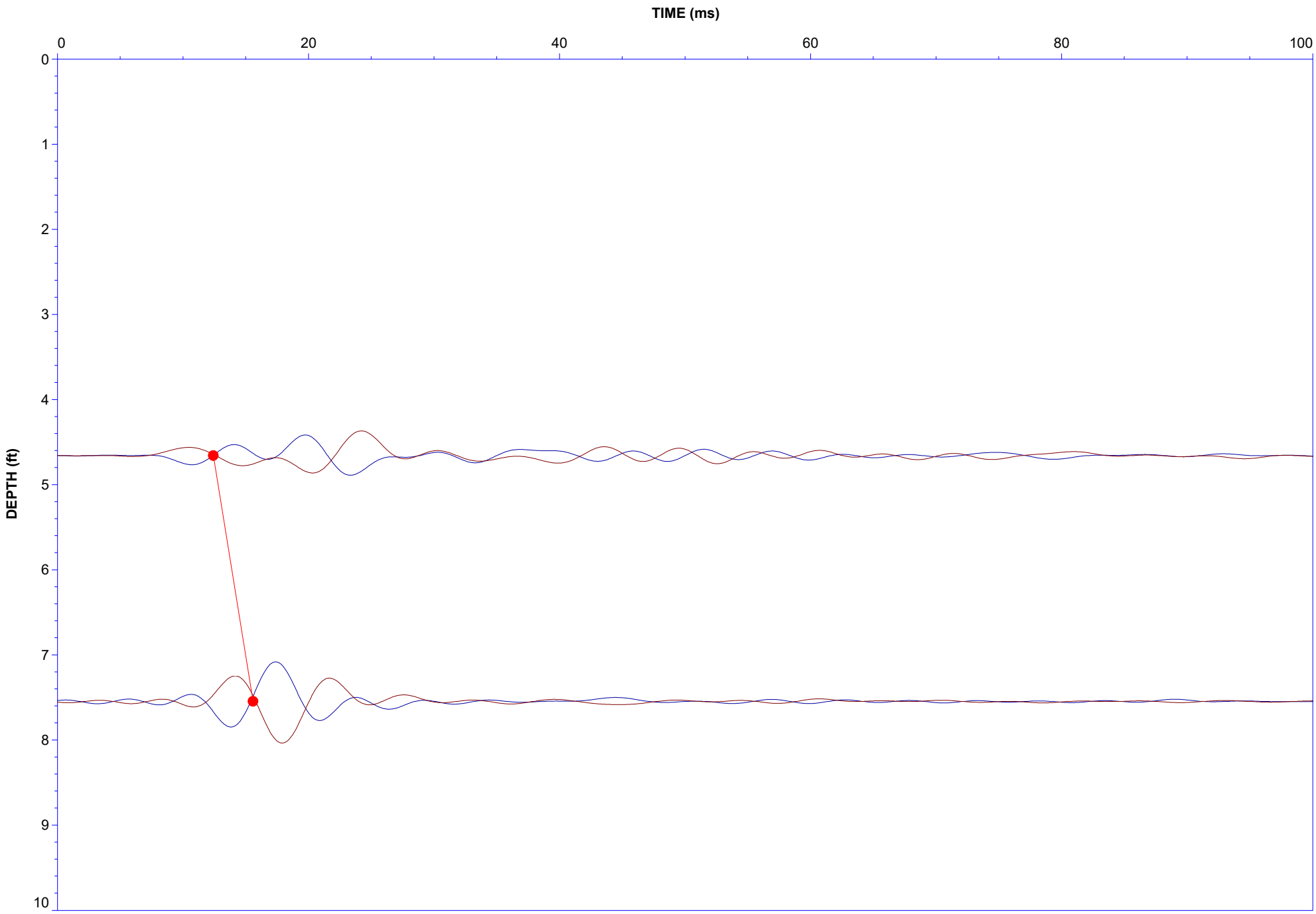
Seismic Cone Penetration Test Shear Wave (Vs) Traces

CONETEC

Job No: 23-59-25656	Client: GeoEngineers, Inc.	Project: Snohomish Fire & Rescue CPT	Analysis: Shear Wave	Sounding: CPT-01
Filter: BP 10 - 200 Hz	Date: 19-Apr-2023	Cone: 730:T1500F15U35		



Job No: 23-59-25656	Client: GeoEngineers, Inc.	Project: Snohomish Fire & Rescue CPT	Analysis: Shear Wave	Sounding: CPT-02
Filter: BP 10 - 200 Hz	Date: 19-Apr-2023	Cone: 730:T1500F15U35		



Soil Behavior Type (SBT) Scatter Plots

CONETEC

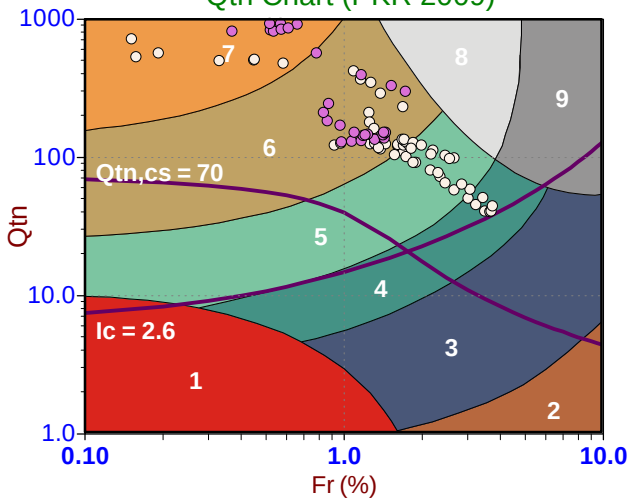
CONETEC

GeoEngineers

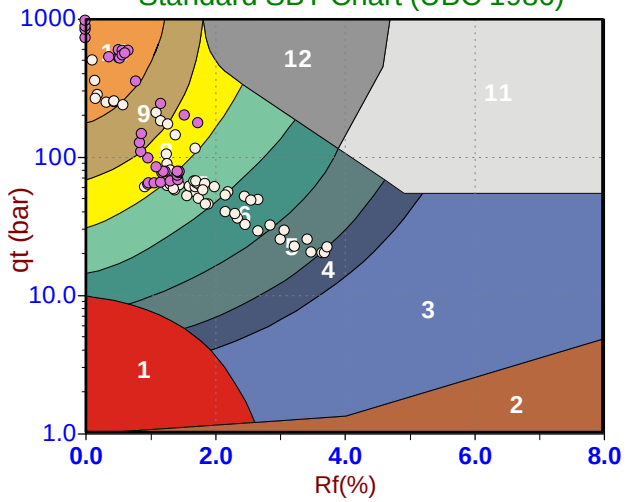
Job No: 23-59-25656
Date: 2023-04-19 08:02
Site: Snohomish Fire & Rescue CPT

Sounding: CPT-01
Cone: 730:T1500F15U35

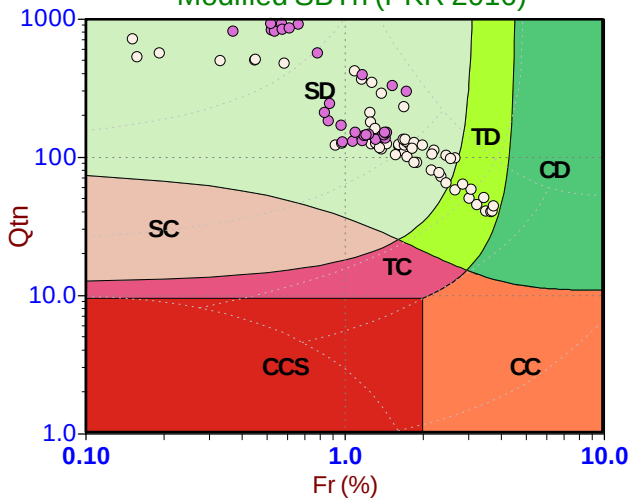
Qtn Chart (PKR 2009)



Standard SBT Chart (UBC 1986)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

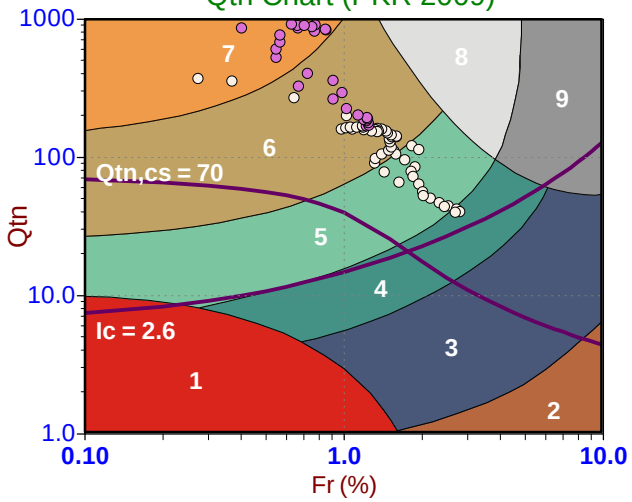
CONETEC

GeoEngineers

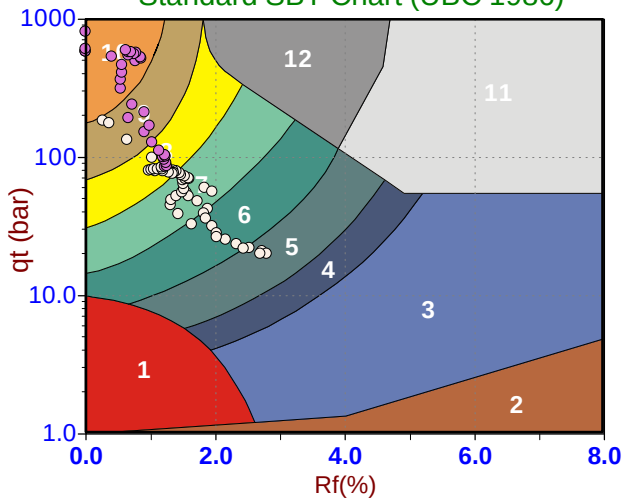
Job No: 23-59-25656
Date: 2023-04-19 09:47
Site: Snohomish Fire & Rescue CPT

Sounding: CPT-02
Cone: 730:T1500F15U35

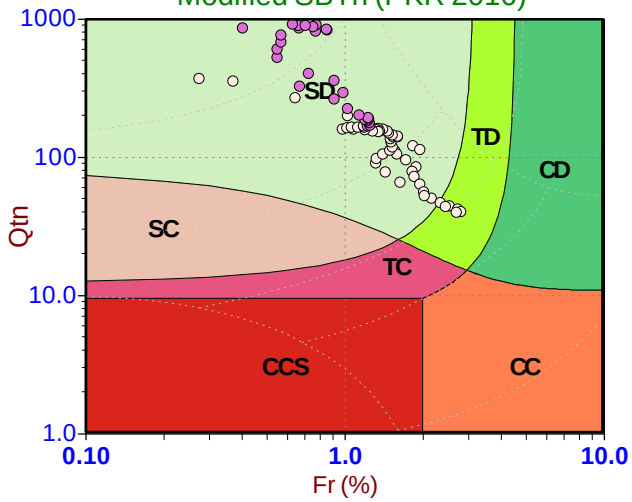
Qtn Chart (PKR 2009)



Standard SBT Chart (UBC 1986)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

APPENDIX B
Report Limitations and Guidelines for Use

APPENDIX B
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

Read These Provisions Closely

It is important to recognize that the geoscience practices (geotechnical engineering, geology and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to our services, GeoEngineers includes the following explanatory "limitations" provisions in its reports. Please confer with GeoEngineers if you need to know more how these "Report Limitations and Guidelines for Use" apply to your project or site.

Geotechnical Services are Performed for Specific Purposes, Persons and Projects

This report has been prepared for Snohomish Regional Fire and Rescue (SRFR) 31 shop addition and for the Project(s) specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Signed Agreement with SRFR dated April 11, 2023, and generally accepted geotechnical practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

A Geotechnical Engineering or Geologic Report is based on a Unique Set of Project-Specific Factors

This report has been prepared for the Snohomish Regional Fire and Rescue (SRFR) 31 shop addition. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

- Not prepared for you,
- Not prepared for your project,
- Not prepared for the specific site explored, or
- Completed before important project changes were made.

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

For example, changes that can affect the applicability of this report include those that affect:

- The function of the proposed structure;
- Elevation, configuration, location, orientation or weight of the proposed structure;
- Composition of the design team; or
- Project ownership.

If changes occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations. Based on that review, we can provide written modifications or confirmation, as appropriate.

Environmental Concerns are Not Covered

Unless environmental services were specifically included in our scope of services, this report does not provide any environmental findings, conclusions, or recommendations, including but not limited to, the likelihood of encountering underground storage tanks or regulated contaminants.

Information Provided by Others

GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Information Provided by Others

GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.

Geotechnical and Geologic Findings are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies the specific subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data

and then applied its professional judgment to render an informed opinion about subsurface conditions at other locations. Actual subsurface conditions may differ, sometimes significantly, from the opinions presented in this report. Our report, conclusions and interpretations are not a warranty of the actual subsurface conditions.

Geotechnical Engineering Report Recommendations are Not Final

We have developed the following recommendations based on data gathered from subsurface investigation(s). These investigations sample just a small percentage of a site to create a snapshot of the subsurface conditions elsewhere on the site. Such sampling on its own cannot provide a complete and accurate view of subsurface conditions for the entire site. Therefore, the recommendations included in this report are preliminary and should not be considered final. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for the recommendations in this report if we do not perform construction observation.

We recommend that you allow sufficient monitoring, testing and consultation during construction by GeoEngineers to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes if the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective means of managing the risks associated with unanticipated conditions. If another party performs field observation and confirms our expectations, the other party must take full responsibility for both the observations and recommendations. Please note, however, that another party would lack our project-specific knowledge and resources.

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

Misinterpretation of this report by members of the design team or by contractors can result in costly problems. GeoEngineers can help reduce the risks of misinterpretation by conferring with appropriate members of the design team after submitting the report, reviewing pertinent elements of the design team's plans and specifications, participating in pre-bid and preconstruction conferences, and providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. The logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Photographic or electronic reproduction is acceptable, but separating logs from the report can create a risk of misinterpretation.

Give Contractors a Complete Report and Guidance

To help reduce the risk of problems associated with unanticipated subsurface conditions, GeoEngineers recommends giving contractors the complete geotechnical engineering or geologic report, including these "Report Limitations and Guidelines for Use." When providing the report, you should preface it with a clearly written letter of transmittal that:

- Advises contractors that the report was not prepared for purposes of bid development and that its accuracy is limited; and
- Encourages contractors to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer.

Contractors are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and adjacent properties.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.

GeoEngineers

SECTION 00 4113

BID FORM

SNOHOMISH REGIONAL FIRE & RESCUE
STATION 31 – Shop Addition

BID/PROPOSAL

Contractor: _____

City: _____, Washington

Date: _____, 2024

TO: Snohomish Regional Fire and Rescue

ADDRESS: 163 Village Court, Monroe, WA

I have received Bid Documents titled Station 31 – Shop Addition dated, March 22, 2024
I have received Addenda Nos._____ and have included their provisions in my Bid.

Pursuant to and in compliance with your invitation for bids and all other documents relating thereto, the undersigned bidder, having familiarized himself/herself with the terms of the contract, the local conditions affecting the performance of the contract, the cost of the work at the place where the work is to be done, proposes and agrees to perform, within the time stipulated, the contract, if this project is accepted, including all its component parts and everything required to be performed, and to provide and furnish any and all labor, materials, tools, expendable equipment, and all utility and transportation services necessary to perform the contract, complete, in a workmanlike manner, of all the work covered by the contract in connection with Snohomish Regional Fire and Rescue project, designated as Station 31, all as required by and in strict conformance with the specifications, contract plans and the standard plans for the following lump sum price:

Show lump sum price in both words and figures and, where conflict occurs, the written or typed words prevail. Show lump sum price with/without Washington State Sales Tax.

I have examined both Documents and the site/job conditions and submit the following Bid.

In submitting this Bid, I agree:
1. To hold my bid open in accordance with referenced Instruction to Bidders, as modified and supplemented.
2. To enter into and execute referenced Contract, if awarded, on basis of this bid and to furnish bonds and insurance required by Bidding Documents.
3. To accomplish the work in accordance with the Contract Documents.
4. To complete the work by the time stipulated in the Project Manual.

OVERHEAD, PROFIT, AND THE LIKE
All bid prices listed in this form include overhead, profit, bonds, and all other expenses involved.

SALES TAX
All bid prices, including Allowances, Alternates, and Unite Prices listed in this Bid Form **DO NOT INCLUDE** applicable local and Washington State Sales Tax.

BID AMOUNT
I WILL CONSTRUCT THIS PROJECT FOR THE FOLLOWING PRICE:

Base Bid Price (Lump sum):
Snohomish Regional Fire and Rescue
Station 31 – Shop Addition

_____ DOLLARS

$ _____

TRENCH EXCAVATION SAFETY PROVISIONS **$_____**
(Included also in base bid)

If the bid amount contains any work which requires trenching exceeding a depth of four feet, all costs for trench safter shall be included in the Base Bid and indicated above for adequate trench safety systems in compliance with Chapter 39.04 RCW. 49.178 RCW and WAC 296-155-650. Bidder must include a lump sum dollar amount in the blank above (even if the value is $0.00) to be responsive.

ALTERNATES

Alternate 01: Carport

_____Addition / Subtraction (Circle One) Dollars

($_____)

The above sum is hereby designated as Alternate 01. Alternate 01 does not include Washington State and/or local sales taxes on the Contract value.

Alternate 02: Re-Roof of Entire Existing Membrane Roof

_____Addition / Subtraction (Circle One) Dollars

($_____)

The above sum is hereby designated as Alternate 02. Alternate 02 does not include Washington State and/or local sales taxes on the Contract value.

SUBCONTRACTOR LISTING REQUIREMENTS

If the base bid plus the sum of the additive alternates is one million dollars or more, the undersigned agrees to submit Section 004336 Proposed Subcontractor Form (HVAC, Plumbing, Electrical) within one hour of bid submittal time & Subcontractor Listing, and Structural Steel Install, Rebar Install within 48 hours of the bid submittal time, as applicable to the work, according to RCW 39.30.060.

CONTRACT TIME

The Owner anticipates Notice of Award of this contract on or about 45 days of bid receipt. Owner shall execute contract and issue Notice to Proceed upon satisfactory receipt of Certificate of Insurance, Bonds, and related documents as required by the Instructions to Bidders, the General Conditions of the Contract, and Supplemental Conditions.

If this Bid is accepted, we will Substantially Complete the work within 275 calendar days from Notice to Proceed.

Liquidated damages will be accessed in accordance with the General Conditions of the Contract.

CONTRACTOR'S QUALIFICATIONS STATEMENT

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

LICENSING

State of Washington Contractor's License No.:_____.

Federal Tax I.D. No.:_____.

THIS BID PROPOSAL SUBMITTED BY:

NAME OF FIRM_____

SIGNED BY_____TITLE_____

PRINTED NAME_____

ADDRESS_____

CITY/STATE/ZIP_____

TELEPHONE_____

DATE_____

NOTE:

If Bidder is a corporation write State of Incorporation, and if partnership, give full names and address of all partners below.

_____

_____

Required Attachments:

Bid Security

END OF SECTION

SNOHOMISH REGIONAL FIRE AND RESCUE
Station 31 Construction

BIDDER'S QUALIFICATION CERTIFICATE

The undersigned hereby certifies and submits the following qualifications:

1. Name and Address

_____

_____

_____

2. State of Washington Registration Number and expiration _____
3. Number of years in contracting business under present firm name _____
4. Particular types of construction work performed by your company:

_____

_____

_____

5. List several recent construction projects performed:

Amount	Type	Owner	Name	Phone

6. Gross amount of contracts now in hand:

_____

7. Bank reference(s):

_____

_____

_____

By (Authorized Signature): _____

Title:_____

BID BOND
FOR CONSTRUCTION OF
FIRE STATION 31

163 Village Court
Monroe, WA 98272
(Note: This form must be used, no substitute is acceptable)

BID BOND

Herewith find deposit in the form of a certified check, cashier's check, or cash in the amount of $_____ which amount is not less than five percent (5%) of the total bid.

Sign Here: _____

BID BOND

Know all men by these presents, that we _____ as Principal and _____ as Surety, are held and firmly bound unto Snohomish Regional Fire and Rescue in Snohomish County Washington, as obligee in the penal sum of _____ dollars, for the payment of which the principal and surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by these presents.

The condition of the obligation is such that if the obligee shall make any award to the principal for _____, according to the terms of the proposal or bid made by the principal therefore, and the principal shall duly make and enter into a contract with the obligee in accordance with the terms of said proposal or bid award and shall give bond for faithful performance thereof, with surety or sureties approved by the obligee; or if the principal shall, in case of failure to do so, pay and forfeit to the obligee the penal amount of the deposit specified in the call for bids, then this obligation shall be null and void; otherwise it shall be and remain in force and effect and the surety shall forthwith pay and forfeit to the obligee, as penalty and liquidated damages the amount of this bond.

Signed, sealed and dated this _____ day of _____, 2024.

Principal_____

Surety_____

Return of deposit in the amount of $_____

Date:_____

END OF FORM

SECTION 00 4336

PROPOSED SUBCONTRACTORS FORM

PARTICULARS

1.01 HEREWITH IS THE LIST OF SUBCONTRACTORS REFERENCED IN THE BID SUBMITTED BY:

1.02 (BIDDER) _____

1.03 TO (OWNER): _____

1.04 DATED _____ AND WHICH IS AN INTEGRAL PART OF THE BID FORM.

1.05 THE FOLLOWING WORK WILL BE PERFORMED (OR PROVIDED) BY SUBCONTRACTORS AND COORDINATED BY US:

LIST OF SUBCONTRACTORS

WORK SUBJECT SUBCONTRACTOR NAME

A Plumbing:_____
B. Electrical:_____
C. Heating:_____
D. Ventilating and Air Conditioning:_____
E. Structural Steel Install Subcontractor:_____
F. Rebar Install:_____

END OF SECTION

SECTION 00 5200

AGREEMENT FORM – STIPULATED SUM

PART 1 - GENERAL

1.1 FORM OF CONTRACT
The Standard *Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum*, AIA Document A101-2017, as modified. Include as part of contract documents.

1.2 RELATED REQUIREMENTS
(1) Section 007200 – GENERAL CONDITIONS.
(2) Section 007300 – SUPPLEMENTARY CONDITIONS.
(3) Section 014216 – DEFINITIONS.

1.3 MODIFICATIONS TO THE AGREEMENT FORM
(1) Refer to ATTACHED AIA A101-2017 Form.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

DRAFT

AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor
where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year «Two Thousand Twenty-Four »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

«Snohomish Regional Fire & Rescue»« »
«163 Village Court»
«Monroe, WA 98272»
« »

and the Contractor:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

« Snohomish Regional Fire & Rescue – Station 31 »
«163 Village Court »
« Monroe, WA 98272»

The Architect:
(Name, legal status, address and other information)

« Rice Fergus Miller, Inc. »« »
« 275 Fifth Street, Suite 100 »
« Bremerton, WA 98337 »
« »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[« »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

« »

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« »

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

« »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

« »

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »

« »
« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[« »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*

DRAFT

AIA® Document A101® – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

for the following **PROJECT**:
(Name and location or address)

« Snohomish Regional Fire & Rescue – Station 31»
« »

THE OWNER:
(Name, legal status and address)

« Snohomish Regional Fire & Rescue »« »
«163 Village Court, Monroe, WA 98272 »

THE CONTRACTOR:
(Name, legal status and address)

« »« »
« »

TABLE OF ARTICLES

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[« »] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

« »

[« »] **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

« »

[« »] **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

« »

[« »] **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

« »

[« »] **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

« »

[« »] **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

« »

[« »] **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

« »

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[« »] **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

« »

[« »] **§ A.2.5.2 Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than « » ($ « ») each occurrence, « » ($ « ») general aggregate, and « » ($ « ») aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;

.2 personal injury and advertising injury;

.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;

.4 bodily injury or property damage arising out of completed operations; and

.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.

.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.

.3 Claims for bodily injury other than to employees of the insured.

.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.

.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.

.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.

.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

.8 Claims related to roofing, if the Work involves roofing.

.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

.10 Claims related to earth subsidence or movement, where the Work involves such hazards.

.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than « » ($ « ») per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than « » ($ « ») each accident, « » ($ « ») each employee, and « » ($ « ») policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[« »] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

« »

[« »] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for Work within fifty (50) feet of railroad property.

[« »] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[« »] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[« »] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[« »] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	
Performance Bond	

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

« »

SECTION 00 7200

GENERAL CONDITIONS OF THE CONTRACT

PART 1 - GENERAL

1.01 STANDARD FORM

The General *Conditions of the Contract for Construction*, AIA Document A201-2007 As Modified. The Contractor and all subcontractors shall read and be governed by them.

1.02 CONFLICTS

In event of conflicts in the Contract Documents, including conflicts between referenced General Conditions and other parts of the Project Manual and Drawings, the Architect reserves the right to determine which governs, and in what order or precedence. See Article 3 of General Conditions and Division 00 Section “Supplemental Conditions”.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

DRAFT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

« Snohomish Regional Fire & Rescue – Station 31»
« »

THE OWNER:
(Name, legal status and address)

«Snohomish Regional Fire & Rescue »« »
«163 Village Court, Monroe, WA 98272 »

THE ARCHITECT:
(Name, legal status and address)

« Rice Fergus Miller, Inc. »« »
«275 Fifth Street, Suite 100, Bremerton, WA 98337 »

TABLE OF ARTICLES

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

INDEX

(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set

forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that 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, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately

suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

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

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

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

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not

have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will

similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the

Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor

change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot

be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to

the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by 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, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work 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 completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance,

the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the

Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

SECTION 007300 - SUPPLEMENTAL CONDITIONS

The following supplements modify, change, delete from, or add to the referenced "General Conditions of the Contract for Construction."

ARTICLE 1
CONTRACT DOCUMENTS

1.1.1 THE CONTRACT DOCUMENTS

Add the following new subparagraphs 1.1.1.1:

1.1.1.1 In the event of any inconsistencies, conflicts or ambiguities between the Contract Documents, or within an individual document not clarified by addendum, the resolution of such inconsistencies, conflict or ambiguity shall be provided in accordance with the Architect's interpretation. All conflicts are to be referred to the Architect for resolution and incorporation into a Contract Modification, if appropriate.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following new subparagraphs 1.2.4 and 1.2.5:

1.2.4 Such execution of the Contract also constitutes a representation by the Contractor that it can fully perform the Contract and address all issues arising out of the Contract Documents or conditions of the site of the Work for the Contract Amount. The failure of the Contractor fully to acquaint itself with any applicable condition or matter shall not in any way relieve the Contractor from the responsibility for performing the Work in accordance with the Contract Documents and within the Contract Time and the Contract Sum.

1.2.5 Contractor to make the following representation to Owner:

A. 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

B. 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.

ARTICLE 2
OWNER

2.1 GENERAL

Add the following new subparagraphs 2.1.1.1 and 2.1.1.2:

2.1.1.1 The Owner shall designate a Project Manager to act on behalf of the Owner. Unless specifically limited by the Owner, the Project Manager shall have, at their discretion, complete authority to transmit instructions, receive information, to interpret and define Owner's policies and decisions with respect to Work, and to approve Construction Change Directives within established budget limits. The Owner shall retain the final decision on acceptance of the contract and approval of any proposed Change Orders or proposed Construction Change Directives except for the limited delegation in this paragraph. Except for the limited approval authority delegated for Construction Change Directives, the Owner shall have the sole authority to authorize any change to the provisions of the contract which the Contractor claims may entitle the Contractor to any time or equitable adjustment or extra compensation.

2.1.1.1.2 The Owner's designated Project Manager referred to in paragraph 2.1.1.1 above shall have only that authority stated above. The presence on site of the Owner's designated Project Manager, or any other employee or officer of the Owner shall not imply any authority by such person to direct any work or make approvals or acceptances except as specifically delegated in this contract or as adopted by formal action of the Owner and communicated in writing to the Contractor. The presence of such persons on the

site and his/her observations, knowledge and/or statements shall not create any apparent authority. No act or omission, statement or silence by such person on site shall waive any requirement of this contract, constitute acceptance or approval by the Owner, or waive any requirement of written notice. No such Project Manager or other Owner employee or officer shall have authority to direct the manner or means by which the Contractor carries out the Work, to direct or approve safety measures of the Contractor, or to direct any extra work except the Project Manager by the written Construction Change Directive procedure and within the limited authority herein provided. The presence on site of such persons shall in no way derogate from the authority of the Architect, nor shall it alter the contractually specified procedures for communication through the Architect.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER
Delete subparagraph 2.3.6 and substitute the following:

[2.3.6The Contractor will be furnished free of charge PDF files of Drawings and Project Manuals for the purposes of making reproductions pursuant to Section 1.5.2.]

Add the following new subparagraphs 2.6 through 2.6.1:
2.6 OWNER'S RIGHT AND RESPONSIBILITIES
2.6.1 The Owner will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided in Paragraph 3.3. The Owner will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Owner will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons performing portion of the Work.

ARTICLE 3
CONTRACTOR

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES
Add the following to subparagraph 3.3.1:
3.3.4 If the Contractor has any concerns, objections or reservations concerning such specific instructions, the Contractor must raise and resolve such issues with the Architect and the Owner prior to performing such specific instructions.

3.4 LABOR AND MATERIALS
Add the following to subparagraph 3.4.3:
3.4.3.1 At no change to the Contract Sum or Contract Time, the Owner may provide written notice requiring the Contractor to remove from the Work any employee, subcontractor employee, or other person carrying out the Contract whom the Owner reasonably considers objectionable.

Add the following subparagraph 3.4.4 through 3.4.4.6:
3.4.4 PREVAILING WAGES

3.4.4.1The Washington State Department of Labor and Industries Prevailing Wage Rates are part of the Contract.

3.4.4.2It is the Contractor's responsibility to follow the Prevailing Wage rates in effect as of the Bid date.

3.4.4.3No worker may be paid less than the prevailing minimum hourly wage rate established by the State Department of Labor and Industries. Statements of Intent to Pay Prevailing Wages and Affidavits of Wages Paid are required. The Contractor shall fully comply with all current applicable labor laws and regulations, including without limitation RWC Chapters 39.12 (Prevailing Wages); 49.28 (Hours of labor); and 49.70 (Worker Right to Know).

3.4.4.4Any fabricator or manufacturer that produces nonstandard items and is considered by the Department of Labor and Industries as a contractor must comply with all of the requirements of RCW 39.12, including but not limited to the filing of the “Statement of Intent to Pay Prevailing Wages” and “Affidavit of Wages Paid” with the Department of Labor and Industries Industrial Statistician.

3.4.4.5The Owner reserves the right to perform wage rate interviews and/or require Contractor submission of certified payrolls for all Contractor and Subcontractor personnel.

3.4.4.6Contractor shall provide Owner with copies of the Intent to Pay Prevailing Wage forms as filed with the State of Washington for the contractor’s forces and for all subcontractors.

3.6 TAXES

Change subparagraph 3.6 to read:

3.6 The Contractor shall pay all applicable State and Local Sales, Consumer, Use and other similar taxes for Work or portions thereof provided by the Contractor. The Owner shall include these taxes in his payments to the Contractor who shall pay the taxes to the proper authorities in accordance with the applicable laws and regulations governing this project. Sales tax is not included in the bid amount.

3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS

Delete subparagraph 3.7.1 and substitute the following:

3.7.1 The Owner shall secure and pay for the Plan Review Fees, Building Permit(s), Demolition Permit(s), as required by the City of Monroe. The Contractor shall secure and pay for all other permits and governmental fees, licenses and inspections necessary for proper execution of and completion of the Contract which are legally required when bids are received.

3.9 SUPERINTENDENT

Add the following to subparagraphs 3.9.3:

During the construction period should the initial superintendent fall ill, retire, be laid off or employment otherwise terminated, the Owner reserves the right to review and accept the replacement as stated above.

Add the following subparagraph 3.9.4:

3.9.4 The Superintendent shall remain on the Project whenever Subcontractors are present.

3.10 CONTRACTOR’S CONSTRUCTION SCHEDULE

Change this entire Article 3.10 to read:

3.10.1 Within (10) calendar days following Notice to Proceed, the Contractor shall submit to the Owner and the Architect for review and comment, a Project Schedule in a form satisfactory to the Owner for Contractor’s construction of the Work. The initial and any revisions of the Project Schedule shall be prepared and submitted in electronic PDF form. With each approved monthly payment request, provide an updated Progress Schedule. Not less than 5% in retention of Progress Payments to the Contractor may be withheld by the Owner until such initial and updated Progress Schedules have been timely submitted for review by the Owner and the Architect.

3.10.2 The Project Schedule shall consist of a network diagram with activity descriptions and durations and supporting data which will explain the Contractor’s planning of the work. Contractor shall provide, if requested by Owner, cost allocation and resource estimates for each activity.

(a) The cost component for each activity shall be provided if requested by Owner. The sum of the activity cost components shall equal the Contract price.
(b) The identity of any potential problems or constraints related to the implementation of the overall construction plan.
(c) Identify any time within activities that may impact the operation of the Owner and existing building tenants.

3.10.2.3 A schedule for the purchase of items required for performance of the Work, showing lead items between purchase order placement and delivery dates, shall be integrated with the Progress Schedule upon request of the Owner. The Contractor shall furnish the Architect with copies of all purchase orders

and acknowledgements and fabrication, production, and shipping schedules for all major items on the critical path within 10 days of Contractor's receipt of each purchase order, acknowledgment or schedule. Neither the Architect nor the Owner shall be deemed to have approved or accepted any such material, or its schedule, nor deemed to have waived this requirement if some or all of the material is not received.

3.10.4 It is to be expressly understood and agreed by the Contractor that the schedule is an estimate to be revised from time-to-time as progress proceeds, and that the Owner does not guarantee that Contractor can start work activities on the "early start" or "late start" dates or complete work activities on the "early finish' or "late finish" date shown in the Schedule, or as same may be upgraded or revised; nor does the Owner guarantee that Contractor can proceed at all times in the sequence established by said Schedule. If Contractor's schedule indicates that Owner or separate contractor is to perform an activity by a specific date, or within a certain duration, Owner or any separate contractor under contract with the Owner shall not be bound to said date or duration unless Owner expressly and specifically agrees in writing to same; the Owner's or the Architect's overall review and approval or acceptance of the Schedule does not constitute an agreement to specific dates, durations or sequences for activities of the Owner of any separate contractor.

3.10.5 Should any of the conditions exist such that certain activities shown on the Contractor's Project Schedule fall behind schedule to the extent that any of the specific dates are in jeopardy, the Contractor shall be required to, at no extra cost to the Owner, prepare and submit to the Owner a supplemental Recovery Schedule, in a form and detail appropriate to the need, to explain and display how he intends to reschedule those activities to regain compliance with the Project Schedule during the immediately subsequent pay period.

3.10.6 The Contractor shall do the following after determination of the requirement for a Recovery Schedule:

(a) Within three (3) calendar days, the Contractor shall submit a Recovery Schedule to the Owner for review. The Recovery Schedule shall be prepared to a similar level of detail as the Project Schedule and shall have a maximum duration of one (1) month.

(b) Any revisions necessary as a result of this review shall be resubmitted by the Contractor with any necessary revisions for acceptance within two (2) calendar days of the review. The approved Recovery Schedule shall then be the Schedule which the Contractor shall use in planning, organizing, directing, coordinating, performing and executing the Work including all activities of subcontractors, equipment vendors, and suppliers for its one (1) month duration, to regain compliance with the Project Schedule.

3.10.7 Should the Contractor, after approval of the initial Project Schedule desire to change his plan of construction, he shall submit his requested revisions to the Owner including a description of the logic for rescheduling the work, methods of maintaining adherence to Intermediate Milestones and Specific Dates. The Contractor shall revise his Schedule to include the effect of changes, acts of God or other conditions or events which have affected the Project Schedule, If the requested changes are acceptable to the Owner, they will be incorporated by the Contractor into the Project Schedule in the next reporting period. The resultant cost to the Owner for significant changes or a significant number of changes to the Project Schedule shall be paid for by the Contractor.

3.10.8 When the Owner orders changes by Change Order which have the potential to impact the Contract Milestones or Specific Dates stipulated, a Network will be prepared by the Contractor and provided to the Project Manager. After the Network has been accepted by the Owner, it will be incorporated into the Project Schedule by the Contractor.

3.10.9 Failure of the Contractor to substantially comply with any of the scheduling requirements of this Contract at no cost to the Owner shall constitute cause that the Contractor is failing to prosecute the Work with such diligence as will insure its completion within the Contract times and shall be considered cause for termination by the Owner, pursuant to Article 14 of the General Conditions; and may also result in the Owner's withholding of Progress Payment(s) until the Contractor complies.

3.10.10 Float time is defined as the amount of time between earliest start date and the latest start date or between the earliest finish date or the latest finish date of a chain of activities on the Project Schedule. Float time is not for the exclusive use or benefit of either the Contractor of the Owner. Contractor's work shall proceed according to start dates, and the Owner shall have the right to reserve and apportion float time according to the needs of the project. The Contractor acknowledges and agrees that actual delays, affecting paths of activities containing float time, will not have any effect upon Contract Completion times,

providing that the actual delay does not exceed the float time associated with those activities. Extensions of time for performance as described in the Contract Documents will be granted only to the extent that time adjustments for the activity or activities affected by any condition or event which entitles the Contractor to a time extension exceeds the total float or slack time along the actual critical path of activities affected at the time of Notice to Proceed of a Change Order or the commencement of any delay, claim or condition for which an adjustment is claimed or warranted under the Contract Documents.
3.10.11 The Schedule Duration shall be based on the Contract Time of Completion listed on the Bid Form. The Owner shall not be obligated to accept any Early Completion Schedule suggested by the Contractor. The Contract Time for Completion shall establish the Schedule Completion Date. If the Contractor feels that the work can be completed in less than the Specified Contract Time, then the Surplus Time shall be considered Project Float. This Float time shall be shown on the Project Schedule. It shall be available to accommodate changes in the work and unforeseen conditions. Neither the Contractor nor the Owner have exclusive right to this Float Time. It belongs to the project.

3.11 DOCUMENTS AND SAMPLES AT THE SITE
Add the following new subparagraphs 3.11.1 and 3.11.2:
3.11.1 The Contractor shall keep the approved permit set of plans at the jobsite during construction, in good condition. Prior to final acceptance, the Contractor shall deliver this permit set to the Architect.
3.11.2 Satisfactory maintenance of up-to-date record drawings will be a requirement for approval of monthly Progress Payments.

ARTICLE 5
SUBCONTRACTORS

5.3 SUBCONTRACTUAL RELATIONS
Add the following new subparagraph:
5.3.1 The Contractor shall schedule, supervise and coordinate the operations of all Subcontractors. No subcontracting of any of the Work shall relieve the Contractor from its responsibility for the performance of the Work in accordance with the Contract Documents or from its responsibility for the performance of any other of its obligations under the Contract Documents.

ARTICLE 6
CONSTRUCTION BY OWNER
OR BY SEPARATE CONTRACTORS

6.2 MUTUAL RESPONSIBILITY
Add the following to paragraph:
6.2.2 If the Contractor receives items from a separate contractor or from the Owner for storage, erection or installation, the Contractor shall acknowledge receipt for items delivered, and thereafter will be held responsible for care, storage and any necessary replacement of item or items received.

At subparagraph 6.2.4, delete the word “wrongfully.”

ARTICLE 7
CHANGES IN THE WORK

7.2 CHANGE ORDERS
Add the following paragraphs 7.2.2 through 7.2.5:
7.2.2 Change proposal disagreements shall be submitted by the Contractor to the Architect in a form satisfactory to the Owner for such submittals. The total cost of any change, including a claim shall be limited to the reasonable value thereof, to be determined in the following manner:
7.2.3 ADDITIVE CHANGES:

1a.Direct Labor Costs: This is defined as the estimated labor costs determined by either the estimated number of craft hours and the hourly costs necessary to perform the change in work; or the unit labor costs necessary to perform the change in work; or the unit labor costs applied to the material quantities, provided said unit labor costs are developed from the above craft man hour cost; whichever is applicable, according to industry practice. The hourly cost shall be based on the following:

1. Basic Wages: Current minimum prevailing hourly wage rates, including vacation pay, for all labor, crew foreman, and general foreman performing and/or directly supervising the work on site. These rates, whichever are applicable, are established by the State of Washington, Department of Labor and Industries.
2. Fringe Benefits: Fringe benefits established by the State of Washington, Department of Labor and Industries or contributed to labor trust funds as itemized fringe benefits, whichever is applicable.
3. Worker's Insurance: Direct contributions to the State of Washington as Industrial Insurance; Medical Aid; and Supplemental Pension, by the class and rates established by the State of Washington, Department of Labor and Industries.
4. Federal Insurance's: Direct contributions required by the Federal Insurance Compensation Act (FICA); Federal Unemployment Tax Act (FUTA); and the State Unemployment Compensation Act (SUCA).
5. Costs incurred by the Washington Industrial Safety and Health Act (WISHA); established as 2% of 1, 2, 3, and 4 above.
6. Travel allowances and/or subsistence if applicable not to exceed those established by Regional Labor Union Agreements shall be itemized and identified separately.

1b.Direct Material Costs: This is defined as an itemization of the estimated quantity of materials necessary to perform the change in the work and the cost thereof. These costs shall be by the unit cost applied to the quantity and extended. The unit costs shall be based on the following:

1. The net costs after all offered or available discounts or rebates.
2. Freight costs; express charges; or special delivery costs when applicable.

No lump sum costs will be allowed except when approved in advance by the Architect

1c. Construction Equipment Usage Costs:

1. Rental Equipment: This is defined as an itemization of and the estimated length of time construction equipment will be used on change order work at the site. The rental costs applied thereof will be the rates established by the following whichever is applicable:
   a) The current hourly rental rates established by agreement between the Associated General Contractors (AGC) and Washington State Department of Highways.
   b) The current rental rates established by the State of Washington, utilities and Transportation Commission for trucks used on highways.
   c) The current rental rates established by the National Electrical Contractor's Association (NECA) for equipment used on electrical work.
   d) The current rental rates established by the mechanical Contractor's Association for equipment used on mechanical work.
   e) If equipment is required for which a rental rate is not established in any of the above, an agreed rental rate shall be established for that equipment. Such rates and the use of the equipment on the work must be approved by the Architect prior to performing the work.
   f) The rates in effect at the time of performance of the work are the maximum rates allowable for equipment of modern design and in good working condition and include full compensation for furnishing all fuel, oil, lubrication, repairs, maintenance, and insurance.
2. Small Tools, Expendable and Consumable Supplies:
   a) These are general in nature and are defined as tools for which the initial purchase price is under $250 and are normally furnished by the performing contractor.
   b) The allowable rate for small tools will be:

- General Contractors, 3% direct labor costs
- Specialty Contractors, 5% direct labor costs

c) Expendable and consumable supplies directly associated with the change in work to be itemized.

1d. Subcontractor Proposals: Subcontractors' proposals are to be itemized as in 1a, 1b, and 1c above.

1e. Overhead and Profit by the Contractor Actually Performing the Work: A total amount, not to exceed 10% of items 1a, 1b, and 1c above will be allowed. This is to compensate such contractor for all personnel not defined in 1a above; temporary construction facilities; home office costs; office architecting and estimating costs; profit, and any other cost incidental to the performance of the change in work.

1f. Overhead and Profit by the Contractor and Subcontractor when Subcontractor actually performs the Work:

1. A total amount not to exceed 8% of the total amount of subcontractors proposal as defined in 1d above will be allowed to the Contractor for all overhead and profit to supervise and administer the subcontractors actually performing the change in the work. The Subcontractor doing the work will be allowed no more than 10%. Lower tier sub-subcontractors will be allowed no more than 7%.
2. No direct costs of the Contractor will be allowed to be added to a subcontractor's proposal. Contractor's direct cost, if required, must be submitted as outlined in 1a, 1b, 1c and 1g.

1g. Cost of Any Increase or Decrease in Premium for Insurance and Bond Caused by the Change:

1. Contractor's Liability Insurance: To the above, the costs of the Contractor's Liability Insurance may be increased or decreased.
2. Bond: To the above, the cost of the Contractor's Bond may be increased or decreased.

7.2.4 DEDUCTIVE CHANGES

2a. Items 1a (labor), 1b (material), 1c (equipment), 1d (subcontractor), 1e (overhead and profit, Contractor), 1f (overhead and profit, subcontractor), 1g (insurance and bond) will be itemized for deleted changes in the work.

7.2.5 ADDITIVE CHANGES AND DEDUCTIVE CHANGES TOGETHER

3a. If a change in the work involves both additive and deductive changes, the appropriate overhead and profit amount allowed will be added to the net difference of items 1a, 1b, 1c, and 1d.

3b. If other additive unrelated changed items are included in the same change proposal, the appropriate overhead and profit allowed is to be applied to these individual change items.

ARTICLE 8
TIME

8.2 PROGRESS AND COMPLETION

Add the following new subparagraphs 8.2.4 and 8.2.5:

8.2.4 The Contractor shall furnish such manpower, materials, facilities, and equipment and shall work such hours, including night shifts, overtime operations and Sundays and holidays, as may be necessary to insure the progress and completion of the Work in accordance with the approved and currently updated Progress Schedule. If work actually in place falls behind the currently updated and approved Progress Schedule and it becomes apparent from the current schedule that the Work will not be completed within the Contract Time, the Contractor agrees that he will, as necessary, take some or all of the following actions at no additional cost to the Owner, as required to substantially eliminate tardiness of Work:

1. Increase the manpower in such quantities and crafts as will substantially eliminate, in the opinion of the Owner, the backlog of Work.
2. Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of equipment, or any combination of the foregoing sufficiently to substantially eliminate, in the opinion of the Owner, the backlog of Work; and
3. Reschedule activities to achieve maximum practical concurrency of accomplishment of activities.

8.2.5 The Contractor and Owner acknowledge and contemplate that delay in substantial completion and final completion will cause the Owner substantial damages which are difficult to determine precisely. To the extent the Owner is unable to beneficially occupy each of the facilities which are the subject of this Contract, the Owner is expected to experience damages and costs including but not limited to the

following: Loss of use of the facility; the costs of delayed move-in and the disruption of Owner activities and schedule; and rescheduling and shift changes to paid personnel. The parties therefore agree that the following sums of liquidated damages shall be paid to the Owner or the Owner may withhold payments otherwise due to the Contractor in liquidation of these difficult to measure damages and/or delay costs reasonably anticipated as a result of delays beyond the dates as established in the Contract, as they may be extended by agreement of the parties by change order during the course of the project:

SUBSTANTIAL COMPLETION: For each calendar day after the date fixed for Substantial Completion and until Substantial Completion of the facilities, the Contractor shall pay the Owner the sum of five hundred dollars (**$500)** per day. The Owner shall not be required to accept Substantial Completion of anything less than the entirety of the project but shall have the option to do so. This sum is to be fixed, agreed, liquidated damages and not to be construed as in any sense a penalty.
FINAL COMPLETION: Actual damages will be assessed for failure to achieve Final Completion within (30) days after Substantial Completion. Actual damages will be calculated on the basis of direct architectural, administrative, and other related costs attributed to the Project from the date when Final Completion should have been achieved, to the date Final Completion is actually achieved. Owner may offset these costs against any payment due to the Contractor by reduction in retainage.

8.3 DELAYS AND EXTENSIONS OF TIME

Change subparagraph 8.3.3 to read:

8.3.3 Except as provided in this subparagraph, the Contractor's sole remedy for delays shall be an extension of time. Except for unreasonable delays in performance caused by the acts or omissions of the Owner, the Contractor shall not be entitled to damages, extra compensation or equitable adjustment for direct, indirect or impact damages for delay, including but not limited to cost of acceleration, home office overhead or lost profits. All claims for damages or extensions of time are subject to the requirements of Article 15. In the event the Contractor is entitled to damages from the Owner for delay, it is agreed that the Contractor's sole damages for each day of delay shall be limited to the daily liquidated damage rate provided for the Owner in subparagraph 8.2.5 above.

ARTICLE 9
PAYMENT AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT

Change sub paragraph 9.3.2 to read:

9.3.2 If authorized by the 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, subject to Owner's approval, for material stored off the Project site, provided the Contractor complies with or furnishes satisfactory evidence of the following:

1. The material will be placed in a warehouse that is structurally sound, dry, lighted and suitable for the materials to be stored;
2. The warehouse is located within a 25-mile radius of the project. Other locations may be utilized, if approved in writing, by Owner;
3. Only materials for the Project are stored within the warehouse or a secure portion of a warehouse set aside for the Project;
4. 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. The warehouse or secure portion thereof is continuously under lock and key, and only Contractor's authorized personnel shall have access;
6. Owner shall at all times have the right of access in company of the Contractor;
7. Contractor and its surety assume total responsibility for the stored materials; and
8. 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.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

Add the following to subparagraph 9.5.1:
The Architect may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or part of a Certificate for Payment previously issued, or the Owner may refuse to process an application for payment to such extent as may be necessary in the Owner's or Architect's opinion to protect the Owner from loss because of:

Add the following new subparagraphs 9.5.1.8 through 9.5.1.12:
9.5.1.8 Unsatisfactory prosecution of the Work by the Contractor, including but not limited to failure to carry out the Work in accordance with the Contract Documents.
9.5.1.9 Failure or refusal of the Contractor to fully comply with requirements in the Contract Documents for preparation and submission of scheduling of the Work and updates thereof, or failure to present statements of Intents or Affidavits pertaining to prevailing wages paid as may be required by statue.
9.5.1.10 Liquidated damages.
9.5.1.11 Failure to provide adequate security measures to protect materials stored on site for which the Contractor is seeking payment for.
9.5.1.12 Failure to provide evidence that the performance and payment bonds have been increased to equal the sum of Change Orders.

9.6 PROGRESS PAYMENTS

Add the following new subparagraphs 9.6.9 through 9.6.14:
9.6.9 Upon Commencement of the Work and at the option of the Contractor, an escrow account may be established by the Contractor in a financial institution chosen by the Contractor and approved by the Owner.
9.6.10 The escrow agreement shall provide that the financial institution will act as escrow agent, will pay interest on funds deposited in such account in accordance with the provisions of the escrow agreement and will disburse funds from the account upon the direction of the Owner as set forth below. Compensation to the escrow agent for establishing and maintaining the escrow account shall be paid from interest accrued in the escrow account.
9.6.11 As each progress payment is made, the retainage with respect to that payment shall be deposited by the Owner in the escrow account.
9.6.12 The interest earned on funds in the account shall accrue for the benefit of the Contractor until the substantial completion date named in the Construction Contract or the expiration of any authorized extension of such date. Interest earned after such date shall accrue for the benefit of the Owner. Cost of compensation to the escrow agent paid out of interest earned shall be borne by the Contractor.
9.6.13 When the Contractor has fulfilled all of the requirements of the Contract providing for reduction of retained funds, the escrow agent shall release to the Contractor one-half of the accrued funds but none of the interest thereon. When the Work has been fully completed in a satisfactory manner and the Architect has issued a final Certificate for Payment, the escrow agent shall pay to the Contractor the full amount of funds remaining in the account, including net balance of the interest paid to the account, but less any interest that may have accrued for the benefit of the Owner, which shall be paid to the Owner.
9.6.14 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor, the escrow agent shall make payment to the Contractor as provided in Subparagraph 9.10.3

9.8 SUBSTANTIAL COMPLETION

Change subparagraph 9.8.1 to read:
9.8.1 Substantial Completion is the stage in the progress of the Work or portion thereof designated and approved by the Architect and Owner when the construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can fully occupy under necessary permits the Work or portion thereof designated by the Owner for the use for which it is intended. All Work other than incidental corrective or punch list work and final cleaning shall have been completed.

Change subparagraph 9.8.5 to read:

9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of the responsibilities assigned to the in such Certificate.

Add the following new subparagraph 9.8.6:
9.8.6 The acceptance of Substantial Completion payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the application for payment for the Substantial Completion payment, and except for the Contract Sums due at Final Acceptance.

9.10 FINAL COMPLETION AND FINAL PAYMENT
Add the following to this subparagraph 9.10.1:
The Architect's final Certificate of Payment shall establish the date of Final Completion. If the Contractor notifies the Architect that the punch list items are completed and requests an inspection to determine compliance, and the Architect determines that some or all the punch list items are not completed, the Contractor shall be responsible to the Owner for all costs, including Architect's fees, for any future Architect's inspections after the first inspection to determine subsequent compliance with the punch list.
Delete from subparagraph 9.10.2: Delete "remaining" from the first sentence.

ARTICLE 10
PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

Add the following new subparagraph10.2.9:
10.2.9 At all times until final acceptance of the Work, the Contractor shall protect from damage, weather, deterioration, theft, vandalism, and, malicious mischief all materials, equipment, tools, and other items incorporated or to be incorporated in the Work, or consumed or used in the performance of the Work, and all Work in process and completed Work.

ARTICLE 11
INSURANCE

11.1 CONTRACTOR'S LIABILITY INSURANCE
Add the following new subparagraphs 11.1.1.1 through 11.1.1.10:
11.1.1.1 Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:

1. Premises operations including X, C and U coverage's as applicable.
2. Independent Contractors' Protective.
3. Products and Completed Operations.
4. Personal Injury Liability with Employment Exclusion deleted.
5. Contractual, including specified provision for Contractor's obligation under Paragraph 3.18.
6. Owned, non-owned and hired motor vehicles.
7. Broad Form Property Damage including Completed Operations.

11.1.1.2 If the General Liability coverage's are provided by a Commercial General Liability Policy on a claims-made basis, the policy date or Retroactive Date shall predate the Contract; the termination date of the policy or applicable extended reporting period shall be no earlier than the termination date of coverage's required to be maintained after final payment, certified in accordance with Subparagraph 9.10.2.

11.1.1.3 The Contractor shall provide an original of the executed insurance policy Endorsements to the Owner prior to commencement of the work.

11.1.1.4 Upon request of the Owner, the Contractor shall provide complete, certified copies of all required insurance polices.

11.1.1.5 The Contractor shall provide bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through the Contractor's usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal 100 percent of the Contract Sum and modified throughout the contract period to include all change orders and sales tax.

Add the following new subparagraphs:
11.1.1.6 The Contractor shall deliver the required bonds to the Owner no later than ten days following the Notice of Award and shall also be submitted with the signed and executed contract.
11.1.1.7 Bonds shall be obtained from companies holding certificates of authority as acceptable sureties pursuant to 31 CFR part 223.
11.1.1.8 Provide bonds executed by surety company or companies authorized to transact business in State in which the project is being constructed. Required form: Performance Bond and Payment Bond AIA-A312, March 1984. Bonding company as approved by Owner.
11.1.1.9 Provide originals of the executed bonds to the Owner, complete with original ink signatures and original stamps/embossing.
11.1.1.10 Provide proof of bond rider adjustments in the bond sum for Change Orders in conjunction with requests for progress payments.

Add the following paragraph 11.6:
11.6 HOLD HARMLESS STATEMENT
11.6.1 The Contractor agrees to defend, indemnify and save harmless the Owner, Architect, and their agents, and employees against any and all loss, damage, liability, claims, demands or costs resulting from injury or harm to persons or property (including, with limitation, the Contractor's employees or property) arising out of or in any way connected with Contractor's performance hereof, excepting only such injury or harm as may have been caused solely by the fault or negligence of the Owner, Architect, and their agents, and employees, and shall be deemed to include those of subcontractors.

ARTICLE 13
MISCELLANEOUS PROVISIONS

13.4 TESTS AND INSPECTIONS
Add the following new subparagraph:
13.4.7 No acceptance by the Owner of any Work shall be construed to result from any inspection, tests or failures to inspect by the Owner, the Owner’s representative, the Architect or any other person. No inspection, test, failure to inspect or test, or failure to discover any defect or non conformity by the Owner, the Owner’s representative, the Architect or any other person shall relieve the Contractor of its responsibility for meeting the requirements of the Contract Documents or impair the Owner’s right to reject defective or nonconforming items or right to avail itself of any other remedy to which the Owner may be entitled, notwithstanding the Owner’s knowledge of the defect or nonconformity, its substantially or the ease of discovery.

[Add the following new paragraph 13.6:

13.6 EQUAL OPPORTUNITY

13.6 The Contractor shall maintain policies of employment as follows:

13.6.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, sexual orientation, marital status, physical and mental disabilities, or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth policies of nondiscrimination.

13.6.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, sexual orientation, marital status, physical and mental disabilities, or national origin.
]

ARTICLE 14
TERMINATION OR SUSPENSION OF THE CONTRACT

14.2 TERMINATION BY THE OWNER FOR CAUSE

Change subparagraph 14.2.1 to read:

14.2.1 The Owner may, upon seven days' written notice to the Contractor, terminate without prejudice to any right or remedy of the Owner the whole or any portion of the Work for cause, including the following circumstances:

1. the Contractor fails to prosecute the Work or any portion thereof with sufficient diligence to ensure the Substantial Completion of the Work within the Contract Time;
2. the Contractor is in material default of any provision of the Contract;
3. the Contractor is adjudged bankrupt, makes a general assignment for the benefit of its creditors, or if a receiver is appointed on account of its insolvency;
4. the Contractor fails to supply a sufficient number of properly skilled workers or proper materials;
5. the Contractor fails to make prompt payment due to Subcontractors or for materials or labor;
6. the Contractor disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction; or
7. the Contractor materially breaches any provision of the Contract Documents.

Add the following new subparagraph:

14.2.5 If the Owner terminates in whole or part the Work pursuant to paragraph 14.2, the Owner may procure, upon such terms and in such manner as it deems appropriate, supplies or services similar to those terminated, and the Contractor shall be liable to the Owner for any excess costs for such similar supplies or services. The Contractor shall continue to perform of this Contract to the extent not terminated hereunder.

ARTICLE 15
ADMINISTRATION OF THE CONTRACT

15.1 CLAIMS AND DISPUTES

Add the following new subparagraphs 15.1.8 and 15.1.9:

15.1.8 All Claims filed against Owner shall be subject to audit at any time following the filing of the Claim. Failure of Contractor, or Subcontractor 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 recovery. 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.

15.1.9 The Contract Documents and the rights of the parties herein shall be governed by the laws of the State of Washington. Venue for all dispute resolution proceedings including, but not limited to, mediation, arbitration, and litigation shall be in the county in which the Owner's principal place of business is located, unless otherwise specified.

END OF SECTION

SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Project information.
   2. Work covered by Contract Documents.
   3. Phased construction.
   4. Work by Owner.
   5. Work under separate contracts.
   6. Future work.
   7. Purchase contracts.
   8. Owner-furnished products.
   9. Contractor-furnished, Owner-installed products.
   10. Access to site.
   11. Coordination with occupants.
   12. Work restrictions.
   13. Specification and Drawing conventions.
   14. Miscellaneous provisions.

1.03 PROJECT INFORMATION

A. Project Identification:
   1. 163 Village Court, Monroe, WA 98272

B. Owner: Snohomish Regional Fire and Rescue, 163 Village Court, Monroe, WA 98727

1.04 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
   1. Scope of work includes removal of existing tent structure at North end of the existing building and constructing a new fire apparatus maintenance shop addition, approximately 3,000SF. Existing open air maintenance area at Northwest corner of the existing building will be enclosed. Existing storage containers at Northwest corner of the project site will be removed and new carport, approximately 2,000SF, is to be built for vehicle charging.

1.05 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract.
   1. _____

C. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory Work under this Contract.
   1. _____

1.06 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products.

B. Owner-Furnished Products:
   1. See Equipment Schedule on drawings.

1.07 ACCESS TO SITE

A. General: Each Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.08 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. Restricted Substances: Use of controlled substances on Project site is not permitted.

1.09 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 2300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Description of alternates.
- B. Procedures for alternates.
- C. Acceptance of alternates.

1.02 DEFINITIONS
- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  1. The cost or credit for each Alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.03 SUBMITTALS
- A. Schedule of expiration date for each alternate.

1.04 DESCRIPTION OF ALTERNATES
- A. Alternate No.1: Carport.
  1. Remove existing Conex boxes and associated concrete foundation/slab, provide new pre-engineered metal building carport, provide lighting and electrical wiring/conduit for power. See drawings for additional information.
- B. Alternate No. 2: Re-Roof Entire Building
  1. See Section 07 5216 - SBS Modified Bituminous Membrane Roofing for roofing details.

1.05 PROCEDURES FOR ALTERNATES
- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the Alternate into Project.
  1. Include as part of each Alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of Alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each Alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.

1.06 ACCEPTANCE OF ALTERNATES
- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option.
- B. Coordinate related work and modify surrounding work to integrate the Work of each alternate.
- C. Owner, Architect and Contractor to define schedule of alternate expiration dates. Alternates are considered void once the expiration dates have passed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 01 6000 - Product Requirements for requirements for submitting comparable product submittals for products by listed manufacturers.

1.03 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.04 ACTION SUBMITTALS

A. Substitution Requests: Submit one copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use Substitution Request form found in Section 01 2500A immediately following this section.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    e. Samples, where applicable or requested.
    f. Certificates and qualification data, where applicable or requested.
    g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.

j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 5 working days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 10 working days of receipt of request, or five working days of receipt of additional information or documentation, whichever is later.
   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
   b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.05 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.06 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 10 working days prior to time required for preparation and review of related submittals.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      b. Requested substitution provides sustainable design characteristics that specified product provided.
      c. Substitution request is fully documented and properly submitted.
      d. Requested substitution will not adversely affect Contractor's construction schedule.
      e. Requested substitution has received necessary approvals of authorities having jurisdiction.
      f. Requested substitution is compatible with other portions of the Work.
      g. Requested substitution has been coordinated with other portions of the Work.
      h. Requested substitution provides specified warranty.
      i. If requested substitution involves more than one Contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is

compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed unless otherwise indicated.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within 10 working days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
   a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
   b. Requested substitution does not require extensive revisions to the Contract Documents.
   c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   d. Requested substitution provides sustainable design characteristics that specified product provided.
   e. Substitution request is fully documented and properly submitted.
   f. Requested substitution will not adversely affect Contractor's construction schedule.
   g. Requested substitution has received necessary approvals of authorities having jurisdiction.
   h. Requested substitution is compatible with other portions of the Work.
   i. Requested substitution has been coordinated with other portions of the Work.
   j. Requested substitution provides specified warranty.
   k. If requested substitution involves more than one Contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 EXECUTION (NOT USED)

END OF SECTION

012500-A - SUBSTITUTION REQUEST FORM

To: Architect: Rice Fergus Miller, Inc.
275 5th Street, Suite 100
Bremerton, Washington 98337

Contractor: _____

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

Section Paragraph Specified Item

Proposed Substitution:

Attachments: (If not applicable, write N/A left of item number.)

No. 1: Complete product data.
No. 2: Drawings showing dimensional changes and other change to drawings.
No. 3: Complete description of all changes to specifications.
No. 4: Description of effect on other trades, other contracts, and contract completion date.
No. 5: List of differences between proposed and specified items.
No. 6: List of names and addresses of three similar projects on which product was used, date of installation, and Architect's name and address.
No. 7: Cost impact.

Undersigned attests function and quality equivalent or superior to specified item.

Submitted by: (Person and Firm) _____

Date_____Phone_____Signature_____

Acceptance by Architect:

By:
Date:
Remarks:

Accepted
Accepted as Noted
Not Accepted

END OF SECTION 012500-A

SECTION 01 2600
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 01 2500 - SUBSTITUTION PROCEDURES for administrative procedures for handling requests for substitutions made after the Contract award.

1.03 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.04 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 10 working days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    e. Quotation Form: Use CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail." or forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use CSI Form 13.6A, "Change Order Request (Proposal)," with attachments CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail." or form acceptable to Architect.

1.05 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.06 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 2900
PAYMENT PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 01 2600 - CONTRACT MODIFICATION PROCEDURES for administrative procedures for handling changes to the Contract.
2. Section 01 3200 - Construction Progress Documentation for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.03 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.04 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
   a. Application for Payment forms with continuation sheets.
   b. Submittal schedule.
   c. Items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract as described in Section 01 1000 - Summary

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
   a. Project name and location.
   b. Name of Architect
   c. Architect's project number.
   d. Contractor's name and address.
   e. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703.

3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
        1) Labor.
        2) Materials.
        3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
    a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.05 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application

for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Architect by the 5th of each month. Owner will make payment to the Contractor in 30 calendar days. The period covered by each Application for Payment is one month, ending on the last day of the month.
   1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

E. Application for Payment Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in Project Manual.

F. Application for Payment Forms: Use forms acceptable to Architect and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.

G. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
   4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

H. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
   2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
   3. Provide summary documentation for stored materials indicating the following:
      a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
      b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
      c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

I. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

J. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
   2. When an application shows completion of an item, submit conditional final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

K. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

L. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Report of preconstruction conference.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire Owner's insurance.

M. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

N. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."

5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Notice of Completion of Public Works Contracts received from Public Works, L&I Contractor Release, and Employment Security Department.

O. No final payment shall be made until (a) the Contractor provides to the Owner, prior to the acceptance of the Work, a notarized Certification of Compliance in the form attached hereto as Exhibit A; (b) the Contractor provides to the Owner the Contractor's drawings showing as-built changes and field markings; (c) the Contractor provides to the Owner two copies of the Operating and Maintenance Manuals for equipment and/or systems installed by the Contractor, if applicable; (d) the Owner receives the Certificates of Payments Received by the Washington State Department of Revenue, Employment Security and Labor & Industries; and (e) current status of Contractor's Workers' Comp account is verified.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 3100
PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. Requests for Information (RFIs).
   4. Project Web site.
   5. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
   1. Section 01 3200 - Construction Progress Documentation for preparing and submitting Contractor's construction schedule.
   2. Section 01 7300 - Execution for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Section 01 7700 - Closeout Procedures for coordinating closeout of the Contract.

1.03 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.04 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:
   1. Name, address, and telephone number of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 5 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.05 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Coordination: Each Contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each Contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.06 REQUESTS FOR INFORMATION (RFIS)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
2. Project number.
3. Name of Contractor.
4. Name of Architect.
5. RFI number, numbered sequentially.

6. RFI subject.
7. Specification Section number and title and related paragraphs, as appropriate.
8. Drawing number and detail references, as appropriate.
9. Field dimensions and conditions, as appropriate.
10. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
11. Contractor's signature.
12. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 Software-generated form with substantially the same content as indicated above, acceptable to Architect.
   1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow 10 working days for Architect's response for each RFI. RFIs received by Architect after 3:00 p.m. will be considered as received the following working day.
   1. The following Contractor-generated RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for approval of Contractor's means and methods.
      d. Requests for coordination information already indicated in the Contract Documents.
      e. Requests for adjustments in the Contract Time or the Contract Sum.
      f. Requests for interpretation of Architect's actions on submittals.
      g. Incomplete RFIs or inaccurately prepared RFIs.
   2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
   3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log at Owner Architect Contractor (OAC) Meeting or as requested by Owner or Architect. Use CSI Log Form 13.2B. Software log with not less than the following:
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect.
   4. RFI number including RFIs that were returned without action or withdrawn.
   5. RFI description.
   6. Date the RFI was submitted.
   7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
   1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
   2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.07 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated. Due to Covid restrictions meetings will be conducted via digital tele video technology such as ZOOM.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner and Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing of Owner furnished Items and long-lead items.
      d. Owner Furnished Contractor Installed Items
      e. Designation of key personnel and their duties.
      f. Lines of communications.
      g. Procedures for processing field decisions and Change Orders.
      h. Procedures for RFIs.
      i. Procedures for testing and inspecting.
      j. Procedures for processing Applications for Payment.
      k. Distribution of the Contract Documents.
      l. Submittal procedures.
      m. Preparation of record documents.
      n. Use of the premises.
      o. Work restrictions.
      p. Working hours.
      q. Owner's occupancy requirements.
      r. Responsibility for temporary facilities and controls.
      s. Procedures for moisture and mold control.
      t. Procedures for disruptions and shutdowns.
      u. Construction waste management and recycling.
      v. Parking availability.
      w. Office, work, and storage areas.
      x. Equipment deliveries and priorities.
      y. First aid.
      z. Security.
      aa. Progress cleaning.
   4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
   1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
   2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
      a. Contract Documents.
      b. Options.
      c. Related RFIs.
      d. Related Change Orders.
      e. Purchases.
      f. Deliveries.
      g. Submittals.
      h. Review of mockups.
      i. Possible conflicts.
      j. Compatibility requirements.
      k. Time schedules.
      l. Weather limitations.
      m. Manufacturer's written instructions.
      n. Warranty requirements.
      o. Compatibility of materials.
      p. Acceptability of substrates.
      q. Temporary facilities and controls.
      r. Space and access limitations.
      s. Regulations of authorities having jurisdiction.
      t. Testing and inspecting requirements.
      u. Installation procedures.
      v. Coordination with other work.
      w. Required performance results.
      x. Protection of adjacent work.
      y. Protection of construction and personnel.
   3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
   4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
   5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 14 days prior to the scheduled date of Substantial Completion.
   1. Conduct the conference to review requirements and responsibilities related to Project closeout.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    a. Preparation of record documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. Requirements for completing documentation.
    e. Requirements for preparing operations and maintenance data.
    f. Requirements for delivery of material samples, attic stock, and spare parts.
    g. Requirements for demonstration and training.
    h. Preparation of Contractor's punch list.
    i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    j. Submittal procedures.
    k. Coordination of separate contracts.
    l. Owner's partial occupancy requirements.
    m. Installation of Owner's furniture, fixtures, and equipment.
    n. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at weekly intervals. All meetings to provide digital tele video capabilities if in-person attendance is not required.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
        1) Review schedule for next period.
    b. Review present and future needs of each entity present, including the following:
        1) Interface requirements.
        2) Sequence of operations schedule.
        3) Status of submittals.
        4) Status of documentation.
        5) Deliveries.
        6) Off-site fabrication.
        7) Access.
        8) Site utilization.
        9) Temporary facilities and controls.
        10) Progress cleaning.
        11) Quality and work standards.
        12) Status of correction of deficient items.

13) Field observations.
14) Status of RFIs.
15) Status of proposal requests.
16) Pending changes.
17) Status of Change Orders.
18) Pending claims and disputes.
19) Documentation of information for payment requests.

4. Minutes: General Contractor will be responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
   1. Attendees: In addition to representatives of Owner, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work. Architect shall be invited to the meeting as needed to facilitate coordination questions.
   2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
      a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
      c. Review present and future needs of each contractor present, including the following:
         1) Interface requirements.
         2) Sequence of operations.
         3) Resolution of BIM component conflicts.
         4) Status of submittals.
         5) Deliveries.
         6) Off-site fabrication.
         7) Access.
         8) Site utilization.
         9) Temporary facilities and controls.
         10) Work hours.
         11) Hazards and risks.
         12) Progress cleaning.
         13) Quality and work standards.
         14) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 PRODUCTS (NOT USED)
PART 3 EXECUTION (NOT USED)
END OF SECTION

SECTION 01 3200
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Startup construction schedule.
   2. Contractor's construction schedule.
   3. Construction schedule updating reports.
   4. Daily construction reports.
   5. Material location reports.
   6. Site condition reports.
   7. Special reports.

B. Related Requirements:
   1. Section 01 3300 - Submittal Procedures for submitting schedules and reports.
   2. Section 01 4000 - Quality Requirements for submitting a schedule of tests and inspections.

1.03 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.
   1. Float time belongs to Owner.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.04 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. Working electronic copy of schedule file, where indicated.
   2. PDF electronic file.

3. Two paper copies.

B. Startup construction schedule.
   1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Daily Construction Reports: Submit at weekly intervals.

F. Material Location Reports: Submit at weekly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

1.05 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 PRODUCTS

2.01 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
      a. Insert list of major items or pieces of equipment.
   2. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   3. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
   4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
   5. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Work Restrictions: Show the effect of the following items on the schedule:
   1. Coordination with existing construction.
   2. Limitations of continued occupancies.
   3. Uninterruptible services.
   4. Partial occupancy before Substantial Completion.
   5. Use of premises restrictions.
   6. Provisions for future construction.
   7. Seasonal variations.
   8. Environmental control.

D. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
E. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.02 CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for commencement of the Work the Notice to Proceed the Notice of Award.
B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 30 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.03 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
    1. List of subcontractors at Project site.
    2. List of separate contractors at Project site.
    3. Approximate count of personnel at Project site.
    4. Equipment at Project site.
    5. Material deliveries.
    6. High and low temperatures and general weather conditions, including presence of rain or snow.
    7. Accidents.
    8. Meetings and significant decisions.
    9. Unusual events (see special reports).
    10. Stoppages, delays, shortages, and losses.
    11. Meter readings and similar recordings.
    12. Emergency procedures.
    13. Orders and requests of authorities having jurisdiction.
    14. Change Orders received and implemented.
    15. Construction Change Directives received and implemented.
    16. Services connected and disconnected.
    17. Equipment or system tests and startups.
    18. Partial completions and occupancies.
    19. Substantial Completions authorized.
B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
    1. Material stored prior to previous report and remaining in storage.
    2. Material stored prior to previous report and since removed from storage and installed.
    3. Material stored following previous report and remaining in storage.
C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.04 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling: Contractor shall employ skilled personnel with experience in scheduling and reporting techniques to create the construction schedule.

B. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Architect and Owner. separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

SECTION 01 3300
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 01 2900 - Payment Procedures for submitting Applications for Payment and the schedule of values.
2. Section 01 3200 - Construction Progress Documentation for submitting schedules and reports, including Contractor's construction schedule.
3. Section 01 7823 - Operation and Maintenance Data for submitting operation and maintenance manuals.
4. Section 01 7839 - Project Record Documents for submitting record Drawings, record Specifications, and record Product Data.

1.03 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.04 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:
    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.05 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
    1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
        a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
        b. Digital Drawing Software Program: The Contract Drawings are available in pdf and AutoCAD.
        c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
        d. The following digital data files will by furnished for each appropriate discipline:
            1) Floor plans.
            2) Reflected ceiling plans.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
    1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
    2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
    3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
    4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
        a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
    1. Initial Review: Allow 10 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
    2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
    3. Resubmittal Review: Allow 10 working days for review of each resubmittal.
    4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 7

days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
   1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
   2. Name file with submittal number or other unique identifier, including revision identifier.
      a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
   3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
   4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
      a. Project name.
      b. Name and address of Architect.
      c. Name of Construction Manager.
      d. Name of Contractor.
      e. Name of firm or entity that prepared submittal.
      f. Names of subcontractor, manufacturer, and supplier.
      g. Category and type of submittal.
      h. Submittal purpose and description.
      i. Specification Section number and title.
      j. Specification paragraph number or drawing designation and generic name for each of multiple items.
      k. Drawing number and detail references, as appropriate.
      l. Location(s) where product is to be installed, as appropriate.
      m. Related physical samples submitted directly.
      n. Indication of full or partial submittal.
      o. Transmittal number, numbered consecutively.
      p. Submittal and transmittal distribution record.
      q. Other necessary identification.
      r. Remarks.
   5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
      a. Project name.
      b. Number and title of appropriate Specification Section.
      c. Manufacturer name.
      d. Product name.

E. Options: Identify options requiring selection by Architect.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
   1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 PRODUCTS

2.01 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Contractor shall review and approve submittals prior to issuance to Architect. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Post electronic submittals as PDF electronic files directly to Architect's representative specifically established for Project.
   a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
2. Submit electronic submittals via email as PDF electronic files.
   a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

a. PDF electronic file.
b. Three paper copies of Product Data unless otherwise indicated. Architect will return two copies.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 by 36 inches.
3. Submit Shop Drawings in the following format:
a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.
e. Specification paragraph number and generic name of each item.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the

following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
    1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
    2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
    1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
    2. Manufacturer and product name, and model number if applicable.
    3. Number and name of room or space.
    4. Location within room or space.
    5. Submit product schedule in the following format:
        a. PDF electronic file.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
    1. Name of evaluation organization.
    2. Date of evaluation.
    3. Time period when report is in effect.
    4. Product and manufacturers' names.
    5. Description of product.
    6. Test procedures and results.
    7. Limitations of use.
U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
V. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.02 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
    1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
    1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
C. BIM File Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project.
    1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.

PART 3 EXECUTION

3.01 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

1.03 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope , consisting of multiple products, assemblies, and subassemblies.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.04 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.05 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
   1. Indicate manufacturer and model number of individual components.
   2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.06 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
B. Qualification Data : For Contractor's quality-control personnel.
C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
   1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
   2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.

8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.07 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
   1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
   1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
   2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
   3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.08 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of technical representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement whether conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of factory-authorized service representative making report.
   2. Statement that equipment complies with requirements.
   3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   4. Statement whether conditions, products, and installation will affect warranty.
   5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.09 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented

according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    a. Allow seven days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
   3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:

B. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections and in Statement of Special Inspections attached to this Section, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 ACCEPTABLE TESTING AGENCIES

A. To be determined by Owner prior to construction start

3.02 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.03 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7300 - Execution

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 4200
REFERENCES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.03 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.04 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.

2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
10. AF&PA - American Forest & Paper Association; www.afandpa.org.
11. AGA - American Gas Association; www.aga.org.
12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
14. AI - Asphalt Institute; www.asphaltinstitute.org.
15. AIA - American Institute of Architects (The); www.aia.org.
16. AISC - American Institute of Steel Construction; www.aisc.org.
17. AISI - American Iron and Steel Institute; www.steel.org.
18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
20. ANSI - American National Standards Institute; www.ansi.org.
21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
22. APA - APA - The Engineered Wood Association; www.apawood.org.
23. APA - Architectural Precast Association; www.archprecast.org.
24. API - American Petroleum Institute; www.api.org.
25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
28. ASCE - American Society of Civil Engineers; www.asce.org.
29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
31. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The); www.asse.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.

45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; www.ec-central.org.
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
73. EIA - Electronic Industries Alliance; (See TIA).
74. EIMA - EIFS Industry Members Association; www.eima.com.
75. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
76. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
77. ESTA - Entertainment Services and Technology Association; (See PLASA).
78. EVO - Efficiency Valuation Organization; www.evo-world.org.
79. FM Approvals - FM Approvals LLC; www.fmglobal.com.
80. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
81. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
82. FSA - Fluid Sealing Association; www.fluidsealing.com.
83. FSC - Forest Stewardship Council U.S.; www.fscus.org.
84. GA - Gypsum Association; www.gypsum.org.
85. GANA - Glass Association of North America; www.glasswebsite.com.
86. GS - Green Seal; www.greenseal.org.
87. HI - Hydraulic Institute; www.pumps.org.
88. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
89. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
90. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.

91. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
92. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
93. IAS - International Approval Services; (See CSA).
94. ICBO - International Conference of Building Officials; (See ICC).
95. ICC - International Code Council; www.iccsafe.org.
96. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
97. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
98. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
99. IEC - International Electrotechnical Commission; www.iec.ch.
100. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
101. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
102. IESNA - Illuminating Engineering Society of North America; (See IES).
103. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
104. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
105. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
106. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
107. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
108. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
109. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
110. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
111. ISO - International Organization for Standardization; www.iso.org.
112. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
113. ITU - International Telecommunication Union; www.itu.int/home.
114. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
115. LMA - Laminating Materials Association; (See CPA).
116. LPI - Lightning Protection Institute; www.lightning.org.
117. MBMA - Metal Building Manufacturers Association; www.mbma.com.
118. MCA - Metal Construction Association; www.metalconstruction.org.
119. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
120. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
121. MHIA - Material Handling Industry of America; www.mhia.org.
122. MIA - Marble Institute of America; www.marble-institute.com.
123. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
124. MPI - Master Painters Institute; www.paintinfo.com.
125. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
126. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
127. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
128. NADCA - National Air Duct Cleaners Association; www.nadca.com.
129. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
130. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
131. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
132. NCMA - National Concrete Masonry Association; www.ncma.org.
133. NEBB - National Environmental Balancing Bureau; www.nebb.org.

134. NECA - National Electrical Contractors Association; www.necanet.org.
135. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
136. NEMA - National Electrical Manufacturers Association; www.nema.org.
137. NETA - InterNational Electrical Testing Association; www.netaworld.org.
138. NFHS - National Federation of State High School Associations; www.nfhs.org.
139. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
140. NFPA - NFPA International; (See NFPA).
141. NFRC - National Fenestration Rating Council; www.nfrc.org.
142. NHLA - National Hardwood Lumber Association; www.nhla.com.
143. NLGA - National Lumber Grades Authority; www.nlga.org.
144. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
145. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
146. NRCA - National Roofing Contractors Association; www.nrca.net.
147. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
148. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
149. NSPE - National Society of Professional Engineers; www.nspe.org.
150. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
151. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
152. NWFA - National Wood Flooring Association; www.nwfa.org.
153. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
154. PDI - Plumbing & Drainage Institute; www.pdionline.org.
155. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
156. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
157. RFCI - Resilient Floor Covering Institute; www.rfci.com.
158. RIS - Redwood Inspection Service; www.redwoodinspection.com.
159. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
160. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
161. SDI - Steel Deck Institute; www.sdi.org.
162. SDI - Steel Door Institute; www.steeldoor.org.
163. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
164. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
165. SIA - Security Industry Association; www.siaonline.org.
166. SJI - Steel Joist Institute; www.steeljoist.org.
167. SMA - Screen Manufacturers Association; www.smainfo.org.
168. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
169. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
170. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
171. SPIB - Southern Pine Inspection Bureau; www.spib.org.
172. SPRI - Single Ply Roofing Industry; www.spri.org.
173. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
174. SSINA - Specialty Steel Industry of North America; www.ssina.com.
175. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
176. STI - Steel Tank Institute; www.steeltank.com.
177. SWI - Steel Window Institute; www.steelwindows.com.
178. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
179. TCA - Tilt-Up Concrete Association; www.tilt-up.org.

180. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
181. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
182. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
183. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
184. TMS - The Masonry Society; www.masonrysociety.org.
185. TPI - Truss Plate Institute; www.tpinst.org.
186. TPI - Turfgrass Producers International; www.turfgrasssod.org.
187. TRI - Tile Roofing Institute; www.tileroofing.org.
188. UBC - Uniform Building Code; (See ICC).
189. UL - Underwriters Laboratories Inc.; www.ul.com.
190. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
191. USAV - USA Volleyball; www.usavolleyball.org.
192. USGBC - U.S. Green Building Council; www.usgbc.org.
193. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
194. WASTEC - Waste Equipment Technology Association; www.wastec.org.
195. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
196. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
197. WDMA - Window & Door Manufacturers Association; www.wdma.com.
198. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
199. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
200. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
201. WPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
   1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
   2. ICC - International Code Council; www.iccsafe.org.
   3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.
   1. COE - Army Corps of Engineers; www.usace.army.mil.
   2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
   3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
   4. DOD - Department of Defense; http://dodssp.daps.dla.mil.
   5. DOE - Department of Energy; www.energy.gov.
   6. EPA - Environmental Protection Agency; www.epa.gov.
   7. FAA - Federal Aviation Administration; www.faa.gov.
   8. FG - Federal Government Publications; www.gpo.gov.
   9. GSA - General Services Administration; www.gsa.gov.
   10. HUD - Department of Housing and Urban Development; www.hud.gov.
   11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
   12. OSHA - Occupational Safety & Health Administration; www.osha.gov.

13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeia; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
   1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
   2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
   3. DSCC - Defense Supply Center Columbus; (See FS).
   4. FED-STD - Federal Standard; (See FS).
   5. FS - Federal Specification; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
      a. Available from Defense Standardization Program; www.dsp.dla.mil.
      b. Available from General Services Administration; www.gsa.gov.
      c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
   6. MILSPEC - Military Specification and Standards; (See DOD).
   7. USAB - United States Access Board; www.access-board.gov.
   8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
   1. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
   2. CCR - California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
   3. CDHS - California Department of Health Services; (See CDPH).
   4. CDPH - California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
   5. CPUC - California Public Utilities Commission; www.cpuc.ca.gov.
   6. SCAQMD - South Coast Air Quality Management District; www.aqmd.gov.
   7. TFS - Texas Forest Service; Forest Resource Development and Sustainable Forestry; http://txforestservice.tamu.edu.

PART 2 PRODUCTS (NOT USED)
PART 3 EXECUTION (NOT USED)
END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.03 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Owner will pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Owner will pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.

E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.04 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of work.

2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste handling procedures.
5. Other dust-control measures.

1.05 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.06 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 PRODUCTS

2.01 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.
B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.
C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
D. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.
E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.02 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
    1. Store combustible materials apart from building.

2.03 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
    1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
    2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
    3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section

01 7700 "Closeout Procedures".

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
   1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. Coordinate with Owner for location of temporary facilities.

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
   1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
      a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
      b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
   2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
   3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
   1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

H. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

I. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Install electric power service underground unless otherwise indicated.
   2. Connect temporary service to Owner's existing power source, as directed by Owner.

J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
   2. Install lighting for Project identification sign.

3.03 SUPPORT FACILITIES INSTALLATION

A. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

B. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.

C. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
   1. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
      a. Provide temporary, directional signs for construction personnel and visitors.
   2. Maintain and touchup signs so they are legible at all times.

D. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

F. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

G. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
   1. Do not load elevators beyond their rated weight capacity.
   2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

H. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
   1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
   1. Comply with work restrictions specified in Section 01 1000 - Summary
C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 31 1000 - Site Clearing
D. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
E. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
F. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.
   1. Construct covered walkways using scaffold or shoring framing.
   2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
   3. Paint and maintain appearance of walkway for duration of the Work.
G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
H. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
   1. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
   2. Protect air-handling equipment.
   3. Provide walk-off mats at each entrance through temporary partition.
I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
   1. Prohibit smoking in construction areas.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.05 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
   1. Protect porous materials from water damage.
   2. Protect stored and installed material from flowing or standing water.
   3. Keep porous and organic materials from coming into prolonged contact with concrete.

4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Periodically collect and remove waste containing cellulose or other organic matter.
   4. Discard or replace water-damaged material.
   5. Do not install material that is wet.
   6. Discard, replace, or clean stored or installed material that begins to grow mold.
   7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Use permanent HVAC system to control humidity.
   3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
      a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
      b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
      c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.06 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of Contractor.
   2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 7700 - Closeout Procedures

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A . Silt control measures.

B . Temporary stormwater runoff control.

C . Measures to keep streets clean.

D . Polyethylene (PE) sheeting cover for exposed soil.

E . Maintaining, monitoring, and supplementing silt control and stormwater runoff control measures.

1.02 RELATED REQUIREMENTS

A . Section 31 2335 - Excavating, Backfilling, and Compacting for Utilities and Structures

B . Section 33 4000 - Storm Drainage Utilities

1.03 REFERENCE STANDARDS

A . WSDOT Standard Specifications – Washington State Department of Transportation 2024 Standard Specifications for Road, Bridge, and Municipal Construction.

1.04 SUBMITTALS

A . Comply with 01 3000.

B . Product Submittals: Product catalog cuts for filter fabric and silt sac inserts.

1.05 REGULATORY REQUIREMENTS

A . All Work and material shall be in accordance with WSDOT Standard Specifications.

1.06 SEQUENCING AND SCHEDULING

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

1.07 MAINTENANCE

A . Maintain erosion control through duration of project.

B . Maintain erosion control after substantial completion per this section.

PART 2 - PRODUCTS

2.01 MATERIALS

A . Filter Fabric Fence: WSDOT Standard Specifications Section 9-33, Table 6, Geotextile for Temporary Silt Fence.

B . Compost Socks: WSDOT Standard Specifications Section 9-14.5(6).

C . Orange Protective Fence: Minimum 3 feet tall, heavy plastic, with readily visible mesh, minimum mesh width 0.4 inches.

D . Filter Bag Inserts: Commercially manufactured filter bags specifically manufactured for silt filtering and which will provide filtering performance required.

E . Polyethylene (PE) Sheeting: WSDOT Standard Specifications Section 9-14.5(3).

PART 3 - EXECUTION

3.01 PREPARATION

A . Locate existing utilities, avoid damage or disturbance. For aid in utility location call “Dial Dig 1-800-424-5555,” 48 hours (two working days) prior to beginning construction. There are utilities on site that Dial Dig will not locate. Employ and pay for locator service to locate and mark utilities in addition to “DIAL DIG” service.

B . Survey limits of Work to install orange construction.

C . Perform clearing or other work required to install erosion control.

3.02 CONSTRUCTION

A . Filter Fabric Fence: Field-adjust location to perimeter of clearing and stripping. Location shown on Drawings is schematic. Cast trench excavation soils from fence installation to Construction side of fence. Overlap filter fabric fence joints minimum 1 foot prior to backfilling trench.

B . Polyethylene Sheeting: Overlap joints minimum 28 inches. Overlap in direction of drainage and prevent water from draining onto material being protected. Secure in place to prevent movement and damage. Provide sandbags at 2.5 feet spacing and tie sand bags together with rope on slopes greater than 3:1. Minimize driving stakes through plastic.

C . Compost Socks: Apply compost socks on exposed soils not protected by other means.

3.03 FIELD QUALITY CONTROL

A . Site Inspection: Comply with WSDOE requirements.

3.04 ADJUSTMENTS AND REVISIONS

A . Adjust or move swales, berms, pipes, pumps, culverts, bales, and silt fences as necessary during construction to direct site runoff to sediment trap.

3.05 PROTECTION AND MAINTENANCE

A . Protection:

1. Where possible, maintain natural vegetation for silt control.
2. Prevent silt-laden water from leaving site or from entering off-site storm sewer systems.
3. Stabilize slope, cut, or fill areas where Work is stopped for more than 30 days by mulching, polyethylene sheeting, or other method to prevent erosion and sediment transport.
4. Keep off-site parking areas, fire access, sidewalks and streets clean from construction activities. Keep paved surfaces clean using mechanical sweeping equipment, hand shovels, brooms, or other accepted methods suitable for removing dirt, rock, silt, and sand. No street washing will be allowed.

B . Supplementary Measures: Provide additional silt control and temporary erosion control measures required to protect soils and prevent silt-laden runoff from leaving project site.

C . Maintenance: Monitor and maintain silt control measures. Maintain temporary erosion control facilities until need for each facility is superseded by other stabilization methods or until Architect authorizes removal.

D . Inspect and repair temporary erosion control facilities. Inspect entire system to ensure proper operation minimum of once per week, during and after storms, and prior to weekends and holidays.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 01 2500 - SUBSTITUTION PROCEDURES for requests for substitutions.
2. Section 01 4200 - References for applicable industry standards for products specified.

1.03 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.04 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 5 working days of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 10 working days of receipt of request, or 5 working days of receipt of additional information or documentation, whichever is later.
    a. Form of Approval: As specified in Section 01 3300 "Submittal Procedures."
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 3300 - Submittal Procedures Show compliance with requirements.

1.05 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
   1. Each Contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
   2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
   1. Store products to allow for inspection and measurement of quantity or counting of units.
   2. Store materials in a manner that will not endanger Project structure.
   3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
   5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   6. Protect stored products from damage and liquids from freezing.
   7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.07 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.

3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 001 7700 - Closeout Procedures

PART 2 PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.
   5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
   6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
   1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   3. Products:
      a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
      b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
   4. Manufacturers:
      a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
      b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
   5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics

that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
   1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 2500 - SUBSTITUTION PROCEDURES for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.02 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
   1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
   2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   3. Evidence that proposed product provides specified warranty.
   4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
   5. Samples, if requested.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 7300
EXECUTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. Installation of the Work.
   4. Cutting and patching.
   5. Coordination of Owner-installed products.
   6. Progress cleaning.
   7. Starting and adjusting.
   8. Protection of installed construction.

B. Related Requirements:
   1. Section 01 1000 "Summary" for limits on use of Project site.
   2. Section 01 3300 "Submittal Procedures" for submitting surveys.
   3. Section 01 7700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
   4. Section 02 4119 "Selective Demolition" for demolition and removal of selected portions of the building.
   5. Section 07 8413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.03 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.04 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
   1. Contractor is required to allow Owner to inspect all walls, ceilings, all finished spaces and all elements therein to validate the quality of the work and the presence and location of all required elements in the walls, ceilings and all finished spaces.
   2. Concealed Elements: Contractor is required to allow Owner to inspect all work before it is concealed.
   3. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
   4. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

a. Primary operational systems and equipment.
b. Fire separation assemblies.
c. Air or smoke barriers.
d. Fire-suppression systems.
e. Mechanical systems piping and ducts.
f. Control systems.
g. Communication systems.
h. Fire-detection and -alarm systems.
i. Conveying systems.
j. Electrical wiring systems.
k. Operating systems of special construction.

5. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Exterior curtain-wall construction.
   d. Sprayed fire-resistive material.
   e. Equipment supports.
   f. Piping, ductwork, vessels, and equipment.
   g. Noise- and vibration-control elements and systems.
6. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services,

and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Owner will have the option to inspect all walls before Gypsum board is applied.
3. No existing and abandoned items (i.e. plumbing lines, gas lines, electrical conduit) will be left in place. All existing items will be removed and disposed of.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
6. Owner will examine all concealed spaces before wall face or ceilings are installed. Contractor will let Owner know in weekly construction meetings when concealed spaces will be available for inspection.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 3100 "Project Management and Coordination."

3.03 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. Storage of all construction tools and materials will be maintained in/on locations that have been approved by Owner prior to commencement of construction activities.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.
F. Contractor will secure and lock all supplies and tools at the end of each day in the designated contractor laydown areas. Owner is not responsible for tools or supplies that go missing. No tools or supplies will be left in the construction area without prior Owner approval.

3.04 HOURS OF WORK

1. Work taking place inside of the Existing Emergency Department or adjacent areas on the first floor must take place between 6:00 am and 4:00 PM and be scheduled through owner.
2. Limit conduct of especially noisy work to hours designated by Owner.
3. Construction in the basement must first be coordinated with the Owner. In essence the rooms will need to be scheduled through Owner for construction activity. Contractor should anticipate at least one weeks' notice to schedule rooms.

3.05 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.
B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
   1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
   2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
   2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
   3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
   1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
   2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.06 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. NVH Permits. A standing “Hot Works Permit” will be permitted to the Contractor for work inside the construction zone. Any work outside the construction zone, i.e., inside the existing hospital, will require Hot Works Permit for each instance of that work and any time the Contractor works above the ceiling in the existing facility, they will be required to take out an Above-Ceiling Work Permit. These are secured through the Facilities office.

D. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

E. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

F. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

G. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

H. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

I. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

J. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

K. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.07 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
    1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
    2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
    3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
    4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
    5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
    6. Proceed with patching after construction operations requiring cutting are complete.
H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
    1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
    2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
        a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
        b. Restore damaged pipe covering to its original condition.
    3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
        a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
    4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
    5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.08 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.09 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
   a. Use containers intended for holding waste materials of type to be stored.
4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 7419 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.10 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.11 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Salvaging nonhazardous demolition and construction waste.
   2. Recycling nonhazardous demolition and construction waste.
   3. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:
   1. Section 02 4116 "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements.
   2. Section 02 4119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.

1.03 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.04 ACTION SUBMITTALS

A. Waste Management Plan: Consult with Owner regarding Salvaging, recycling and disposal of construction and demolition waste. Wherever possible recycle construction and/or demolition waste.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PLAN IMPLEMENTATION

A. General: Implement approved waste management process as agreed with Owner. plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
   2. Comply with Section 01 5000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.02 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
   3. Store items in a secure area until installation.
   4. Protect items from damage during transport and storage.
   5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
B. Salvaged Items for Sale and Donation: Are not permitted on Project site. Owner will have first right of refusal on all salvaged waste material. Salvaged waste cannot be stored on site.
C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's storage area designated by Owner.
   5. Protect items from damage during transport and storage.
D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
F. Plumbing Fixtures: Separate by type and size.
G. Lighting Fixtures: Separate lamps by type and protect from breakage.
H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.03 RECYCLING CONSTRUCTION WASTE

A. Packaging:
   1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
   2. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
   3. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
B. Wood Materials:
   1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
   2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

3.04 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction. No construction waste can be sold or given away on the project site.
   1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
B. Burning: Do not burn waste materials.
C. Disposal: Remove waste materials and dispose of at designated spoil areas on Owner's property.

D. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 7700
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

B. Related Requirements:
   1. Section 01 7300 "Execution" for progress cleaning of Project site.
   2. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
   3. Section 01 7839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.03 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.04 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.06 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
   3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 7900 "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.07 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 01 2900 "Payment Procedures."
2. Contractor shall submit all prevailing wage affidavits for the history of the project.
3. Contractor shall submit to Owner a set of record drawings not all changes from design that were incorporated during construction.
4. Contractor shall submit to Owner lien releases for general contractor and all sub-contractors.
5. Before final payment can be released, Washington State Labor and Industries, Washington Department of Revenue and Washington State Employment Security, must

have released Contractor from its respective responsibilities.

6. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
7. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
8. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.08 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.
   1. Organize list of spaces in sequential order.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Name of Architect.
      c. Name of Contractor.
      d. Page number.
   4. Submit list of incomplete items in the following format:
      a. MS Excel electronic file. Architect will return annotated file.
      b. PDF electronic file. Architect will return annotated file.
      c. Three paper copies. Architect will return two copies.

1.09 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
   1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
   1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 EXECUTION

3.01 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
      a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
      c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
      d. Remove tools, construction equipment, machinery, and surplus material from Project site.
      e. Remove snow and ice to provide safe access to building.
      f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
      g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
      h. Sweep concrete floors broom clean in unoccupied spaces.
      i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
      j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
      k. Remove labels that are not permanent.
      l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
      m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
      n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
q. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
D. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." Section 01 7419 "Construction Waste Management and Disposal."

3.02 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 7823
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory.
   2. Emergency manuals.
   3. Operation manuals for systems, subsystems, and equipment.
   4. Product maintenance manuals.
   5. Systems and equipment maintenance manuals.

B. Related Requirements:
   1. Section 01 3300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.03 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.04 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Owner will comment on whether content of operations and maintenance submittals are acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:
   1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Owner.
      a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
      b. Enable inserted reviewer comments on draft submittals.
   2. Two paper copies to Owner. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Owner will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
   1. Correct or revise each manual to comply with comments. Submit copies of each corrected manual within 15 days of receipt of comments and prior to commencing demonstration and training.

PART 2 PRODUCTS

2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
   1. List of documents.
   2. List of systems.
   3. List of equipment.
   4. Table of contents.
B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.02 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.
B. Title Page: Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name and contact information for Contractor.
   6. Name and contact information for Construction Manager.
   7. Name and contact information for Architect.
   8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
   9. Cross-reference to related systems in other operation and maintenance manuals.
C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.03 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Flood.
2. Gas leak.
3. Water leak.
4. Power failure.
5. Water outage.
6. System, subsystem, or equipment failure.
7. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:
   1. Instructions on stopping.
   2. Shutdown instructions for each type of emergency.
   3. Operating instructions for conditions outside normal operating limits.
   4. Required sequences for electric or electronic systems.
   5. Special operating instructions and procedures.

2.04 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
   1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
   2. Performance and design criteria if Contractor has delegated design responsibility.
   3. Operating standards.
   4. Operating procedures.
   5. Operating logs.
   6. Wiring diagrams.
   7. Control diagrams.
   8. Piped system diagrams.
   9. Precautions against improper use.
   10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:
   1. Product name and model number. Use designations for products indicated on Contract Documents.
   2. Manufacturer's name.
   3. Equipment identification with serial number of each component.
   4. Equipment function.
   5. Operating characteristics.
   6. Limiting conditions.
   7. Performance curves.
   8. Engineering data and tests.
   9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
   1. Startup procedures.
   2. Equipment or system break-in procedures.
   3. Routine and normal operating instructions.
   4. Regulation and control procedures.
   5. Instructions on stopping.
   6. Normal shutdown instructions.
   7. Seasonal and weekend operating instructions.
   8. Required sequences for electric or electronic systems.
   9. Special operating instructions and procedures.
   10. Training procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.05 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
C. Product Information: Include the following, as applicable:
    1. Product name and model number.
    2. Manufacturer's name.
    3. Color, pattern, and texture.
    4. Material and chemical composition.
    5. Reordering information for specially manufactured products.
D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
    1. Inspection procedures.
    2. Types of cleaning agents to be used and methods of cleaning.
    3. List of cleaning agents and methods of cleaning detrimental to product.
    4. Schedule for routine cleaning and maintenance.
    5. Repair instructions.
E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
    1. Include procedures to follow and required notifications for warranty claims.

2.06 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
    1. Standard maintenance instructions and bulletins.
    2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
    3. Identification and nomenclature of parts and components.
    4. List of items recommended to be stocked as spare parts.
D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
    1. Test and inspection instructions.
    2. Troubleshooting guide.
    3. Precautions against improper maintenance.
    4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    5. Aligning, adjusting, and checking instructions.
    6. Demonstration and training video recording, if available.
E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 EXECUTION

3.01 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."

G. Comply with Section 01 7700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 7839
PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

B. Related Requirements:
   1. Section 01 7300 "Execution" for final property survey.
   2. Section 01 7700 "Closeout Procedures" for general closeout procedures.
   3. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.03 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit one set(s) of marked-up record prints.
   2. Number of Copies: Submit copies of record Drawings as follows:
      a. Initial Submittal:
         1) Submit PDF electronic files of scanned record prints and one of file prints.
         2) Submit record digital data files and one set(s) of plots. DWG/CAD compatible.
         3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal:
         1) Submit one paper-copy set of marked-up record prints.
         2) Submit PDF electronic files of scanned record prints and three set(s) of prints.
         3) Print each drawing, whether or not changes and additional information were recorded.
         4) Submit record digital data files and three set(s) of record digital data file plots. DWG/CAD Compatible.

B. Record Specifications: Submit one paper copy annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy annotated PDF electronic files and directories of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 PRODUCTS

2.01 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross-reference record prints to corresponding archive photographic documentation.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations below first floor.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.
      g. Actual equipment locations.
      h. Duct size and routing.
      i. Locations of concealed internal utilities.
      j. Changes made by Change Order or Construction Change Directive.
      k. Changes made following Architect's written orders.
      l. Details not on the original Contract Drawings.
      m. Field records for variable and concealed conditions.
      n. Record information on the Work that is shown only schematically.
   3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
   4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
   5. Mark important additional information that was either shown schematically or omitted from original Drawings.
   6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
   1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
   2. Format: DWG, Version , Microsoft Windows operating system.
   3. Format: Annotated PDF electronic file.
   4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
   5. Refer instances of uncertainty to Architect for resolution.
   6. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
      a. See Section 013300 "Submittal Procedures" for requirements related to use of Architect's digital data files.

b. Architect will provide data file layer information. Record markups in separate layers.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
a. Project name.
b. Designation "PROJECT RECORD DRAWINGS."
c. Name of Architect.
d. Name of Contractor.

2.02 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file paper copy.

2.03 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file paper copy.
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.04 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
B. Format: Submit miscellaneous record submittals as PDF electronic file paper copy.
    1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 EXECUTION

3.01 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.
   3. Demonstration and training video recordings.

1.03 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For facilitator.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.04 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 4000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
   1. Inspect and discuss locations and other facilities required for instruction.
   2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
   3. Review required content of instruction.
   4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.05 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 PRODUCTS

2.01 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor has delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.
2. Documentation: Review the following items in detail:
    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.

5. Adjustments: Include the following:
    a. Alignments.
    b. Checking adjustments.
    c. Noise and vibration adjustments.
    d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
    a. Diagnostic instructions.
    b. Test and inspection procedures.
7. Maintenance: Include the following:
    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Procedures for routine cleaning
    e. Procedures for preventive maintenance.
    f. Procedures for routine maintenance.
    g. Instruction on use of special tools.
8. Repairs: Include the following:
    a. Diagnosis instructions.
    b. Repair instructions.
    c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    d. Instructions for identifying parts and components.
    e. Review of spare parts needed for operation and maintenance.

PART 3 EXECUTION

3.01 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.02 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
    1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
    2. Owner will furnish an instructor to describe Owner's operational philosophy.
    3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
    1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A . Demolition and removal of utility structures.

B . Demolition and removal of site improvements and pavements.

C . Disconnecting, capping or sealing, and removing site utilities.

1.02 RELATED REQUIREMENTS:

A . Section 31 2335 - Excavating, Backfilling, and Compacting for Utilities and Structures

B . Section 01 5713 - Temporary Erosion and Sedimentation Control

C . Section 33 4000 - Storm Drainage

1.03 REFERENCES

A . WSDOT Standard Specifications – Washington State Department of Transportation 2024 Standard Specifications for Road, Bridge, and Municipal Construction.

1.04 DEFINITIONS

A . Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.

B . Existing to Remain: Protect construction to remain against damage and soiling during demolition. When permitted by Architect, items may be removed to suitable, protected storage location during demolition then cleaned and reinstalled in original locations.

1.05 SUBMITTALS

A . Comply with Section 01 3000.

1.06 QUALITY ASSURANCE

A . Regulatory Requirements: Comply with City of Monroe requirements.

1.07 MATERIAL OWNERSHIP

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

PART 2 - PRODUCTS

2.01 MATERIALS

A . Structural Fill: Per Section 31 2335.

PART 3 - EXECUTION

3.01 EXAMINATION

A . Verify erosion control is in place and operating properly.

B . Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.02 PREPARATION

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

B . Protect elements surrounding Work of this section from damage or disfiguration.

C . Protect existing utilities from damage and disturbance. Provide shoring to support existing utilities and their support prism or remove and replace utilities where shoring is not practical. Removing and replacing to be performed per utility Owner's standards.

D . Erect barriers and barricades to direct and protect adjacent traffic.

E . Locate existing utilities, avoid damage or disturbance. For aid in utility location call "Dial Dig 1-800-424-5555," 48 hours (two working days) prior to beginning construction. Employ and pay for a locator service to locate and mark utilities in addition to the "DIAL DIG" service.

F . Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

3.03 DEMOLITION

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

B . Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Architect. Provide alternate routes around closed or obstructed traffic ways if required.

C . Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.

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

E . Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

F . Utilities: Locate, identify, disconnect and seal or cap off utilities as shown on Drawings.

G . Pavement Demolition:

1. Saw cut pavement at edge of sections to remain. Construct neat, straight lines.
2. Break up and remove pavement. Dispose of material off site.

H . Filling and Grading:

1. Filling and grading per Section 31 2335.
2. Collect and stockpile on-site topsoil. Remove and dispose of topsoil to a Contractor-provided, off-site disposal location.

3.04 FIELD QUALITY CONTROL

A . Comply with Section 01 4000.

3.05 CLEANING

A . Dispose of surplus or unsuitable material.

B . Dispose of waste, surplus, and unsuitable materials according to laws, regulations, and ordinances off site at a site obtained by Contractor.

End of Section

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1

1.01 RELATED REQUIREMENTS

A. Section 03 3511 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.
B. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.
C. Section 09 9123 - Interior Painting: Sealer for concrete wall in App Bay.
D. Section 32 1313 - Concrete Paving: Sidewalks, curbs and gutters.
E. Division 23: Mechanical items for casting into concrete.
F. Division 22: Plumbing items for casting into concrete.
G. Division 21: Fire protection items for casting into concrete.
H. Divisions 26, 27, & 28: Electrical items for casting into concrete.

1.02 REFERENCE STANDARDS

A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
C. ACI 301 - Specifications for Structural Concrete; 2016.
D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.
E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
F. ACI 305R - Guide to Hot Weather Concreting; 2010.
G. ACI 306R - Guide to Cold Weather Concreting; 2016.
H. ACI 308R - Guide to External Curing of Concrete; 2016.
I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).
J. ACI 347R - Guide to Formwork for Concrete; 2014, with Errata (2017).
K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018.
L. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.
M. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.
N. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
O. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2018.
P. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
Q. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2018.
R. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.
S. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.
T. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
U. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.
V. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

W. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
X. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
Y. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
Z. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.
AA. AA. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2016.
BB. AB. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2015.
CC. AC. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
DD. AD. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014a.
    1. AE. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2015. AF. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.
EE. AG. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2011.
FF. AH. ASTM C1582/C1582M - Standard Specification for Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete; 2011, with Editorial Revision (2017).
GG. AI. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
HH. AJ. ASTM C1708/C1708M - Standard Test Methods for Self-leveling Mortars Containing Hydraulic Cements; 2019.
    1. AK. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.
II. AL. ASTM D8139 - Standard Specification for Semi-Rigid, Closed-Cell Polypropylene Foam, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction; 2017.
JJ. AM. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type); 2011 (Reapproved 2016).
KK. AN. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.
    1. AO. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.
LL. AP. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a, with Editorial Revision (2013).
MM. AQ. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 2014.
NN. AR. ASTM E1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers (Metric); 2014.
OO. AS. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011 (Reapproved 2017).
PP. AT. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.
QQ. AU. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.03 SUBMITTALS

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

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
C. Mix Design: Submit proposed concrete mix design for each concrete mix.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
D. Test Reports: Submit report for each test or series of tests specified.
E. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures. See Drawings for additional requirements.
F. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.
   1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
G. Welding Certificates: Copies of certificates for welding procedures and personnel.
H. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.
I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
   3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   4. Form Ties: cone snap; taper removable bolt type that will leave no metal within 1-1/2 inches of concrete surface.
   5. Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   6. Form Coating: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   7. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.02 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.
B. Steel Welded Wire Reinforcement (WWR): Plain type, ASTM A1064/A1064M.
   1. Form: Flat Sheets.
   2. WWR Style: As indicated on drawings.
C. Reinforcing Steel as indicated on the drawings: ASTM A706/A706M, Grade 60 (60,000psi)
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.
D. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel, galvanized, or plastic components for placement within 1-1/2 inches of weathering surfaces.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I/II Portland type.
   1. Acquire cement for entire project from same source.
B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.
C. Fly Ash: ASTM C618, Class C or F.
D. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.
E. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Chemical Admixture: Shall be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
B. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
C. Air Entrainment Admixture: ASTM C260/C260M.
D. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
E. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
F. Water Reducing Admixture: ASTM C494/C494M Type A.
G. Shrinkage Reducing Admixture:
   1. ASTM C494/C494M, Type S.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
   1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
   2. Permeance: 0.01 perms maximum as tested accordance with ASTM E1745, Section 7. Provide independent testing data showing compliance.
   3. Installation: Comply with ASTM E1643
   4. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   5. Manufacturers:
      a. Henry Company; Moistop Ultra 10: www.henry.com/#sle.
      b. Stego Industries, LLC; 10-mil (Class A) Stego Wrap: www.stegoindustries.com/#sle.
      c. W. R. Meadows, Inc; PERMINATOR Class A - 10 mils (0.25 mm): www.wrmeadows.com/#sle.

d. Substitutions: See Section 01 6000 - Product Requirements.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Grout: Comply with ASTM C1107/C1107M.
2. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.
3. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.
4. Products containing aluminum powder are not permitted.

2.06 BONDING AND JOINTING PRODUCTS

A. Epoxy Bonding System:
1. Complying with ASTM C881/C881M and of Type required for specific application. See Drawings for additional requirements.

B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

C. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.

2.07 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.

B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

C. Normal Weight Concrete:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
3. Water-Cement Ratio: As indicated on Drawings.
4. Total Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated and as determined in accordance with ASTM C173/C173M. See drawings for additional requirements.
5. Maximum Aggregate Size: 1 inch.

2.09 MIXING

A. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
B. Verify that forms are clean and free of rust before applying release agent.
C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
D. Prepare existing concrete surfaces to be repaired according to ICRI 310.2R.
E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
F. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
G. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
    1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.
B. Place concrete for floor slabs in accordance with ACI 302.1R.
C. Notify Architect not less than 48 hours prior to commencement of placement operations.
D. Test Samples taken.
E. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Locate joints as indicated on drawings.
B. Anchor joint fillers and devices to prevent movement during concrete placement.
C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
    1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
E. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:

1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15.
2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15.
3. Under Carpeting: F(F) of 25; F(L) of 20.
4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25.

B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.
C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.
B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
    1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
    1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
    2. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; take measures necessary to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, surfaces to receive liquid hardeners, surfaces to be polished, and all other exposed slab surfaces.
    3. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.
F. Concrete Polishing: See Section 03 3511.

3.08 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
    1. Normal concrete: Not less than seven days.
C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
D. Surfaces Not in Contact with Forms:
    1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
    2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
        a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.

b. Spraying: Spray water over floor slab areas and maintain wet.
c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.

3. Final Curing: Begin after initial curing but before surface is dry.
a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.
b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
B. Provide free access to concrete operations at project site and cooperate with appointed firm.
C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure four concrete test cylinders. Test three cylinders in accordance with ASTM C39/39M and hold one test cylinder in reserve. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 03 3513
CONCRETE FLOOR AND ARCHITECTURAL CIP FINISHING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Finishing slabs on grade and monolithic floor slabs.
  1. The floor flatness and levelness recommendations of ACI 302.1R referenced below are written for slabs on grade and supported slabs at the time of initial concrete placement and finishing. This specification requires achievement of floor flatness and levelness at the time of application of final floor covering.
- B. Surface treatment with stain and sealer.

1.02 RELATED REQUIREMENTS
- A. 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS
- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).
- B. ACI 301 - Specifications for Structural Concrete 2016.
- C. ACI 302.1R - Guide to Concrete Floor and Slab Construction 2015.
- D. ACI 303R - Guide to Cast-in-Place Architectural Concrete Practice 2012.
- E. ACI 347R - Guide to Formwork for Concrete 2014, with Errata (2017).
- F. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers 2020.

1.04 ADMINISTRATIVE REQUIREMENTS
- A. Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 3100 - Project Management and Coordination.
  1. Review preparation and installation procedures, and coordinating and scheduling required with related work.
- B. Coordinate the work with concrete floor placement and concrete floor curing.

1.05 SUBMITTALS
- A. Product Data: Provide data on sealer and other manufactured products, including information on compatibility of different products and limitations.
- B. Map and Test Data: Provide floor flatness and levelness measurements and test locations.
- C. Mockup areas on site as sample finishes of each type of finish scheduled.
  1. Schedule Architect site visit to view sample areas.
  2. Provide submittal form and photograph of sample area, shoot with low angle light
- D. Maintenance Data: Provide data on maintenance renewal of applied coatings.

1.06 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.07 FIELD CONDITIONS
- A. Maintain light level equivalent to minimum 200 W light source, placed 8 feet above the floor surface, for each 425 sq ft of floor being finished.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Concrete Floor Flatness: Measure for F(F) and F(L) tolerances for floors in accordance with ASTM E1155.
  1. Under Tile and Resilient Finishes: Ff 35 (25 local) and Fl 25 (17 local).
  2. Under Carpeting: Ff 25 (17 local) and Fl 20 (15 local).
  3. Sensitive Areas: Ff 35 (25 local) and Fl 25 (17 local).

2.02 ARCHITECTURAL CONCRETE FORMWORK
- A. Smooth Architectural Concrete:

1. High Density Overlaid panel or other approved nonabsorptive panel materials that will provide continuous, true, and smooth Architectural concrete surfaces.
    a. Furnish in largest practicable sizes to minimize number of joints.
    b. New or very clean - no scratches or indentations or other scars allowed.

B. Board Formed Architectural Concrete:
1. Basis of Design: Formed with 8 inch weathered plank.
    a. Grain: Heavy.
    b. Maximum depth: 0.5 inches.
    c. Butt Joints: Staggered.
    d. Length: 10 feet minimum.
    e. Joints: 1/8 inch maximum.

2.03 COMPOUNDS - HARDENERS AND SEALERS

A. Chemical Sealer-Hardener:
1. Concrete Floor Sealer/Finish: Liquid chemical hardener; siliconate type.

B. (CONC-1) Polished Concrete: See 03 35 26 Polished Concrete.

C. (CONC-2) Sealed Concrete:
1. Finish: Hard troweled and sealed.
2. Location: As indicated on Drawings.

D. Dustproofer:
1. Penetrating Liquid Dustproofer: Clear, chemically reactive, waterborne solution of materials and proprietary components; odorless; colorless; that penetrates, densifies, and dustproofs concrete surfaces. Provide products manufactured by one of the following, or approved:
    a. Dayton Superior Corporation.
    b. Euclid Chemical Company.
    c. L&M Construction Chemicals, Inc.

E. Concrete Cleaner:
1. Liquid concentrate, biodegradable, heavy-duty cleaner-degreaser compound as recommended by manufacturer.

2.04 FORMWORK JOINING

A. At Architectural Concrete join formwork sections smooth, per tolerances listed below and seal the joints at the inside.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

3.02 CAST-IN-PLACE ARCHITECTURAL FINISH

A. Reduce all tolerances to 1/2 of the permitted tolerance of ACI 117.

B. Formwork to be Class A per ACI 347R.
1. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.
2. Tie-holes: Use plastic inserts, ensure that cones are tight around the form and sealed.
3. Finished tie holes should appear similar to ACI 303R Fig 4.8 (left image not right image).
    a. Finish tie hole with a small amount of Portland cement mortar. Just enough to bond and hide the metal end of the tie. Leave most of tie hole empty. Follow recommendation of ACI 303R especially 10.2.

3.03 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301, ACI 302.1R, and ACI 117.

B. Wood float surfaces that will receive quarry tile or ceramic tile, with full bed setting system.

C. Steel trowel surfaces that will receive carpeting, resilient flooring, or thin set ceramic tile.

D. Steel trowel surfaces that are scheduled to be left exposed.

E. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains at 1/8 inch per foot nominal.
F. In areas with floor drains and in areas indicated on drawings slope surfaces uniformly to drains.
    1. Floors not so indicated, are to be finished flat and level.

3.04 FLOOR SURFACE TREATMENT

A. Apply hardener to scheduled floor surfaces in accordance with manufacturer's instructions.
B. Apply slip resistant finish to scheduled floor surfaces in accordance with manufacturer's instructions.
C. Apply sealer to floor surfaces in accordance with manufacturer's instructions.
D. Apply retarder to exposed aggregate floor surfaces, as scheduled, in accordance with manufacturer's instructions.

3.05 DEFECTIVE CONCRETE

A. Definition: Concrete not conforming to required lines, details, dimensions, flatness, tolerances, or specified requirements.
B. Test Results: The testing agency shall report test results in writing to Consultant and Contractor within 24 hours of test.
C. Repair or replacement of defective concrete will be determined by the Consultant. The cost of additional testing or replacement of concrete shall be borne by Contractor when defective concrete is identified.
D. Correct the slab surface if tolerances are less than specified.
    1. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Remeasure corrected areas by the same process.
E. Do not patch, fill, touch-up, repair, or replace concrete to be left exposed except upon express direction of Consultant for each individual area.
F. Architectural Concrete may not be patched.

3.06 MISCELLANEOUS PENETRATIONS

A. Pipe and ducts not formed into the concrete by their placement or by the use of void forms must have any gap between the item and the concrete filled with non-shrink grout. If the penetration passes through an exterior wall exposed to drainage and/or weather, the exposed area must be waterproofed and sealed to insure against leakage.

3.07 FINISHING

A. Slabs and Floors To Receive Adhesive-Applied Flooring: Do not over trowel or burnish the floor or create a burnt finish as this may inhibit the adhesion of flooring adhesives. In the event of over finishing, mechanically abrade and clean the surface to expose absorbent surfaces to allow adhesion.

3.08 FINISH DEFINITION

A. Finish concrete floor surfaces in accordance with Standards listed in References above.
    1. Floor finish noted below and floor levelness or flatness noted above are not necessarily related.
B. Heavy Broom Finish: Applied with a stiff coarse broom perpendicular to the flow of traffic, resulting in a rough non-slip surface.
    1. Location: Exterior concrete platforms, steps, ramps, and sidewalks and as noted.
C. Light Broom Finish: Applied with a stiff broom lightly applied to the concrete, providing a non-slip surface with a lighter texture than the heavy broom finish above.
    1. Location: Slab surfaces to be covered with traffic coating, or thinset tile and interior exposed concrete stair treads, platforms, and ramps.
D. Full Steel Trowel Finish: Tolerance for these floors as noted above.
    1. Location: All other Concrete flatwork. Unless noted otherwise.
E. Sealer Finish:

1. After finishing operations (trowel finish or broom finish) are complete, precast panels have been lifted into place and slabs are ready for final treatment, thoroughly clean surface to remove curing membrane and other residue and apply concrete floor sealer.
2. Location: At all interior, exposed slabs subject to pedestrian traffic, unless indicated otherwise.

F. Dustproofer Finish:
1. Apply a single coat in accordance with the manufacturer's instructions.
2. Location: At all exposed parking garage slabs subject to vehicular traffic, unless indicated otherwise.

G. Architectural Formed Finish: Light Sandblast per ACI 303R and approved in field.
1. This finish will be used as noted and at portions of concrete walls that are exposed to view. Portions of concrete walls not exposed to view need not be sandblasted.

H. Architectural Formliner Finish:
1. This finish will be used as noted and at portions of concrete walls that are exposed to view. Portions of concrete walls not exposed to view need not be formed with formliners.

I. Polish: Universal grind depth.

END OF SECTION

SECTION 04 2213
CONCRETE UNIT VENEER MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Concrete Masonry Unit
- B. Mortar.
- C. Reinforcement and Anchorage.
- D. Flashings.
- E. Accessories.

1.02 RELATED REQUIREMENTS
- A. 05 50 00 - Metal Fabrications: Loose steel lintels.
- B. 07 90 05 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.03 ADMINISTRATIVE REQUIREMENTS
- A. Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 3100 - Project Management and Coordination .
  1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.04 SUBMITTALS
- A. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.
- B. Samples: Submit one sample of each CMU block and physical samples of all available colors of grout for selection by Architect.
- C. Manufacturer's Certificates: Certify that masonry units meet or exceed specified requirements.

1.05 MAINTENANCE MATERIAL
- A. Furnish the following for Owner's use in maintenance of project.
  1. Extra Glazed Units: 50 of each type, size, and color combination.
  2. Extra Pre-Faced Units: 50 of each type, size, and color combination.

1.06 QUALITY ASSURANCE
- A. Comply with provisions of ASTM D1790/ERTA, except where exceeded by requirements of the contract documents.
- B. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.
- C. Certified member in good standing with the Washington State Conference of Mason Contractors (WSCMC) or accepted by Architect prior to bid date.
  1. Other installers who meet or exceed quality assurance and qualifications criteria of WSCMC may submit bid upon acceptance by Architect.
- D. Source Limitation for Brick: Provide all material of a single type from one manufacturer and any colored material from one run.
- E. Source Limitations for Mortar and Grout Materials: Obtain ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

1.07 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.08 FIELD CONDITIONS
- A. Cold and Hot Weather Requirements: Comply with requirements of ASTM D1790/ERTA or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 DESCRIPTION

A. Concrete unit veneer masonry (CMU veneer) system for walls with related flashings, and accessory components.

2.02 CONCRETE MASONRY UNITS

A. (CMU-1):
   1. Manufacturer: Basalite.
   2. Blend of the following manufactured by Redmond, Oregon Plant.
      a. Nominal size: Standard, 4-inches x 8-inches x 16-inches.
      b. Texture: Smooth Face, one score line
      c. Bond: Running bond.
      d. Color: 665 Chocolate
      e. Grout Color: Match existing. To be selected by Architect from manufacturer's available colors.
      f. Absorption: Low.
   3. Special Shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

B. (CMU-2):
   1. Manufacturer: Basalite.
   2. Blend of the following manufactured by Redmond, Oregon Plant.
      a. Nominal size: Standard, 4-inches x 8-inches x 16-inches.
      b. Texture: Split Face, 5 score lines.
      c. Bond: Running bond.
      d. Color: 665 Chocolate
      e. Grout Color: Match existing. To be selected by Architect from manufacturer's available colors.
      f. Absorption: Low.
   3. Special Shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.03 MORTAR MATERIALS

A. Preblended dry mortar mix:
   1. Manufacturers:
      a. BMI Products: www.bmi-products.com.
      b. Spec Mix: www.specmix.com.
   2. Color: Match existing. To be selected by Architect from manufacturer's available colors.

B. Accelerating Admixture: Nonchloride type for use in cold weather.

C. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

2.04 REINFORCEMENT AND ANCHORAGE

A. Joint Reinforcement: Truss type; ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
   1. Manufacturers:
      a. Lock-Rite Metal Products Inc.
      b. Hohmann & Barnard, Inc (including Dur-O-Wal brand): www.h-b.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

B. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, G90 galvanized. Sized in accordance with anchor manufacturer's recommendation.
   1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners.

2. Wire ties: Triangular shape, 0.1875 inch thick minimum.
3. Vertical adjustment: Not less than 2 inches.
4. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
5. Manufacturers:
   a. Hohmann & Barnard, Inc (including Dur-O-Wal brand): www.h-b.com.
   b. Lock-Rite Metal Products Inc.

2.05 FLASHINGS

A. Self-Adhering Flexible Flashing:
   1. Self-adhering composite material comprising rubberized asphalt adhesive compound bonded to cross-laminated polyethylene film, minimum 0.040 inch total thickness.
   2. Manufacturers:
      a. GCP Applied Technologies, Inc. Perm-A-Barrier Wall Flashing.
      b. Henry Blueskin SA.
      c. Tremco, Inc.; ExoAir 110/110LT.
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Self-Adhering Stainless Steel Flashing:
   1. Self-adhering stainless steel flashing for moisture control in thru-wall applications.
   2. Basis of Design: York 304 SA by York Flashings.

C. Pre-Coated Galvanized Steel:
   1. ASTM A653/A653M, with G90/Z275 coating, 24 gage, 0.0239 inch base metal thickness, shop precoated with fluoropolymer coating in color FP-1 specified in Section 05 0513 - Shop-Applied Coatings for Metal. Profiles as detailed.

2.06 ACCESSORIES

A. Preformed Control Joints:
   1. Closed Cell Neoprene Sponge placed horizontally beneath relieving angle and vertical expansion joints to act as a control joint.
      a. Conforms to ASTM D1056 Grade 2A1.
      b. Provide expansion joints per BIA recommendations and as indicated on Construction Drawings.
      c. Basis of Design: Products by NS Closed Cell Neoprene Sponge by Hohmann & Barnard, Inc or a comparable product by one of the following:
         1) Blok-Lok Limited: www.blok-lok.com.
         2) LockRite.
         3) Substitutions: See Section 01 6000 - Product Requirements.

B. Precast Architectural Concrete Units:
   1. Provide unit types as indicated on Drawings, including trim units.
      a. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
      b. Portland Cement: ASTM C150/C150M, Type I or Type III.
         1) For surfaces exposed to view in finished structure, use color required for selected unit color.
      c. Anchors:
         1) Carbon Steel Shapes and Plates: ASTM A36/A36M.
         2) Carbon Steel Plate: ASTM A283/A283M, Grade C.
      d. Color: To be selected by Architect to match CMU.

C. Joint Filler:
   1. Closed cell polyurethane; oversized 50 percent to joint width; self-expanding; 1 inch wide by maximum lengths available.

D. Weeps:
   1. Molded PVC grilles, insect resistant, manufacturer's best color match to masonry units.

E. Cavity Vents:
   1. Molded PVC grilles, insect resistant.
F. Cavity Mortar Control:
   1. Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
G. Cleaning Solution:
   1. Non-acidic, not harmful to masonry work or adjacent materials.
   2. Basis of Design: Sure Klean 600 Detergent by ProSoCo or a comparable product by one of the following:
      a. Evonik Corporation.

2.07 MORTAR MIXES
A. Mortar for Unit Masonry: ASTM C1506 Type N.
B. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION
A. Follow recommendations of ASTM C1714/C1714M for control of Efflorescence.
B. Verify that field conditions are acceptable and are ready to receive masonry.
C. Verify that related items provided under other sections are properly sized and located.
D. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 COURSING
A. Establish lines, levels, and coursing indicated. Protect from displacement.
B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

3.03 PLACING AND BONDING
A. Remove excess mortar as work progresses.
B. Interlock intersections and external corners.
C. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
D. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
E. Isolate top joint of masonry veneer from horizontal structural framing members or support angles with compressible joint filler.

3.04 CAVITY MORTAR CONTROL
A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

3.05 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER
A. Install horizontal joint reinforcement 16 inches on center.
B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
C. Place continuous joint reinforcement in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 6 inches.
E. Stud Back-up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 1.77 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.
F. Reinforce joint corners and intersections with strap anchors 16 inches on center.

3.06 MASONRY FLASHINGS
A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry and turn up at least 4 inches to form watertight pan at non-masonry construction.
2. Remove or cover protrusions or sharp edges that could puncture flashings.
3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend metal flashings through exterior face of masonry and turn down to form drip.
C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.07 INSTALLATION OF PRECAST ARCHITECTURAL CONCRETE UNITS

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.
B. Repair:
1. Repair architectural precast concrete units if permitted by Architect. Architect reserves the right to reject repaired units that do not comply with requirements.
2. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 ft. (6 m).
3. Prepare and repair damaged galvanized coatings with galvanizing repair paint in accordance with ASTM A780/A780M.

3.08 CONTROL AND EXPANSION JOINTS

A. Apply two-stage joints with two separate seals at exterior walls. A primary architectural seal and a secondary (backup) seal.
1. Architectural sealant joint sanded to maintain visual of mortar.
B. Do not continue horizontal joint reinforcement through control and expansion joints.
C. Size control joint in accordance with Section 07 9005 for sealant performance.
D. Form expansion joint as detailed.

3.09 TOLERANCES

A. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.
B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

3.10 CUTTING AND FITTING

A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.
B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.11 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.
B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for conformance to requirements of this specification.
C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.
1. Test mortar once each 5000 sf of wall area or portion thereof or more if required by code.
D. Grout Test: For each mix provided, per ASTM C1019.

3.12 CLEANING

A. Remove excess mortar and mortar smears as work progresses.
B. Replace defective mortar. Match adjacent work.
C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.13 SEALERS

A. Apply sealers in accordance with Section 07 1900 - Water Repellents, using procedures and application methods recommended as producing the best results.

3.14 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members.
B. Base plates, shear stud connectors, gusset plates, connection plates, embed plates, anchor rods, deformed bar anchors.
C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 05 3100 - Steel Decking: Support framing for small openings in deck.
B. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.
C. Section 07 8100 - Applied Fire Protection: Fireproof protection to framing and metal deck systems.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
C. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2018.
D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).
F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.
G. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2015.
H. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2007 (Reapproved 2013).
I. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.
J. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).
K. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.
L. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014a.
M. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film; 2017.
N. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2019.
O. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2012.
P. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2015.
Q. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum
    1. Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2018.
R. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2018a.

S. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series; 2017a.
T. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2018.
U. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2018.
V. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
W. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
X. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2014, with Errata (2015).
Y. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
Z. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
    1. AA. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016). AB. SSPC-SP 2 - Hand Tool Cleaning; 2018.
    2. AC. SSPC-SP 3 - Power Tool Cleaning; 1982, with Editorial Revision (2004). AD. SSPC-SP 5 - White Metal Blast Cleaning; 2007.
    3. AE. SSPC-SP 6 - Commercial Blast Cleaning; 2007. AF. SSPC-SP 7 - Brush-Off Blast Cleaning; 2007.
    4. AG. SSPC-SP 10 - Near-White Blast Cleaning; 2007.
    5. AH. SSPC-SP 11 - Power Tool Cleaning to Bare Metal; 2012 (Ed. 2013).
    6. AI. SSPC-SP 13 - Surface Preparation of Concrete; 1997 (Reaffirmed 2003). AJ. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings:
    1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, fasteners, and ASTM specification and grade of steel; and finish.
    2. Connections and connections not detailed.
    3. Indicate cambers.
    4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths and joint preparation. See structural drawings for additional requirements.
    5. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
    6. Include embedment drawings.
    7. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
    8. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
    9. Identify members and connections of the seismic-load-resisting system.
    10. Indicate locations and dimensions of protected zones.
    11. Identify demand critical welds.
C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint qualified by testing, including the following:
    1. Power source (constant current or constant voltage).
    2. Electrode manufacturer and trade name, for demand critical welds.
D. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

E. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.
F. Fabricator Test Reports: Comply with ASTM A1011/A1011M.
G. Materials Test Reports: Submit independent test results or engineered performance analysis of structural thermal-break pad performance in bearing or slip-critical connections where shear and moment loads are applied.
H. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months. See structural drawings for additional requirements.
I. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category SBD. Or a qualified fabricator registered in accordance with WABO Standard 1702 Steel Fabricator Registration Program.
B. Installer Qualifications: A qualified installer specializing in the work of this Section with a minimum of 5 years documented experience with commercial quality work of comparable scope for a minimum of 3 projects.
C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel." Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing,
    1. as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
D. Comply with applicable provisions of the following specifications and documents:
    1. AISC 303.
    2. AISC 341 and AISC 341s1.
    3. AISC 360.
    4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles, Plates, and Channels: ASTM A36/A36M.
B. Steel W Shapes and Tees: ASTM A992/A992M.
C. Rolled Steel Structural Shapes: ASTM A992/A992M.
D. Steel Plates and Bars: ASTM A572/A572M, Grade 50 (345) high-strength, columbium-vanadium steel.
E. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.
F. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.
G. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A with ASTM A153/A153M, Class C.
H. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.
I. Tension Control Bolts: Twist-off type; ASTM F3125/F3125M.
J. Unheaded Anchor Rods: ASTM F1554, Grade 36, Grade 55, or as indicated on Drawings,
    1. , with matching ASTM A563 or ASTM A563M nuts and ASTM F436/F436M Type 1 washers.
K. Headed Anchor Rods: ASTM F1554, Grade 361, Grade C; ASTM F1554, Grade 55, plain or as indicated.
L. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.
M. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
N. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

O. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

P. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning.

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel
1. wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

H. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches (250 mm) o.c. unless otherwise indicated.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

J. Shop fabricate to greatest extent possible.

K. Fabricate connections for bolt, nut, and washer connectors.

L. Develop required camber for members.

2.03 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified. Joint Type: As indicated on drawings.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.04 FINISH

A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, high strength bolted, or noted for exposed galvanized finish.
B. Galvanize structural steel members exposed to weather to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.

2.05 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
    1. Liquid Penetrant Inspection: ASTM E 165.
    2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    3. Ultrasonic Inspection: ASTM E 164.
    4. Radiographic Inspection: ASTM E 94.
E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
    1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
    2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of
    1. bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
    2. Set plates for structural members on wedges, shims, or setting nuts as required.
    3. Weld plate washers to top of baseplate.
    4. Pretension anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
    5. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be

in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.
F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
I. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
J. Field weld components and shear studs indicated on shop drawings.
K. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".
L. Do not field cut or alter structural members without approval of Architect.
M. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
N. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.
D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.
E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Delegated design of metal fabrications.
- B. Metal Fabrications.

1.02 RELATED REQUIREMENTS
- A. 05 0513 - Shop-Applied Coatings for Metal: Factory applied coatings.
- B. 09 9000 - Painting and Coating: Field applied paint finish.

1.03 SUBMITTALS
- A. Qualification Data: For fabricator and design engineer.
- B. Delegated-Design Submittal: For assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Product Data: On all cleaning, galvanizing, and finishing products, including VOC content.
- D. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- E. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
- F. Maintenance Data: For user operation and maintenance of system including:
  1. Methods for maintaining system's materials and finishes.
  2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

1.04 QUALITY ASSURANCE
- A. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.
- B. Fabricators Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (AC172). Company specializing in performing the work of this section with minimum 5 years' experience on projects of similar size and complexity.

1.05 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Items designed and shop fabricated out of steel and aluminum sections, tubing, plates and pipe for exposed and concealed locations.

2.02 MATERIALS
- A. Steel:
  1. Steel Sections:
     a. ASTM A36/A36M.
  2. Steel Tubing:
     a. ASTM A500/A500M, Grade B cold-formed structural tubing.
  3. Plates:
     a. ASTM A283/A283M.
  4. Pipe:

a. ASTM A53/A53M, Grade B Schedule 40, black finish.
5. Slotted Channel Framing:
a. ASTM A653/A653M, Grade 33.
6. Slotted Channel Fittings:
a. ASTM A1011/A1011M.
7. Fasteners:
a. To suit application. Unless noted otherwise, match fasteners exposed to view with the material and color/finish of the material being fastened if metal; color and finish if not metal. Fasteners not exposed to view: Galvanized steel unless otherwise noted.
8. Bolts, Nuts, and Washers:
a. ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.
9. Welding Materials:
a. AWS D1.1/D1.1M; type required for materials being welded.
10. Touch-Up Primer for Galvanized Surfaces: See Section 09 90 00.

B. Stainless Steel:
1. Stainless-Steel Sheet, Strip, and Plate:
a. ASTM A240/A240M or ASTM A666, Type 304.
2. Tubing:
a. ASTM A554, Grade MT 304.
3. Pipe:
a. ASTM A312/A312M, Grade TP 304.
4. Castings:
a. ASTM A743/A743M, Grade CF 8 or CF 20.
5. Stainless-Steel Bars and Shapes:
a. ASTM A276/A276M, Type 304.
6. Rolled-Stainless-Steel Floor Plate:
a. ASTM A 793.
7. Stainless-Steel Bolts and Nuts:
a. Regular hexagon-head annealed stainless-steel bolts, ASTM F593; with hex nuts, ASTM F594.

C. Aluminum:
1. Extruded Aluminum:
a. ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
2. Sheet Aluminum:
a. ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.
3. Aluminum-Alloy Drawn Seamless Tubes:
a. ASTM B210 (ASTM B210M), 6063 alloy, T6 temper.
4. Aluminum-Alloy Bars:
a. ASTM B211 (ASTM B211M), 6061 alloy, T6 temper.
5. Aluminum-Alloy Sand Castings:
a. ASTM B26/B26M.
6. Aluminum-Alloy Die Castings:
a. ASTM B85/B85M.
7. Bolts, Nuts, and Washers:
a. Stainless steel.
8. Welding Materials:
a. AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.
C. Continuously seal joined members by continuous welds.
D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED MATERIALS

A. (MTL-1) Metal Wall Base:
1. Manufacturer: Metal Depot.
2. Product: Stainless steel sheet, 304.
3. Finish: #4 brushed finish.
4. Location: App Bay.
B. Non-Structural metal items as indicated on Drawings.
1. Profile and material as indicated.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.
B. Maximum Offset Between Faces: 1/16 inch.
C. Maximum Misalignment of Adjacent Members: 1/16 inch.
D. Maximum Bow: 1/8 inch in 48 inches.
E. Maximum Deviation from Plane: 1/16 inch in 48 inches.

2.06 FINISHES

A. Steel:
1. Prime paint all steel items.
a. Exceptions:
1) Galvanize items to be embedded in concrete or masonry.
2) Galvanize items specified for galvanized finish.
3) Do not prime surfaces indicated for spray fire proofing, weathering steel or blackened steel finish.
4) Field welding is required.
b. See Section 09 9000 - Painting and Coating for field finish painting.
2. Prime Painting: One coat.
3. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M or ASTM A153/A153M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.
4. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating
B. Stainless Steel:
1. #4 Satin.
C. Aluminum:
1. Typical Exterior Aluminum Surfaces: Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
2. Typical Interior Aluminum Surfaces: Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31 Clear anodic coating not less than 0.4 mils thick.
3. On systems indicated: High Performance Organic Coating System: In accordance with Section 05 05 13 - Shop-Applied Coatings for Metal.
4. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.07 ACCESSORIES

A. All accessory materials required by the fabricator for a complete installation of the installed products in a manner that meets the Performance and Design Criteria.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
C. Field weld components indicated.
D. Perform field welding in accordance with AWS D1.1/D1.1M.
E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.03 INSTALLATION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
B. Maximum Offset from True Alignment: 1/4 inch.
C. Maximum Out-of-Position: 1/4 inch.

3.04 PROTECTION

A. Protect installed work as required by the fabricator to maintain finishes, product performance, design criteria, and warranty.

3.05 SCHEDULE

A. Bollards: Steel pipe, concrete filled, crowned cap; shop primed, field finished.
B. Ledge Angles, Shelf Angles, Channels, Backing Plates and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.
C. Anchor bolts, steel pipe, cast in masonry anchors, pipe protection.
D. Door Frames for Overhead Door Openings and Wall Openings: Steel channel and angles; shop primed.
E. Metal Shelving: Medical storage room.
F. Metal Wall Base: App Bay.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.
B. Nonstructural dimension lumber framing.
C. Rough opening framing for doors, windows, and roof openings.
D. Sheathing.
E. Roof-mounted curbs.
F. Roofing nailers.
G. Roofing cant strips.
H. Preservative treated wood materials.
I. Miscellaneous framing and sheathing.
J. Communications and electrical room mounting boards.
K. Concealed wood blocking, nailers, and supports.
L. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Setting anchors in concrete.
B. Section 05 1200 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.
C. Section 06 1733 - Wood I-Joists.

RFM TO CONFIRM

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.
E. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. ICC (IECC) - International Energy Conservation Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
G. PS 1 - Structural Plywood; 2009.
H. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
I. PS 20 - American Softwood Lumber Standard; 2015.
J. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2015.
K. WWPA G-5 - Western Lumber Grading Rules; 2017.

2.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.
C. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.

2.03 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

3.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: As indicated on Drawings, unless otherwise indicated.
   2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

3.02 DIMENSION LUMBER

A. Sizes: Nominal sizes as indicated on drawings.
B. Moisture Content: Kiln-dry or MC19.
C. Species: As indicated on Drawings.
D. Grade: As indicated on Drawings.
E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No.2.
   2. Boards: Standard or No. 3.

3.03 TIMBERS

A. Grading Agency: West Coast Lumber Inspection Bureau; WCLIB (GR).
B. Grading Agency: Western Wood Products Association; WWPA G-5.
C. Moisture Content: Kiln-dry (15 percent maximum).
D. Beams and Posts 5 inches and over in thickness:
   1. Species: Douglas Fir-Larch.
   2. Grade: As indicated on drawings.

3.04 STRUCTURAL COMPOSITE LUMBER

A. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.
   1. Columns/Posts/Studs: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's public E (modulus of elasticity: Minimum as indicated on the Drawings.
   2. Beams: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published E (modulus of elasticity): Minimum as indicated on Drawings.
   3. Manufacturers:
      a. Boise Cascade Company: www.bc.com/#sle.
      b. Weyerhaeuser Company: www.weyerhaeuser.com/#sle.
      c. RedBuilt: www.redbuilt.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

3.05 EXPOSED BOARDS

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
B. Moisture Content: Kiln-dry (15 percent maximum).
C. Surfacing: S4S.
D. Species: Douglas Fir.
E. Grade: No. 2, 2 Common, or Construction.

3.06 CONSTRUCTION PANELS

A. Roof Sheathing: Rating, classification, span rating and performance category as indicated on Drawings.

B. Wall Sheathing: Rating, classification, span rating, and performance category as indicated on Drawings.
C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

3.07 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
C. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
D. Sill Flashing: See Section 07 6200.

3.08 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
B. Preservative Treatment:
1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
b. Treat lumber exposed to weather.
c. Treat lumber in contact with roofing, flashing, or waterproofing.
d. Treat lumber in contact with masonry or concrete.
e. Treat lumber in other locations as indicated.
2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
b. Treat plywood in contact with roofing, flashing, or waterproofing.
c. Treat plywood in contact with masonry or concrete.
d. Treat plywood in other locations as indicated.
3. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A to 0.31 lb/cu ft retention.
a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
b. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

PART 3 EXECUTION

4.01 PREPARATION

A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
B. Coordinate installation of rough carpentry members specified in other sections.

4.02 INSTALLATION - GENERAL

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

4.03 FRAMING INSTALLATION

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

4.04 BLOCKING, NAILERS, AND SUPPORTS

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

4.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
B. Provide wood curb at each roof opening except where specifically indicated otherwise; form corners by alternating lapping side members.

4.06 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.

1. Provide 2x blocking at all unframed panel edges or as indicated on the drawings. At long edges use sheathing clips where joints occur between roof framing members.
2. Nail panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails as indicated on drawings.
1. Use plywood at building corners, for not less than 96 inches, measured horizontally.
2. Provide inlet diagonal bracing at corners.
3. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.
4. Size and Location: As indicated on drawings.

4.07 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

4.08 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

4.09 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

4.10 CLEANING

A. Waste Disposal: See Section 01 7419 - Construction Waste Management and Disposal.
1. Comply with applicable regulations.
2. Do not burn scrap on project site.
3. Do not burn scraps that have been pressure treated.
4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 1733
WOOD I-JOISTS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Wood I-joists for roof and floor framing.
- B. Bridging, bracing, and anchorage.
- C. Framing for openings.
- D. Preservative treatment of wood.

1.02 RELATED REQUIREMENTS
- A. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.
- B. Section 06 1000 - Rough Carpentry: Material requirements for blocking, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS
- A. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a (Reapproved 2018).
- B. ASTM D5055 - Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists; 2016.
- C. PS 1 - Structural Plywood; 2009.
- D. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

1.04 DESIGN REQUIREMENTS
- A. Design Deflection: Roof Live Snow and Dead Load: Limited to 1/240 of span.
- B. Design Loads: As indicated on drawings.

1.05 SUBMITTALS
- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacings, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.
- C. Shop Drawings: Indicate sizes, spacing, and layout of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists. Provide details indicating dimensional relationships of components.
- D. Certificate: Certification by joist manufacturer that products delivered are of the same design and construction as those evaluated by the independent inspection agency.
- E. Calculations: Structural calculations and analysis shall be sealed and signed by a professional engineer licensed in the State of Washington.
- F. See structural drawings for additional requirements.

1.06 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING
- A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.
- B. Protect products from damage due to weather and breakage.
- C. Protect joists from warping or other distortion by stacking in upright position, braced to resist movement, with air circulation under coverings and around stacks.
- D. Handle individual joists in the upright position.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. Wood I-Joists:
  1. RedBuilt; www.redbuilt.com.

2. Substitutions: See Section 01 6000 - Product Requirements. See structural drawings for additional requirements.

2.02 MATERIALS

A. Wood I-Joists: Solid Lumber or Laminated veneer lumber top and bottom flanges and oriented strand board (OSB) or plywood webs bonded together with structural adhesive, with published span rating to meet project requirements.
   1. Oriented Strand Board: Comply with PS 2.
   2. Plywood: Comply with PS 1.
   3. Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
   4. Depth: As indicated on drawings.
   5. Fabrication Tolerances:
      a. Flange Width: Plus/minus 1/32 inch.
      b. Flange Thickness: Minus 1/16 inch.
      c. Joist Depth: Plus 0, minus 1/8 inch.
   6. Marking: Mark each piece with depth, joist spacing, and allowable span for joist spacing.
   7. Provide bearing stiffeners if required by span rating or joist hanger manufacturer.

B. Joist Hangers: as indicated on plans or as recommended by joist manufacturer..

C. Joist Bridging: Type, size and spacing recommended by joist manufacturer.

D. Wood Blocking, Plates, and Miscellaneous Framing: Softwood lumber, Douglas fir, construction grade, maximum moisture content of 19 percent.

E. Wood Blocking, Plates, and Miscellaneous Framing: As specified in Section 06 1000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports and openings are ready to receive joists.

B. Verify that field measurements are as indicated on shop drawings.

3.02 PREPARATION

A. Coordinate placement of bearing and support items.

3.03 ERECTION

A. Install joists in accordance with manufacturer's instructions.

B. Set structural members level and plumb, in correct position.

C. Make provisions for erection loads and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field cut or alter structural members without approval of Architect.

E. Install permanent bridging and bracing.

F. Install headers and supports to frame openings required.

G. Frame openings between joists with lumber in accordance with Section 06 1000.

H. Coordinate installation of sheathing/decking with work of this section.

3.04 TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 06 1800
GLUED-LAMINATED CONSTRUCTION

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Glue laminated wood beams and columns.
- B. Preservative treatment of wood.
- C. Steel hardware and attachment brackets.

1.02 RELATED REQUIREMENTS
- A. Section 09 9113 - Exterior Painting: Field finishing.
- B. Section 09 9123 - Interior Painting: Field finishing.
- C. Section 09 9300 - Staining and Transparent Finishing: Field finishing.

1.03 REFERENCE STANDARDS
- A. AITC A190.1 - American National Standard for Wood Products - Structural Glued Laminated Timber; 2007.
- B. ANSI 117 - Standard Specifications for Structural Glued Laminated Timber of Softwood Species; 2015.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- D. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a (Reapproved 2018).
- E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

1.04 SUBMITTALS
- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials, application technique and resultant performance information.
- C. Shop Drawings: Indicate framing, sizes, layout, and spacing of members, cambers, lamination layup designation, and bearing and anchor details.
- D. Manufacturer's Qualification Statement.

1.05 QUALITY ASSURANCE
- A. Manufacturer/Fabricator Qualifications: Company specializing in manufacture of glue laminated structural units with ten years of documented experience, and certified by APA/EWS.

1.06 DELIVERY, STORAGE, AND HANDLING
- A. Protect members to ANSI & APA/EWS.
- B. Leave individual wrapping in place until finishing occurs for members exposed to view.

PART 2 PRODUCTS

2.01 GLUED-LAMINATED UNITS
- A. Glued-Laminated Units: Fabricate in accordance with ANSI 117 Architectural grade where exposed to view.
  1. Verify dimensions and site conditions prior to fabrication.
  2. Cut and fit members accurately to length to achieve tight joint fit.
  3. Fabricate member with camber built in.
  4. Do not splice or join members in locations other than those indicated without permission.
  5. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.
  6. Welding: Perform welding in accordance with AWS D1.1/D1.1M.
  7. After end trimming, seal with penetrating sealer in accordance with APA/EWS requirements.

2.02 MATERIALS

A. Lumber and layup designation: As indicated on Drawings.

2.03 WOOD TREATMENT

A. Factory-Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.

2.04 FABRICATION

A. Fabricate glue laminated structural members in accordance with APA/EWS Architectural grade where exposed to view.
B. Welding: Perform welding in accordance with AWS D1.1/D1.1M.
C. Verify dimensions and site conditions prior to fabrication.
D. Cut and fit members accurately to length to achieve tight joint fit.
E. Fabricate member with camber built in.
F. Do not splice or join members in locations other than those indicated without permission.
G. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.
H. After end trimming, seal with penetrating sealer in accordance with APA/EWS requirements.
I. Field Finishing of Members: Specified in Section 09 9113 and 09 9123.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports are ready to receive units.
B. Verify sufficient end bearing area.

3.02 PREPARATION

A. Coordinate placement of support items.

3.03 ERECTION

A. Lift members using protective straps to prevent visible damage.
B. Set structural members level and plumb, in correct positions or sloped where indicated.
C. Provide temporary bracing and anchorage to hold members in place until permanently secured.
D. Fit members together accurately without trimming, cutting, splicing, or other unauthorized modification.
E. Swab and seal the interior wood surfaces of field drilled holes in members with primer.
F. Field Finishing: Specified in Section 09 9300.

3.04 TOLERANCES

A. Framing Members: 1/2 inch maximum from true position.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Finish carpentry materials.
- B. Fire-retardant-treated wood materials.
- C. Hardware.

1.02 RELATED REQUIREMENTS
- A. 06 1000 - Rough Carpentry: for additional carpentry items.
- B. 09 9000 - Painting and Coating: for field finish of finish carpentry items.

1.03 SUBMITTALS
- A. Qualification Data: For fabricator.
- B. Product Data:
  1. Provide data on fire retardant treatment materials and application instructions.
  2. Provide instructions for attachment hardware and finish hardware.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
  1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot.
  2. Provide the information required by AWI/AWMAC/WI (AWS) Architectural Woodwork Standards.
- D. Sample: Submit three samples of each type of wood exposed to view, 11 inches by width of board (or 8 inches max) inch in size illustrating wood grain and specified finish.
- E. Maintenance Data: For user operation and maintenance of system including:
  1. Methods for maintaining system's materials and finishes.
  2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

1.04 QUALITY ASSURANCE
- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
  1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
  2. Single Source Responsibility: Provide and install this work from single fabricator.

1.05 DELIVERY, STORAGE, AND HANDLING
- A. As required by the Quality Certification Program for installation of the installed products to meet the Performance and Design Criteria.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Wood frames, dimensional lumber and plywood, wall base, and other wood trim, moldings, bases, casings, and miscellaneous trim for doors, glazed lights, window sills, loose shelving. Carpentry items shop fabricated and finished in accordance with AWI/AWMAC/WI (AWS) Architectural Wood Work standards.

2.02 MATERIALS
- A. Interior Woodwork Items:
  1. Finish: Painted P-3 to match doors.
  2. Species: Paintable wood; Poplar.
  3. Moldings, Bases, Casings, and Miscellaneous Trim.
     a. Profiles: As indicated.
- B. Lumber Materials:

1. Softwood Lumber: fir species, quarter sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

C. Sheet Materials:
   1. Softwood Plywood Not Exposed to View: Any face species, veneer core; PS 1 Grade A-B; glue type as recommended for application.
   2. Softwood Plywood Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B; glue type as recommended for application.

D. (WD-1) 1x Hardwood Wood Sill.
   1. Species: Maple
   2. Finish: Clear Stain

E. Flame Retardant: Basis of Cost: WT-103 by FireTect. Finish: Clear Matte. Performance: Provides ASTM E84 Class B.

F. Shop Finishing:
   1. Sand work smooth and set exposed nails and screws.
   2. Apply wood filler in exposed nail and screw indentations.
   3. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
   4. Finish work in accordance with AWI/AWMAC/WI (AWS) Architectural Woodwork Standards, Section 5 - Finishing for Grade specified and as follows:
      a. Transparent:
         1) Stain: As selected by Architect.
      b. Opaque:
   5. Back prime woodwork items to be field finished, prior to installation.

G. Site Finishing:
   1. In accordance with Section 09 9000 - Painting and Coating.

2.03 SHEET MATERIALS

A. (PLY-1) Hardwood Veneer Plywood Paneling: Manufacturer's stock hardwood plywood panels complying with HPVA HP-1.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Columbia Forest Products.
      b. Georgia-Pacific.
      c. National Plywood
      d. Weyerhauser Company.
   2. Veneer Grade: A; APA A-D; Group 1.
   3. Veneer Matching: Selected for similar color and grain.
   4. Backing Veneer Species: Any hardwood compatible with face species.
   5. Construction: Veneer core.
   6. Thickness: 5/8 inch.
   7. Panel Size: 48 by 96 inches.
   8. Glue Bond: Type II (interior).
   9. Face Pattern: Flat.

2.04 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the requirements of the quality standard specified before starting work.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with quality standard specified.

3.03 INSTALLATION

A. General: Install all materials in accordance with quality standard specified based on conditions present.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut to fit adjoining work. Refinish and seal cuts as recommended by quality standard.
2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32 inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
4. Install stairs with no more than 3/16 inch variation between adjacent treads and risers and with no more than 3/8 inch variation between largest and smallest treads and risers within each flight.

C. Install with trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.

3.04 PROTECTION

A. Protect installed work as required by the quality standard to maintain product performance, design criteria, and warranty.

3.05 SCHEDULE

A. (PLY-1) Plywood Wall Panel: For interior sheathing and wainscoting at App Bay and South Storage.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Foam Board Insulation.
- B. Fiber Batt Insulation.
- C. Mineral Fiber Board Insulation
- D. Foam Detailing Insulation.

1.02 RELATED REQUIREMENTS
- A. 09 2116 - Gypsum Board Assemblies: For acoustic insulation installed as a component of assemblies.

1.03 SUBMITTALS
- A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- B. Test Report: Submit report of full-size mockup test for NFPA 285 fire performance, with project cladding assemblies highlighted, for foam insulation on exterior.

1.04 QUALITY ASSURANCE
- A. Installer Qualifications: Company specializing in performing the work of this section with minimum 2 years' experience.

1.05 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Foam board, fiber board, batt and low expansion detailing foam thermal insulation.

2.02 MATERIALS
- A. Foam Board Insulation:
  1. Extruded Polystyrene Board Insulation: ASTM C578, Type X.
     - a. Basis of Design: Styrofoam by Dow.
     - b. Performance Criteria:
       1) Complies with fire-resistance requirements as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285 in cladding systems matching project.
       2) Water Absorption: 4 percent by volume, maximum, when tested in accordance with ASTM D2842.
       3) Water Vapor Transmission: 1.5 perms when tested in accordance with ASTM E96/E96M based on 1 inch thickness.
       4) Board Density: 1.3 lb/cu ft.
       5) Compressive Resistance: 15 psi.
       6) Thermal Conductivity (k factor) at 25 degrees F: 0.28.
       7) Thermal Resistance (R Value) at 40 degrees F/inch of thickness: 5.4.
     - c. Features:
       1) Board Size: 48 x 96 inch.
       2) Board Thickness: Thickness as required to achieve R-Value per plans.
       3) Board Edges: Square.
- B. Fiber Batt Insulation:
  1. Mineral Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
     - a. Basis of Design: MinWool Sound Attenuation Fire Batts by Johns Manville.

b. Performance Criteria:
1) Combustibility: Non-combustible, when tested in accordance with ASTM E136.
2) Manufactured with binder containing no added urea formaldehyde.
3) Flame Spread Index: 25 or less, when tested with facing, if any, in accordance with ASTM E84.
4) Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
5) Thermal Resistance (R Value) at 40 degrees F/inch of thickness: 3.1.
c. Features:
1) Formaldehyde Free.

C. Mineral Fiber Board Insulation:
1. Rigid mineral fiber, ASTM C612.
2. Basis of Design:
a. CavityRock DD by ROCKWOOL.
b. Rainbarrier 45 by Thermafiber.
3. Performance Criteria:
a. Flame Spread Index: 25 or less, when tested with facing, if any, in accordance with ASTM E84.
b. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
c. Rated Non-combustible per NFPA 220 in accordance with ASTM E136.
d. Water Absorption: 0.03 percent by volume, maximum, when tested in accordance with ASTM C1104/C1104M.
e. Water Vapor Transmission: 50 perms when tested in accordance with ASTM E96/E96M based on 1 inch thickness.
f. Board Density: 4.5 lb/cu ft.
g. Compressive Resistance: 25 psi.
h. Thermal Resistance (R Value) at 40 degrees F/inch of thickness: 4.2.
4. Features:
a. Board Thickness: 2.5 inches.
b. Installation: Glue or friction fit between z-clips; no stick pin through fastening.

D. Foam Detailing Insulation:
1. Low expansion foam complying with AAMA 812.
2. Basis of Design: Froth Pak by Dow Chemical.
3. Performance Criteria:
a. Two-component closed-cell urethane foam with low-expansion pressure, 10 percent flexibility, and 1.75 to 2.0 lb/cu. ft., suitable for installation adjacent to fenestration.

2.03 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
B. Sheet Vapor Retarder: Specified in Section 07 25 00 - Weather Barriers.
C. Protection Membrane: White, Polypropylene fiberglass scrim.
D. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.

3.04 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

END OF SECTION

SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Self-Adhered Weather Barrier Sheet.
- B. Liquid Applied Weather Barrier Coating.
- C. Flexible Flashings.

1.02 RELATED REQUIREMENTS
- A. 07 2100 - Thermal Insulation: Vapor retarder and air barrier components installed in conjunction with insulation.
- B. 07 5400 - Thermoplastic Membrane Roofing: Vapor retarder and air barrier components installed in conjunction with roofing membrane.
- C. 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

1.03 DEFINITIONS
- A. Weather Barrier: Assemblies that form water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
- C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
- D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture-resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 ADMINISTRATIVE REQUIREMENTS
- A. Preinstallation Meeting: Convene one month before starting work of this section in accordance with Section 01 3000 - Project Coordination.
  1. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of air barrier system materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection of continuous air barrier.

1.05 SUBMITTALS
- A. Qualification Data: For manufacturer and installer.
- B. Product Data: Provide product criteria, characteristics, accessories, jointing and seaming methods, and termination conditions.
- C. Shop Drawings: Indicate extents, special joint or termination conditions, and conditions of interface with other materials. Indicate line of continuous air barrier at building exterior.
- D. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of air barrier system installation.
- E. Test Report: Submit report of full-size mockup test for NFPA 285 fire performance.
- F. Field test results.
- G. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, perimeter conditions requiring special attention, and storage and handling criteria.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE
- A. Manufacturer Qualification: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience with local product representation available to

review product installation.

B. Installer Qualifications: Company specializing in performing the work of this section, using specified materials with minimum 5 years of experience on projects of similar size and complexity.

1.07 MOCKUP

A. Construct mockup of 100 sq ft of horizontal waterproofing, representing finished work including internal and external corners.

1.08 DELIVERY, STORAGE, AND HANDLING

A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.09 WARRANTY

A. Manufacturer's warranty for air barrier for a period of ten (10) years from date of Purchase.
   1. Preinstallation meeting and jobsite observations by air barrier manufacturer may be required for specified warranty.

PART 2 PRODUCTS

2.01 DESCRIPTION

A. Components of vapor retarder and air barrier assemblies under opaque cladding; including liquid, sheet, and flexible transition flashings.

2.02 PERFORMANCE AND DESIGN CRITERIA

A. Air Permeability:
   1. The system: Air permeability not to exceed 0.04 cfm/ft2 under a pressure differential listed, when tested per ASTM E2357

B. Air Infiltration: 0.004 cfm/sq ft maximum per ASTM E283.

C. Fire Performance: Tested in accordance with, and complying with the acceptance criteria of, NFPA 285; testing must be performed specifically for this project.

D. Fire Performance: Combustible exterior wall coverings shall be tested in accordance with NFPA 268.
   1. 2012 IBC.1406.1.1.

2.03 MATERIALS

A. Liquid Applied Weather Barrier Membrane:
   1. Specification is based on Prosoco R-Guard by Prosoco.
      a. Comparable products by one of the following are also acceptable. See Section 01 60 00 - Product Requirements for submittal requirements.
         1) DOWSIL Silicone Air Barrier System.
         2) Carlisle Coatings and Waterproofing.
         3) Henry Company.
         4) GRACE.
         5) Tremco.
         6) Soprema LM204 VP.
      b. Substitutions for products by manufacturers other than those listed above: See Section 01 60 00 - Product Requirements.
   2. Performance Criteria:
      a. Air Permeance: Pass: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
      b. Water Vapor Permeance: 15 perms, minimum, when tested in accordance with ASTM E96/E96M.
   3. Features:
      a. Material Thickness: 12-15 mils as recommended by manufacturer to attain the performance criteria specified over the substrates present.

b. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for ultraviolet and weather exposure.
c. Color: To be selected by Architect from manufacturer's full range.

4. Full line of accessories:
a. Fast flash.
b. Porous preparation.
c. Joint and seam sealer.
d. Cat-5.

B. Self-Adhered Weather Barrier Sheet:
1. Specification is based on product by products listed below:
a. Substitutions for products by manufacturers other than those listed above: See Section 01 6000 - Product Requirements.
2. Performance Criteria:
a. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
b. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M.
3. Products:
a. Vaproshield SA Membrane System by VaproShield.
1) Features:
(a) Material Thickness: 60 mils.
(b) Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 6 months weather exposure.
b. Majvest SA by SIGA.
1) Features:
(a) Material Thickness: 28 mils.
(b) Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 6 months weather exposure.
c. Soprema Sopraseal Stick VP.

C. Flexible Flashings.
1. Liquid Flashing Membrane: Product recommended by weather barrier manufacture to maintain performance criteria while transitioning to rough openings.
2. High Temperature Self-Adhering Membrane Flashing: Meeting AAMA 711 specification for heat exposure range Level 3 Service temperature over 176 degrees: Butyl based bituminous sheet membrane, 30-40 mil thickness, laminated to a cross-laminated polyethylene film, in factory cut widths. One of the following:
a. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1) Blueskin PE 200HT by Henry Company.
2) CCW-705 HT by Carlisle Coatings & Waterproofing Inc.
3) Lastobond Shield HT by Soprema Inc.
3. Liquid Mastic: Liquid mastic recommended by flashing manufacturer.
4. Primers, Cleaners, Insulation Adhesive, Joint Compound, and Sealant Materials: As recommended by air barrier manufacturer, appropriate to application, and compatible with adjacent materials.

2.04 ACCESSORIES
A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
B. Liquid Flashing Membrane:
1. At locations recommended by air and water resistant membrane manufacturer.

C. Primer:
   1. Liquid waterborne or solvent-borne primer recommended for substrate by air and water barrier material manufacturer.
D. Counter-flashing and Transition Strips:
   1. Modified bituminous or butyl based, 40-mil thick, self-adhering sheet flashing, polyethylene or foil carrier sheet as location and function dictate.
E. Liquid-Applied Flashing:
   1. Manufacturer’s recommended gun-grade waterproofing, adhesive, and detailing company that combines the best of silicone and polyurethane properties. The single component, Silyl-Terminated-Poly-Ether (STPE) produces a highly durable, seamless, elastomeric that should treat joints, seams, cracks, and provide the flashing membrane in rough openings of structural walls and to counter-flash waterproofing and air barrier components.
F. Joint Reinforcing Strip:
   1. Manufacturer's joint reinforcing tape.
G. Substrate-Patching Membrane:
   1. Manufacturer's standard trowel-grade substrate filler.
H. Adhesive and Tape:
   1. Manufacturer's standard adhesive and pressure-sensitive adhesive tape.
I. Metal Flashings:
   1. Per 07 6200 - Sheet Metal Flashing and Trim.
J. Sprayed Polyurethane Foam Sealant:
   1. Per 07 2100 - Thermal Insulation.
K. Joint Sealant:
   1. Per 07 9005 - Joint Sealers.
L. Air Barrier Sealant:
   1. Manufacturer’s recommended sealant to seal field sheet-applied air barrier membrane to sheet-applied air barrier membrane; seal field sheet-applied air barrier membrane to self-adhered membrane; seal membrane flashing around opening to vinyl windows and doors.
M. Termination Mastic:
   1. Fluid or sheet-applied air and water barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION
A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION
A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
B. Follow specific requirements for lapping and integration with flashings described in the details to form an air and weather tight installation.
C. Where primer is required, primer substrates at a rate required by air and water barrier manufacturer and allow it to dry. Limit priming to areas that will be covered by material on same day. Re-prime areas exposed for more than 24 hours.
   1. Where required, prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
D. Connect and seal exterior wall air and water barrier material continuously to the following areas where applicable, using accessory materials as indicated in the Drawings:
   1. Roofing-membrane, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior

louvers, exterior door framing, and other construction used in exterior wall openings.

E. Install air and water barrier as recommended by the manufacturer around window and door rough openings and at penetrations after sheathing is installed and penetrations have been secured. Provide minimum overlaps as require.
F. Coordinate installations with Section 07 6200 - Sheet Metal Flashing and Trim to provide air tight transitions within the air and weather barrier membrane including but not limited to rough opening and penetration heads, ledger angles, and cross cavity through wall flashings. Install tapes and sealant continuously as required to provide an air tight installation.
G. Secure and/or adhere the air and weather barrier system as required by manufacturer.
H. Ensure that air and weather barrier is air tight, free from holes, tears, and punctures.
I. Cover air and weather barrier system within manufacturer’s recommended exposure timeframe.

3.04 CLEANING

A. Clean dust, dirt, and debris from the surface of air and water resistant barriers prior to installation of furring and/or cladding materials.

3.05 PROTECTION

A. Protect air and water barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
    1. Protect air and weather barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for longer than manufacturer’s recommended timeframe, remove and replace fluid-applied air and weather barrier or install additional, full-thickness, fluid-applied air and weather barrier application after repairing and preparing the overexposed membrane according to fluid-applied air and weather barrier manufacturer's written instructions.
    2. Protect fluid-applied air and weather barrier from contact with incompatible materials and sealants not approved by fluid-applied air and weather barrier manufacturer.
B. Repair damage before proceeding with subsequent construction.
C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
D. Remove masking materials after installation.

END OF SECTION

SECTION 07 4213
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Metal wall panels.

1.02 RELATED REQUIREMENTS
- A. 05 0513 - Shop-Applied Coatings for Metal: For finish on panels.
- B. 07 2100 - Thermal Insulation: For insulation and exterior insulation thermal spacers installed with system.
- C. 07 2500 - Weather Barriers: For weather barrier underlayments installed with system wall panels.
- D. 07 9005 - Joint Sealers: For joint sealant installed with system.

1.03 ADMINISTRATIVE REQUIREMENTS
- A. Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 3100 - Project Coordination.
  1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.04 DEFINITIONS
- A. Rainscreen: Exterior wall assembly in which cladding stands off from the moisture-resistant surface of an air and water barrier applied to the sheathing to create a capillary break and to allow drainage and evaporation.
- B. Metal Wall Panels: Roll-formed panel; typically less than 1/8 inch thick.
- C. Weather-tight: Significantly affecting air and water performance requirements though may not be pressure-equalizing or designed to prevent water intrusion.
- D. DBCV: Drained and back-ventilated cavity rainscreen system designed to drain and dry water entering cavity through drainage channels, weeps, and air ventilation.
- E. PER: Pressure-equalized rainscreen system designed for no water intrusion, with equal pressure within air cavity and outside cladding barrier.

1.05 SUBMITTALS
- A. Qualification Data: For manufacturer, installer, fabricator, and design engineer.
- B. Delegated-Design Submittal: For assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Delegated-Design Submittal: For Pressure-equalized rainscreen system assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Product Data: Include material descriptions, dimensions of individual components and profiles, and finishes for each type of metal wall panel and accessory.
- E. Shop Drawings: Include layouts of panels, details of edge and penetration conditions, spacing and type of connections, flashings, and special conditions.
  1. Show work to be field-fabricated or field-assembled.
  2. Indicate joint and reveal sizes and path for water drainage.
- F. Sample: For each panel specified, submit samples of minimum size 12 inches square, representing actual metal panel including material, thickness, profile, color, and texture.
- G. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- I. Maintenance Data: For user's operation and maintenance of system including:

1. Methods for maintaining system's materials and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance. Confirm cleaners are compatible with adjacent materials and face sealers.

J. Certificate of tested assemblies meeting PER performance requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the manufacture of panels specified in this section with minimum 5 years of experience.
B. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.
C. Fabricators Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.
D. Installer Qualifications: Company trained and authorized by panel system manufacturer and specializing in performing the work of this section with minimum 3 years of experience.
E. PER Testing Agency Qualifications:

1.07 MOCKUP

A. Construct mockup of 100 sq ft of system, representing finished work including internal and external corners.

1.08 DELIVERY, STORAGE, AND HANDLING

A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.09 WARRANTY

A. Manufacturer’s Finish Warranty: Correct defective work within a 20 year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
    1. Panel Finish Criteria are listed AAMA 2605.

PART 2 PRODUCTS

2.01 DESCRIPTION

A. Manufactured metal panels for walls and soffits, with insulation, liners, related flashings, and accessory components.

2.02 PERFORMANCE AND DESIGN CRITERIA

A. General:
    1. Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.
    2. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E330/E330M.
        a. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with code.
        b. Maximum Allowable Deflection of Panel: 1/180 of span.
    3. Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
    4. Provide continuity of thermal barrier at building enclosure elements and continuity of air barrier and vapor retarder seal at building enclosure elements in conjunction with materials specified in Section 07 25 00.
    5. Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.

6. Fabricate and finish panels and accessory items at factory, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.
7. Factory-install captive gaskets, sealants, or separator strips at panel joints to eliminate metal-to-metal contact, and minimize noise from panel movements.

2.03 MATERIALS

A. Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 coating designation; structural quality.
B. Panel Finish: In accordance with Section 05 0513 - Shop-Applied Coatings for Metal.

2.04 METAL WALL PANELS

A. Flat Panel:
   1. Basis of Design: HR-36 Series Perforated by AEP Span.
      a. Substitutions for products by manufacturers other than those listed: See Section 01 6000 - Product Requirements.
   2. Features:
      a. Rib Profile: Perforation pattern #5 per AEP Span chart.
      b. Panel Material: Aluminum Sheet.
      c. Sheet Thickness: 22 gauge with aluminum-zinc alloy coating conforming to ASTM A792, Class AZ50.
      d. Panel Width: 36 inches.
      e. Color: Zinc gray.
      f. Attachment: low profile exposed fastener. Painted to match panel.

2.05 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
B. Miscellaneous Metal Subframing and Furring:
   1. Material recommended by manufacturer for compatibility with panel base metal and conditions present. Metal Compatibility and furring installed over fiberglass clips and continuous insulation as detailed.
   2. Profile: Manufacturer's standard profile for conditions present.
C. Miscellaneous Sheet Metal Items:
   1. Provide flashings, trim, moldings, closure strips, of the same material, thickness, and finish as used for the panels.
D. Sealants:
   1. As specified in Section 07 9005.
   2. Exposed sealant must cure to rubber-like consistency.
   3. Concealed sealant must be non-hardening type.
E. Clips:
   1. Interlocking side lap feature which conceals the fasteners and is installed using clips to allow for thermal movement. Clips shall be designed to hold the panel 1/2 inch minimum from exterior insulation to create a drainage plane and ventilation cavity. Load span tables must include evaluation of clip and side joint interaction.
F. Sliding Vent and Insect Screen:
   1. Basis of Design: SV-5 by Cor-A-Vent.
      a. Size: 3/4" thick by 3" high.
      b. Color: Black
G. Factory Applied Sealant:
   1. Concealed within the interlocking joint.
H. Internal and External Corners:

1. Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

I. Expansion Joints:
1. Same material, thickness and finish as exterior sheets; 20 gage; manufacturer's standard brake formed type, of profile to suit system.

J. Trim, Closure Pieces, Caps, Flashings, Facias, and Infills:
1. Same material, thickness and finish as exterior sheets; brake formed to required profiles.

K. Anchors:
1. Galvanized steel or Stainless steel.

L. Fasteners:
1. Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.

B. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

C. Coordinate with installation of associated counterflashings and other components installed under other sections.

3.04 TOLERANCES

A. Maximum Offset from True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.05 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.06 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

END OF SECTION

SECTION 07 5216
STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. SBS-modified bituminous membrane roofing, adhered in cold application.
B. Cover board, mechanically fastened.
C. Roof insulation, loose laid.
D. Substrate board, loose laid.

1.02 RELATED SECTIONS

A. Section 06 2000 - Finish Carpentry: for wood nailers, cants, curbs, and blocking and for wood-based, structural-use roof deck panels.
B. Section 07 6200 - Sheet Metal Flashing and Trim: for flashings and counter flashings.

1.03 REFERENCES

A. Roofing Terminology: Refer to the following publications for definitions of roofing work related terms in this Section:
   1. ASTM D 1079 “Standard Terminology Relating to Roofing and Waterproofing.”
   2. Glossary of NRCA’s “The NRCA Roofing and Waterproofing Manual.”
   3. Roof Consultants Institute “Glossary of Building Envelope Terms.”
   4. International Building Code (IBC)
   5. American Society of Civil Engineers (ASCE-7) Minimum Design Loads for Buildings & Other Structures
B. Sheet Metal Terminology and Techniques: SMACNA “Architectural Sheet Metal Manual.”

1.04 DESIGN CRITERIA

A. General: Installed roofing membrane system shall remain watertight; and resist specified wind uplift pressures, thermally induced movement, and exposure to weather without failure.
B. Material Compatibility: Roofing materials shall be compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.
C. Installer shall comply with current code requirements based on authority having jurisdiction.
D. Wind Uplift Performance: Roofing system shall meet the intent of systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressure calculated in accordance with ASCE 7.
E. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
   1. Exterior Fire-Test Exposure: Class A; UL 790, for application and roof slopes indicated.

1.05 SUBMITTALS

A. Product Data: Manufacturer’s data sheets for each product to be provided.
B. Detail Drawings: Provide roofing system details and details of attachment to other Work, including:
   1. Base flashings and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Crickets, saddles, and tapered edge strips, including slopes.
   4. Insulation fastening and adhesive patterns.
C. Verification Samples: Provide for each product specified.

D. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturers product who is eligible to receive manufacturers special warranty.
E. Maintenance Data: Refer to Johns Manville's latest published documents on www.JM.com.
F. Guarantees: Provide manufacturer's current guarantee specimen.
G. Prior to roofing system installation, roofing sub-contractor shall provide a copy of the Guarantee Application Confirmation document issued by Johns Manville Roofing Systems indicating that the project has been reviewed for eligibility to receive the specified guarantee and registered.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product who is eligible to receive the specified manufacturer's guarantee.
B. Manufacturer Qualifications: Qualified domestic U.S. owned and based manufacturer that has UL listing or accredited testing agency for roofing system identical to that used for this Project.
C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 329.
D. Test Reports:
    1. Roof drain and leader test or submit plumber's verification.
    2. Core cut, if required.
    3. Roof deck fastener pullout test, if required.
E. Moisture Survey, if Required:
    1. Submit prior to installation, results of a non-destructive moisture test of roof system completed by approved third party. Utilize one of the approved methods:
        a. Infrared Thermography
        b. Nuclear Backscatter
F. Source Limitations: Obtain all components from the single source roofing manufacturer guaranteeing the roofing system. All products used in the system shall be labeled by the single source roofing manufacturer issuing the guarantee.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.08 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when current and forecasted weather conditions permit roofing system to be installed in accordance with manufacturer's written instructions and guarantee requirements.

1.09 GUARANTEE

A. Provide manufacturer's system guarantee equal to Johns Manville's Peak Advantage No Dollar Limit Roofing System Guarantee.
    1. Single-source special guarantee includes roofing plies, base flashings, liquid applied flashing, roofing membrane accessories, roofing membrane, roof insulation, fasteners, adhesives, cover board, substrate board, walkway products, manufacturer's edge metal

products, and other approved single-source components of roofing system marketed by the manufacturer.
2. Guarantee Period: 30 years from date of Substantial Completion.
3. Contractor is required to list “Rice Fergus Miller, Inc.” as the Specifier/Consultant of record in the appropriate fields (“Specifier Account”) when applying for the manufacturer’s warranty.

B. Installer’s Guarantee: Submit roofing Installer's guarantee, signed by Installer, covering Work of this Section, including all components of roofing system, for the following guarantee period:
1. Guarantee Period: two years from date of Substantial Completion.

C. Existing Guarantees: Guarantees on existing building elements should not be affected by scope of work.
1. Installer is responsible for coordinating with building owner’s representative to verify compliance.

PART 2 PRODUCTS

2.01 BASE PLY AND CAP-SHEET MATERIALS

A. Roofing Membrane Sheet: SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
1. ASTM D 6164, Grade S, Type II, polyester-reinforced, Basis of design: DynaLastic 250 S

B. Roofing Membrane Cap Sheet: SBS-modified asphalt sheet; granular surfaced; suitable for application method specified.
1. ASTM D 6164, Grade G, Type II, polyester-reinforced, Basis of design: DynaLastic 250 FR CR G.
2. CRRC-listed, highly reflective, non-coated, granular surface with the following minimum properties: Initial SRI- 86, 3 Year SRI- 80

2.02 FLASHING SHEET MATERIALS

A. Backer Sheet: ASTM D 4601, Type II, asphalt-impregnated and coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides. Basis of design: PermaPly 28

B. Backer Sheet: SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
1. ASTM D 6164, Grade S, Type II, polyester-reinforced, Basis of design: DynaLastic 250 S.

C. Flashing Sheet: SBS-modified asphalt sheet; granular surfaced; suitable for application method specified.
1. ASTM D 6164, Grade G, Type II, polyester-reinforced, Basis of design: DynaLastic 250 FR CR G.

D. Liquid Applied Flashing: A liquid and fabric reinforced flashing system created with a stitch bonded polyester scrim and a two-component, moisture cured, elastomeric, liquid applied flashing material, consisting of an asphalt extended urethane base material and an activator. Basis of design: PermaFlash System

2.03 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with built-up roofing.

B. Asphalt Roofing Cement: ASTM D 4586, type I, asbestos free, of consistency required by roofing system manufacturer for application. Basis of design: MBR Utility Cement

C. Mastic Sealant: As required by Johns Manville.

D. Cold-Applied Flashing Adhesive: Roofing system manufacturer's asphalt-based, two-part, elastomeric, liquid-applied, cold-applied adhesive specially formulated for compatibility and use with flashing applications. Basis of design: MBR Flashing Cement

E. Cold-Applied Adhesive: Solvent-based:ASTM D3019, Type III, Grade 2. asphalt-based, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with

membrane applications. Basis of design: MBR Cold Application Adhesive

F. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and provided by the roofing system manufacturer. Basis of design: High Load Fasteners and Plates
G. Roofing Granules: Ceramic-coated roofing granules matching specified cap sheet, provided by roofing system manufacturer. CR Roofing Granules
H. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.04 WALKWAYS (IF APPLICCABLE)

A. Walkway Pads: Mineral-granule-surfaced, reinforced modified asphalt composition, slip-resisting pads, manufactured as a traffic pad for foot traffic provided by roofing system manufacturer, with a pad size of 32-inch x 32-inch. Basis of design: [DynaTred Walkway]

2.05 COVER BOARD

A. Gypsum Board: ASTM C 1177, Heavy duty coated glass-mat facer [with Eonic primed face],, water-resistant gypsum substrate for adhered roof applications Choose thickness thick. Basis of design: Dens Deck Prime Roof Board

2.06 ROOF INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2 (20 psi), Basis of design: ENRGY 3
    1. Provide insulation package with minimum R Value: 49.8
    2. Provide insulation package with minimum thickness: 8.4”
    3. Provide insulation package in multiple layers.
    4. Minimum Long-Term Thermal Resistance (LTTR): 5.7 per inch.
        a. Determined in accordance with CAN/ULC S770 at 75ºF (24ºC)

2.07 TAPERED INSULATION

A. Tapered Insulation: ASTM C 1289, Type II, Class 1, Grade 2 (20 psi), Basis of design: Tapered ENRGY 3

2.08 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
B. Provide saddles, crickets, tapered edge strips, and other insulations shapes where indicated for sloping to drain. Fabricate to slopes indicated. Basis of design: Tapered Fesco Edge Strip.
C. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and furnished by roofing system manufacturer. Basis of design UltraFast Fasteners and UltraFast Plates
D. Insulation Cant Strips: ASTM C 728, perlite insulation board. Basis of design: FesCant Plus
E. Wood Nailer Strips: Comply with requirements in Division 06 Section "Miscellaneous Rough Carpentry."

2.09 SUBSTRATE BOARD

A. Gypsum Board: ASTM C 1177, Heavy duty coated glass-mat facer, water-resistant gypsum substrate for adhered roof applications, Choose Thickness. Basis of design: Dens Deck Prime Roof Board

2.10 EDGE METAL COMPONENTS (IF APPLICABLE)

A. Shop-Fabricated Edge Metal: Custom-fabricated edge metal meeting the criterion of ANSI/SPRI ES-1. Must be approved by manufacturer technical representative. Minimum requirements:
   1. Steel: 24 gauge minimum, fastened 6 inches on center.
   2. Aluminum: 0.05 inch thick, fastened 6 inches on center.
B. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."
C. Roof Edge Drainage Systems: Gutter Systems: Manufactured in section lengths not exceeding 12 feet with 0.100-inch mill aluminum internal Gutter Hangers, 24 inches on center, and 2-inch-wide formed external wind straps 6'-0" on center

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with the requirements affecting performance of roofing system.
   1. General:
      a. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
      b. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   2. Wood Decks:
      a. Verify that wood decking is visibly dry and free of moisture.
      b. Verify that wood has ability to provide minimum fastener pull-out resistance.
         1) Provide documentation of pull-out resistance values in accordance with ANSI/SPRI FX-1 2016.
         2) Provide documentation of pull-out resistance values in accordance with RAS 117.
   3. Ensure general rigidity and proper slope for drainage.
   4. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units more than 1/16 inch (1.6 mm) out of plane relative to adjoining deck.
B. Unacceptable panels should be brought to the attention of the General Contractor and Project Owner's Representative and shall be corrected prior to installation of roofing system.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean and remove from substrate sharp projections, dust, debris, moisture, and other substances detrimental to roofing installation in accordance with roofing system manufacturer's written instructions.
B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.
C. If applicable, prime surface of deck with primer at a rate recommended by roofing manufacturer and allow primer to dry.
D. Proceed with each step of installation only after unsatisfactory conditions have been corrected.

3.03 RE-ROOF PREPARATION

A. Remove all roofing membrane, surfacing, coverboards, insulation, fasteners, asphalt, pitch, adhesives, etc.
   1. Remove an area no larger than can be re-roofed in one day.
B. Tear out all base flashings, counterflashings, pitch pans, pipe flashings, vents, sumps, and like components necessary for application of new membrane.
C. Remove abandoned equipment curbs, skylights, smoke hatches, and penetrations.

1. Install decking to match existing as directed by Owner's Representative.

D. Raise (disconnect by licensed craftsmen, if necessary) all HVAC units and other equipment supported by curbs to conform with the following:
   1. Modify curbs as required to provide a minimum 8" base flashing height measured from the surface of the new membrane to the top of the flashing membrane.
   2. Secure of flashing and install new metal counterflashing prior to re-installation of unit.
   3. Perimeter nailers shall be elevated to match elevation of new roof insulation.

E. Immediately remove all debris from roof surface. Demolished roof system may not be stored on the roof surface.

3.04 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

B. Loose Laid Substrate Board: Loose lay substrate board, staggering joints with insulation board substrate.

3.05 INSULATION INSTALLATION

A. Coordinate installation of roof system components so insulation and cover board are not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system manufacturer's written instructions for installation of roof insulation and cover board.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation boards with long joints in a continuous straight line. Joints should be staggered between rows, abutting edges and ends per manufacturer’s written instructions. Fill gaps exceeding 1/4 inch (6 mm) with like material.

E. Install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

F. Trim surface of insulation boards where necessary at roof drains so completed surface is flush and does not restrict flow of water.

G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

H. Loose Laid Insulation: Loose lay all layers of insulation with staggered joints.

3.06 COVER BOARD INSTALLATION

A. Coordinate installing membrane roofing system components so cover board is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof cover board.

C. Install cover board with long joints in a continuous straight line. Joints should be staggered between rows, abutting edges and ends per manufacturer’s written instructions. Fill gaps exceeding 1/4 inch (6 mm) with cover board.
   1. Cut and fit cover board within 1/4 inch (6 mm) of nailers, projections, and penetrations.

D. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
   1. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

E. Mechanically Fastened Cover Board: Install cover board and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof cover board to deck type.
   1. Fasten to resist uplift pressure at corners, perimeter, and field of roof.

3.07 ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.

B. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
C. Where roof slope exceeds 1/2 inch per 12 inches (1:24), contact the membrane manufacturer for installation instructions regarding installation direction and backnailing
D. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.
   1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation.
   2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
   3. Remove and discard temporary seals before beginning work on adjoining roofing.
E. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.08 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

A. Install one modified bituminous roofing membrane base sheet, and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, with the following installation method:
   1. Unroll roofing membrane sheets and allow them to relax.
   2. Adhere [modified bituminous roofing membrane base and cap sheet to substrate in cold-applied adhesive according to roofing system manufacturer’s instruction.
B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
   1. Repair tears and voids in laps and lapped seams not completely sealed.
   2. As required, apply roofing granules to cover exuded bead at laps while bead is hot.
C. Install roofing membrane sheets so side and end laps shed water.

3.09 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
   1. Prime substrates with asphalt primer if required by roofing system manufacturer.
   2. Backer Sheet Application: Mechanically fasten backer sheet to walls or parapets.
   3. Backer Sheet Application: Adhere backer sheet to substrate in approved adhesive applied at rate required by roofing system manufacturer.
   4. Flashing Sheet Application Adhere flashing sheet to substrate in approved adhesive applied at rate required by roofing system manufacturer.
B. Extend base flashing up walls or parapets 8 inches (200 mm) above roofing membrane. Refer to manufacturer's standard flashing details.
C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
   1. Seal top termination of base flashing with a strip of glass-fiber fabric set in MBR Flashing cement.
D. Roof Drains: Flash drain using liquid applied flashing system. Clamp roofing membrane, flashing, and stripping into roof-drain clamping ring.
   1. Install stripping according to roofing system manufacturer's written instructions.
E. Flash all penetrations using liquid applied flashing system.

3.10 EDGE METAL INSTALLATION (WHERE APPLICABLE)

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that work may properly commence. Do not proceed with installation until

unsatisfactory conditions have been corrected.

B. Provide edge details as indicated on the Drawings. Install in accordance with the membrane manufacturer's requirements and SMACNA's "Architectural Sheet Metal Manual."

C. Join individual sections in accordance with the membrane manufacturer's requirements and SMACNA's "Architectural Sheet Metal Manual".

3.11 WALKWAY INSTALLATION (WHERE APPLICABLE)

A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.
   1. Sweep away loose aggregate surfacing and set walkway pads in additional cold applied adhesive.

B. Walkway Cap Sheet Strips: Install roofing membrane walkway cap sheet strips over roofing membrane in cold applied adhesive.

C. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions in locations indicated, to form walkways.

3.12 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical representative to inspect roofing installation on completion and submit report to Architect.

B. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 PROTECTION AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Fabricated sheet metal items.

1.02 RELATED REQUIREMENTS
- A. 07 2500 - Weather Barriers: Moisture protection and underlayments under sheet metal flashings.
- B. 07 9005 - Joint Sealers: Sealants installed with sheet metal flashing and trim.

1.03 ADMINISTRATIVE REQUIREMENTS
- A. Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 3000 - Project Coordination.
  1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.04 SUBMITTALS
- A. Qualification Data: For fabricator.
- B. Shop Drawings: Indicate material profile, jointing locations, jointing details, fastening methods, flashings, terminations, and installation details. Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop and field assembled work. Include the following:
  1. Identify material, thickness, weight, and finish for each item and location in Project.
  2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
  3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners to adjoining work.
- C. Samples:
  1. Finish Sample: Submit two samples illustrating each metal finish color.
  2. Fabrication Sample: Submit sample of coping lap joint as it will occur every 10 feet.
- D. Warranty: Submit manufacturer finish warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE
- A. Fabricators Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.

1.06 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.07 WARRANTY
- A. Manufacturer’s Finish Warranty: Correct defective work within a 20 year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
  1. Panel Finish Criteria are listed AAMA 2605.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Sheet metal including steel, stainless steel, and aluminum fabricated into items such as flashings, counterflashings, and other items indicated and scheduled.

2.02 PERFORMANCE AND DESIGN CRITERIA
- A. General: Install sheet metal flashing and coping to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.
   1. Temperature Change (Range): 120 deg, ambient; material surfaces.

2.03 MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal, shop pre-coated with PVDF coating.
   1. Fluoropolymer Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As scheduled below and indicated on drawings.
B. Pre-Finished Aluminum: ASTM B209; 0.032 inch thick; plain finish shop pre-coated with fluoropolymer coating.
   1. Fluoropolymer Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As scheduled below and indicated on drawings.
C. Stainless Steel: for masonry use: ASTM A666 Type 304, soft temper, 0.018 inch thick; smooth mill finish.
D. Stainless Steel: For all other uses: ASTM A666 Type 304, rollable temper, 0.018 inch thick; smooth No. 4 finish.

2.04 FABRICATION

A. Conform to referenced SMACNA manual, Manufacturer's recommendations if premanufactured and as detailed. Conform to following general requirements:
B. Form sections true to shape, accurate in size, square, and free from distortion or defects.
C. Form pieces in longest possible lengths.
D. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
E. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
F. Hem exposed edges 1/2 inch on unexposed side, miter and seam corners, unless noted otherwise.
G. Cleats: Fabricate continuous cleats and starter strips from one gauge heavier material than sheet metal material, in widths required by SMACNA, interlockable with sheet.
H. Fully soldered/welded stainless steel saddle and transition flashings at 3-D transitions such as roof to wall intersections, roof to elevator overrun, and the like.
I. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
J. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection, and as required by SMACNA. Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
K. Shingle laps in flashings: 6-inch minimum, sealed with two distinct beads of bib-skinning butyl sealant at each lap.

2.05 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
B. Flexible Flashing:
   1. For use under metal copings and flashings Section 07 25 00 - Weather Barriers; use high temperature type.
C. Slip Sheet:

1. Rosin sized building paper.

D. Protective Backing Paint: See Section 09 90 00 - Painting and Coating.
E. Sealant: As specified in Section 07 90 05 - Joint Sealers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.

3.04 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

3.05 SCHEDULE

A. Sheet Metal Panel:
   1. Material: Prefinished Aluminum.
   2. Thickness: 20 gauge/0.0320 inches.
   3. Color: To be selected from manufacture's standard colors.
   4. Locations: As indicated.
B. Counter Flashing:
   1. Material: Prefinished Aluminum.
   2. Thickness: 20 gauge/0.0320 inches.
   3. Color: To be selected from manufacture's standard colors.
   4. Seaming: Fully-welded shop fabricated corners and end dams.
C. Masonry Through Wall flashing:
   1. Material: Prefinished Aluminum.
   2. Thickness: 20 gauge/0.0320 inches.
   3. Color: To be selected from manufacture's standard colors.
   4. Seaming: Fully-welded shop fabricated corners and end dams.
D. Window Head Flashing:
   1. Material: Prefinished Aluminum.
   2. Thickness: 20 gauge/0.032 inches.
   3. Color: To be selected from manufacture's standard colors.
   4. Seaming: Fully-welded shop fabricated corners and end dams.
E. Coping, Cap, Parapet, Sill and Ledge flashings:
   1. Material: Prefinished Aluminum.
   2. Thickness: 20 gauge/0.0320 inches
   3. Color: To be selected from manufacture's standard colors.
   4. Seaming: Butt joint with concealed splice plates.
   5. Corners: Fully-welded shop fabricated corners, ends and intersections.
F. Pre-finished Metal Sill Flashing:
   1. Material: Prefinished Aluminum.
   2. Thickness: 20 gauge/0.0320 inches
   3. Color: To be selected from manufacture's standard colors.
   4. Seaming: Butt joint with concealed splice plates.
   5. Corners: Fully-welded shop fabricated corners, ends and intersections.
G. Pre-finished Aluminum Trim:
   1. Material: Prefinished Aluminum.
   2. Thickness: 20 gauge/0.0320 inches

3. Color: To be selected from manufacture's standard colors.
4. Seaming: Butt joint with concealed splice plates.
5. Corners: Fully-welded shop fabricated corners, ends and intersections.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Penetration firestopping.
- B. Fire resistive joint systems.

1.02 RELATED REQUIREMENTS
- A. 09 2116 - Gypsum Board Assemblies: For fire rated assemblies requiring firestopping.
- B. Divisions 21-28: For items typically penetrating fire rated assemblies requiring firestopping.

1.03 ADMINISTRATIVE REQUIREMENTS
- A. Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 3000 - Project Coordination.

1.04 SUBMITTALS
- A. Qualification Data: For manufacturer and fabricator.
- B. Product Data: Provide product criteria, characteristics, accessories, and jointing methods, and termination conditions.
- C. Shop Drawings: Indicate system design listing by UL, FM Research, Intertek Testing Services, Omega Point Laboratories (OPL).
  1. Where system design listing is not available for a particular configuration provide an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) for submittal
- D. Contractor Installation log.
- E. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- F. Maintenance Data: For user's operation and maintenance of system including:
  1. Methods for maintaining system's materials.

1.05 QUALITY ASSURANCE
- A. Manufacturer of firestop products shall have been successfully producing and supplying these products for a period of not less than 3 years, and be able to show evidence of at least 10 projects where similar products have been installed and accepted.
- B. Fabricators Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.

1.06 WARRANTY
- A. Installation Warranty: Contractor shall correct defective Work within a five year period after Date of Substantial Completion.
- B. Manufacturer Warranty: Provide five year warranty for firestopping systems.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Interior Firestopping: Provide firestopping of all joints head of walls and penetrations in fire-resistance rated and smoke-resistant assemblies. Single source installer.

2.02 PERFORMANCE AND DESIGN CRITERIA
- A. Penetrations: Provide firestopping systems that resist the spread of fire, and the passage of smoke and other gases according to requirements indicated:
  1. Firestop all penetrations passing through fire resistance rated wall and floor assemblies and other locations as indicated on the drawings.
  2. Provide complete penetration firestopping systems that have been tested and approved by third party testing agency.
  3. F - Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E814, but not less than one

hour or the fire-resistance rating of the construction being penetrated.

4. T - Rated Through-Penetration Firestop Systems: Provide firestop systems with T ratings, in addition to F ratings, as determined per ASTM E814, where indicated by Code.
5. Provide T-Rating Collar Devices tested in accordance with ASTM E814 or ANSI/UL 1479 for metallic pipe penetrations requiring T-Ratings per the applicable building code.
6. L - Rated Through-Penetration Firestop Systems: Provide firestop systems with L ratings, in addition to F and T ratings, as determined per UL 1479, where indicated by Code.
7. W - Rated Through-Penetration Firestop Systems: Provide firestop systems with W Water Resistance ratings, in addition to F, T and L ratings, as determined per UL 1479, where indicated.

B. Perimeter Fire Containment Systems: Provide interior perimeter joint systems with fire-resistance ratings indicated, as determined per ASTM E2307, but not less than the fire-resistance rating of the floor construction.
C. Fire-Resistive Joints: Provide joint systems with fire-resistance ratings indicated, as determined per UL 2079, but not less than the fire-resistance rating of the construction in which the joint occurs.
D. For firestopping exposed to view, traffic, moisture, and physical damage, provide appropriate firestop systems for these conditions.
   1. Exposed to view firestopping must be paintable.
E. Firestop material must be able to be installed per manufacturers written instructions in temperatures ranging from 35 degrees F to 120 degrees F, and have the ability to be frozen, thawed and still comply with its UL designation and testing results.
F. Provide products that upon curing, do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.
G. Movement:
   1. Provide firestop sealants and fire resistive joint sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion and other normal building movement without damage to the seal.
   2. Provide fire-resistive joint sealants designed to accommodate a specific range of movement and tested for this purpose in accordance with a cyclic movement test criteria as outlined in Standards, ASTM E-1399, ASTM E1966, or ANSI/ UL 2079.
H. Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.
I. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.
J. When mechanical cable pathways are not practical, openings within walls and floors designed to accommodate voice, data and video cabling shall be provided with re-enterable products specifically designed for retrofit.
K. Penetrants passing through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall. Systems within the UL Fire Resistance Directory that meet this criterion are identified with the words “Chase Wall Optional”.
L. Provide penetration firestop systems, fire-resistive joint systems, or perimeter fire barrier systems subjected to an air leakage test conducted in accordance with Standard, ANSI/ UL 1479 for penetrations and ANSI/UL 2079 for joint systems with published L-Ratings for ambient and elevated temperatures as evidence of the ability of firestop system to restrict the movement of smoke.

2.03 MANUFACTURERS

A. Basis of Design: 3M Fire Protection Products as listed in assemblies shown on Drawings or approved equal.
   1. Comparable products by one of the following are also acceptable. See Section 01 60 00 - Product Requirements for submittal requirements.

2.04 HEAD OF WALL ASSEMBLIES AT FIRE RESISTIVE JOINT ASSEMBLIES

A. Metal Stud / Gypsum Board Partition Head-of-Wall Assembly: Based on UL assemblies listed on the Drawings.
   1. Track:
      a. Basis of Design: Cemco "FAS Track DL2"; 20 gage (33 mil) track with factory installed intumescent seal; include "Fas Shaft Track DL2" for application at shaft wall assemblies; Include "Cemco Fas Strap" for installation of partitions against fluted metal decks; width as appropriate to flute spacing.

2.05 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping.

3.02 PREPARATION

A. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond. Do not allow spillage and migration onto exposed surfaces.
B. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed. Remove tape as soon as it is possible to do so without disturbing the firestopping seal with substrates.
C. Verify that system components are clean, dry, and ready for installation.
D. Verify that field dimensions are as shown on the Drawings and as recommended by the manufacturer.

3.03 PENETRATION FIRESTOP INSTALLATION

A. Ensure that all pipes, conduit, cable, and other items, which penetrate fire rated construction, have been permanently installed prior to installation of firestop assemblies.
B. Ensure that partitions and all other construction that conceal penetrations are not erected prior to the installation of firestop and smoke seals.
C. Install forming/damming materials and other accessories in accordance with manufacturers written instructions.
D. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
   1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
   2. Install materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed finish to produce smooth, uniform surfaces.

3.04 FIRESTOP JOINT SYSTEM INSTALLATION

A. Install joint fillers to provide support of firestop materials during application.
B. Provide at the position to produce the cross-sectional shapes and depths of installed firestop material relative to joint widths for optimum sealant movement capability and required fire-resistance.
C. Install systems that result in firestop materials:

1. Directly contacting and fully wetting joint substrates.
2. Completely filling recesses provided for each joint configuration.
3. Providing uniform, cross-sectional shapes and depths relative to joint width that optimize movement capability.

D. Tool non-sag firestop materials immediately after application and prior to skinning begins. Form smooth, uniform beads of configuration indicated or required to:
1. Produce fire-resistance rating.
2. Eliminate air pockets.
3. Ensure contact and adhesion with sides of joint.

3.05 INSTALLATION LOG

A. Include the following items for all firestop and fire resistive joint installations:
1. Contractor’s name, address, and phone number.
2. Through-penetration firestop systems designation of applicable testing and inspecting agency.
3. Date of installation.
4. Firestop systems manufacturer’s name.

B. Provide as a pdf file with bi-directional links to floor plans and elevations to clearly illustrate location of material.

3.06 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems.

3.07 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses. Use methods and cleaning materials approved by manufacturers of firestopping products and or assemblies in which openings and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances.

3.08 SCHEDULE

A. Refer to assemblies on drawings.

END OF SECTION

SECTION 07 9005
JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants for exterior surfaces.
B. Sealants for interior surfaces.

1.02 RELATED REQUIREMENTS

A. 01 6000 - Product Requirements: For substitution and additional product requirements.

1.03 SUBMITTALS

A. Qualification Data: For Manufacturer, Installer, Testing Agency.
B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
C. Preliminary Selection Sample: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
D. Field Samples for Confirmation: Provide sealant samples in the color selected based on Manufacturer's charts for sealants other than the ones included in the Visual and Performance Mockup. Field samples shall be minimum 12 inches long and installed at joints intended for each particular sealant use. Mockup and field samples will be used to confirm sealant color selection.
E. Sanded sealant samples: Include in the Visual and Performance mockup, as part of the brick portion of the mockup.
F. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
G. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
H. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
I. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
    1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
    2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
J. Field Test Report Log: For each elastomeric sealant application.
K. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
L. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
M. Maintenance Data: For user's operation and maintenance of system including:
    1. Methods for maintaining system's materials and finishes.
    2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
    3. Recommendations on maintenance schedule.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
B. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project. Minimum 5 years of documented experience in facilities of this size and scope.

1. Prequalification of single source installers for exterior sealants is encouraged.

C. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.05 MOCKUP

A. Construct mockup of 4 lineal feet of sealant at narrowest joint width and widest joint width, representing finished work including internal and external corners and control joints.
B. Locate where directed.
C. Mockup may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.07 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.
B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Ten (10) years from date of Substantial Completion.
C. Special warranties exclude deterioration or failure of elastomeric joint sealants from the following:
   1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 PRODUCTS

2.01 DESCRIPTION

A. Joint sealers for properly designed joints in interior and exterior materials; selected for durability, movement capacity, adhesion to substrates and non-staining characteristics.

2.02 PERFORMANCE AND DESIGN CRITERIA

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
C. Elastomeric Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
D. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.

2.03 MANUFACTURERS

A. Specification is based on products listed below.

2.04 MATERIALS

A. Sealants for exterior surfaces:

1. (S-1): Silyl-terminated polyether elastomeric; ASTM C920, Grade NS, Class 25, Uses NT, M, G, A and O; single, or multi- component.
    a. Color: Standard and custom colors matching finished surfaces.
    b. Product: BASF MasterSeal NP 150
2. (S-2): Silicone Sealant: ASTM C920, Grade NS, Class 50, Uses NT, A, G, M, O; single component, general purpose, medium modulus, neutral curing, non-sagging, non-staining, non-bleeding.
    a. Movement Capability: +/- 50 percent.
    b. Color: Standard colors matching finished surfaces.
    c. Product: DOWSIL 795 manufactured by Dow.
    d. Designed for weather-proofing typical exterior materials including unprimed adhesion to anodized and fluoropolymer coated aluminum.
3. (S-3): Surface Modified Silicone Sealant: ASTM C920, Grade NS, Class 50, Uses NT, A, G, M, O; single component, general purpose, medium modulus, neutral curing, non-sagging, non-staining, non-bleeding.
    a. Movement Capability: +/- 50 percent.
    b. Color: Standard colors matching finished surfaces.
    c. Product: DOWSIL 756 manufactured by Dow.
    d. Designed for weather-proofing sensitive porous stone and light colored metal panel substrates.
4. (S-4): Butyl Sealant: ASTM C1311.
    a. Movement Capability: Plus and minus 12-1/2 percent.
    b. Product: Butyl Sealant by Tremco.
    c. Designed for concealed joints requiring non-drying sealant like lap joints in sheet metal flashing and trim.
5. (S-5): Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, I, M and A; single or multi-component.
    a. Movement Capability: +/- 25 percent.
    b. Color: Color as selected to match concrete.
    c. Product: THC 901 by Tremco Inc.
    d. Designed for exposed, trafficked joints with pourable self-leveling installation.
6. (S-6): Preformed Compressible Foam Sealers.
    a. Movement +25 percent, -25 percent (50 percent total) - permanently elastic.
    b. Color: Color as selected to match concrete.
    c. Product: THC 901 by Tremco Inc.
        1) Backerseal by Emseal.
        2) illmod 600 by Tremco Inc.

B. Sealants for interior surfaces:
1. (S-10): General Purpose Interior Sealant: polyurethane; single, or multi- component, paintable.
    a. Color: Standard colors matching finished surfaces.
    b. Product: Dymonic FC, Dymeric 240FC by Tremco Inc.
    c. Designed for interior movement and non-moving joints adjacent to painted surfaces.
2. (S-11): Bathtub/Tile Sealant: Silicone; ASTM C920, Uses M and A; single component, mildew resistant.
    a. Colors other than white may be required.
    b. Product: DOWSIL Tub and Tile Sealant manufactured by Dow.
    c. Sealant Used in Food preparation area must be USDA approved for that use.
3. (S-12): Acoustical Sealant: Acrylic sealant; ASTM C834.
    a. Product: Tremco "Acoustical Sealant".

b. Non-hardening type.
c. Tested as part of acoustical assemblies.

4. (S-13): Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single or multi-component.
   a. Approved by manufacturer for wide joints up to 1-1/2 inches.
   b. Color: Standard colors matching finished surfaces.
   c. Product: Vulkem 45 SSL by Tremco Inc.
   d. Designed for exposed, trafficked joints with pourable self-leveling installation.

2.05 ACCESSORIES

A. Joint sealant backing:
   1. General:
      a. Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
   2. Cylindrical Sealant Backings:
      a. ASTM C1330, TypeC (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin),or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
   3. Elastomeric Tubing Sealant Backings:
      a. Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 degrees F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
   4. Bond-Breaker Tape:
      a. 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.

B. Miscellaneous Materials:
   1. Primer:
      a. 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.
   2. Cleaners for Nonporous Surfaces:
      a. 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.
   3. Masking Tape:
      a. Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.
   4. Natural Sand:
      a. Washed natural sand containing no contaminants that would affect the sealant. Color as approved by the architect for sanded joints as indicated or scheduled.

C. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.

B. Joint Sanding: Sand sealant joints at brick and sidewalks.

1. Immediately after tooling and prior to skinning over of sealant, broadcast sand onto surface of sealant.
2. Retool by rolling a dowel over the joint to achieve sufficient embedment.
3. Maintain uniform appearance.

3.04 FIELD QUALITY CONTROL

A. Field quality control to include field adhesion testing, field stain testing, test methods and evaluation of field test results.

B. Perform all corrections necessary for issuance of warranty.

3.05 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

3.06 SCHEDULE

A. Sealants for exterior surfaces.

1. (S-1): Exterior joints occurring in paintable surfaces.
2. (S-2): Typical exterior weather-proofing joints including metal to metal, metal to glass and perimeters.
3. (S-3): Exterior weather-proofing joints including porous natural stone, unit masonry, veneer masonry, and concrete applications.
4. (S-3a): Exterior weather-proofing joints at ledger angles in masonry veneer. Sand appearance to match brick mortar appearance. Matching may require several iterations.
5. (S-4): Concealed sealants in sheet metal flashing, metal work and other joints calling for nonhardening, nonskinning, non-drying, nonmigrating sealant.
6. (S-5): Joints in sidewalks and other concrete paving. Provide sanded joints.
7. (S-6): Used as a secondary sealant behind directly-applied liquid sealant. Use at all joints larger than 3/4 inch in width as a secondary sealant.

B. Sealants for interior surfaces:

1. (S-10): Typical Interior Sealant: Moving and non-moving Interior wall and ceiling control joints, smoke rated (but not fire rated) partitions.
2. (S-11): Joints between plumbing fixtures and floor and wall surfaces. Joints between kitchen, laundry room and bath countertops and wall surfaces.
3. (S-12): Use for concealed locations only. Sealant bead between top stud runner and structure and between bottom stud track and floor at any wall designated as acoustical.
4. (S-13): Control joints in floors.
5. Acoustical sealants.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Fire rated steel doors.
- B. Fire rated steel frames.
- C. Exterior steel frames.

1.02 RELATED REQUIREMENTS
- A. 09 9000 - Painting and Coating: For field painting.

1.03 SUBMITTALS
- A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes. Include U-value data for thermally broken doors and frames.
- B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- C. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- E. Maintenance Data: For user's operation and maintenance of system including:
  1. Methods for maintaining system's materials and finishes
  2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

1.04 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Hollow metal frames for hollow metal doors, wood doors and glazing. Hollow metal doors for fire rated, non-fire rated, and insulated openings.

2.02 PERFORMANCE AND DESIGN CRITERIA
- A. Accessibility Requirements: For doors required to be accessible, comply with applicable provisions in the Accessible and Usable Building Facilities ICC A117.1 and 2010 ADA Standards for Accessible Design – Department of Justice.
- B. Comply with ANSI A250.8 in general and for grade and style specified.
- C. NAAMM HMMA doors of equivalent or better construction are allowed.

2.03 MANUFACTURERS
- A. Specification is based on Doors and Frames by one of the following:
  1. Assa Abloy.
  2. Ceco.
  3. Curries.
  4. Fleming.
  5. Steelcraft.

2.04 MATERIALS
- A. Fire rated steel doors.
  1. Performance Criteria:

a. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
    1) Provide units listed and labeled by UL.
    2) Attach fire rating label to each fire rated unit.
b. Grade: ANSI A250.8 Level 3, physical performance Level C, Model 2, seamless.
c. Thickness: 1-3/4 inches.
d. Exterior Doors, Fire Rated:
    1) Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M with manufacturer's standard coating thickness.
    2) Insulating Value: U-value of 0.29, when tested in accordance with ASTM C1363.

2. Features:
a. Door Top and Closures: Steel, Flush with top of faces and edges.
b. Door Edge Profile: Beveled on both edges.
c. Face Texture: Smooth.
d. Glazed Lights: Sizes and configurations as indicated on drawings. Provide secure glazing stops on secure side of door.
    1) Glazing: In accordance with ICC (IBC)-2012 716 Tables.
e. Color: To be selected from manufacturer's full range.
f. Finish: Factory primed for field finishing.

B. Fire Rated Frames:
1. Performance Criteria:
a. Comply with the requirements of grade specified for corresponding door.
b. Fire Rating: Same as door, labeled, tested in accordance with UL 10C ("positive pressure").
c. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 2.
d. Frames for Glass: Comply with frame requirements specified in ANSI A250.8 for Level 1, 18 gage.
2. Features:
a. Assembly: Fully welded.
b. Finish: Factory primed, for field finishing.

C. Exterior Frames:
1. Performance Criteria:
a. Comply with the requirements of grade specified for corresponding door.
b. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
c. Provide with true thermal break.
2. Features:
a. Assembly: Fully welded.
b. Finish: Factory primed, for field finishing.

2.05 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
B. Glazing: As specified in Section 08 80 00 - Glazing, factory installed.
C. Mineral Fiber Insulation: For filling frame cavities.

2.06 FINISHING

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.
C. Field Finish: In accordance with Section 09 90 00 - Painting and Coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.
B. Coat inside of frames to be installed in masonry, with bituminous coating, prior to installation.
C. Coat inside of other frames with bituminous coating to a thickness of 1/16 inch.

3.03 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
B. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
C. Install fire rated units in accordance with NFPA 80.
D. Seal seam at top closures after finish is applied to create a smooth surface without groove or pits.
    1. Seal with sealant Per Section 07 9005 - Joint Sealers.
E. Pack all frames with insulation.
F. Coordinate installation of hardware.
G. Coordinate installation of electrical connections to electrical hardware items.
H. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: As specified in ANSI A250.8.
B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust and lubricate hardware for proper operation.
B. Adjust for smooth and balanced door movement in accordance with manufacturer's instructions.

3.06 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

3.07 SCHEDULE

A. Refer to door schedule on drawings.

END OF SECTION

SECTION 08 3323
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Non-rated overhead coiling doors.

1.02 SUBMITTALS
- A. Qualification Data: For manufacturer.
- B. Product Data: Provide general construction, component connections and details, electrical equipment.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Sample: Submit two slats, 6 inch in length illustrating shape, color and finish texture.
- E. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention. Indicate installation sequence and procedures, adjustment and alignment procedures
- F. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Data: For user operation and maintenance of system including:
  1. Methods for maintaining system's materials and finishes.
  2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
  3. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.
  4. Recommendations on maintenance schedule.

1.03 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.

1.04 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.05 WARRANTY
- A. Manufacturer’s Warranty: Correct defective work within a 20 year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Non-rated overhead coiling doors.

2.02 PERFORMANCE AND DESIGN CRITERIA
- A. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

2.03 MANUFACTURERS
- A. Specification is based on product listed below by Overhead Door Corporation..
  1. Substitutions for products by manufacturers other than those listed above: See Section 01 6000 - Product Requirements .

2.04 NON-RATED OVERHEAD COILING DOORS:
- A. Specification is based on Model 625 by Overhead Door Company..
- B. Performance Criteria:
  1. Electrical: The basis of design for the overhead door(s) is a 3/4 HP motor @ 208V/3-Phase, which has an electrical load of 3.0 amps per the manufacturer data. Due to the

limited electrical capacity, the door motor may be no larger then 3/4 HP or consume more than 3 amps each.

2. . Through Curtain Sound Rating: Sound Rating: STC-28 (STC-30+ with HZ noise generator) as per ASTM E 90.
3. Installed System Sound Rating: STC-21 as per ASTM E 90.
4. U-factor: 0.91 NFRC test report, maximum U-factor of no higher than 1.00.
5. Air Infiltration: Meets ASHRAE 90.1 & IECC 2012/2015 C402.4.3 Air leakage <1.00 cfm/ft2.

2.05 ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.

3.04 ADJUSTING

A. Adjust and lubricate hardware for proper operation.

3.05 CLEANING

A. Dispose of all waste material in accordance with project's Waste Management Plan.

3.06 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

END OF SECTION

SECTION 08 4316
FIBERGLASS FRAMED STOREFRONT

PART 1 - GENERAL

1.01 SECTION INCLUDES
- A. Exterior storefront and entrances.

1.02 RELATED REQUIREMENTS
- A. 07 9005 - Joint Sealers: Installation of joint sealants installed within storefront.
- B. 08 80 00 - Glazing: Glass infill.

1.03 PRECONSTRUCTION TESTING
- A. Preconstruction Testing Service: Provide glazed storefronts that comply with test- performance requirements indicated, as evidenced by reports based on Project- specific preconstruction testing or of tests performed on manufacturer's standard assemblies by a qualified testing agency.

1.04 SUBMITTALS
- A. Qualification Data: For manufacturer, installer and design engineer.
- B. Delegated-Design Submittal: For assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Product Data: Provide product criteria, characteristics, accessories, material descriptions, dimensions of individual components and profiles, and finishes.
- D. Shop Drawings: For glazed storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
  1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
  2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed Storefronts, showing the following:
     a. Joinery, including concealed welds.
     b. Anchorage templates and details.
     c. Interface with adjoining building construction
     d. referenced to detail numbers indicated on the Contract Drawings
     e. Expansion and seismic provisions.
     f. Operable units and vents
     g. Entrance Systems
     h. Glazing.
     i. Flashing and drainage.
- E. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE
- A. Manufacturer Qualification: Company specializing in the manufacture of work specified in this section with minimum 5 years experience.
- B. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years experience on projects of similar size and complexity.

1.06 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.07 WARRANTY

A. Manufacturer's Finish Warranty: Correct defective work within a 20 year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
   1. Finish Criteria are listed AAMA 2605.
B. Manufacturer Warranty: Provide 2 year warranty for system failing to resist penetration of water.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Specification is based on products listed below by Cascadia Windows and Doors.

2.02 DESCRIPTION

A. Factory fabricated and finished fiberglass framing system with infill, and related flashings, anchorage and attachment devices. Systems do not typically equalize pressure or manage water intrusion within the system and are designed to bear on floor plates and be less than 12 feet tall.

2.03 PERFORMANCE AND DESIGN CRITERIA

A. The storefront system begins at the primary structural members of the building frame and the edges of concrete slabs, include all support embeds, plates, angles and ancillary framing members required for structural integrity and support of the Storefront from the building structure.
B. The Drawings:
   1. Indicate the design intent for profile, joints and configuration required together with relationship to structural frame and interior building elements.
      a. Drawings do not purport to identify or solve completely the problems of thermal or structural movement, pressure equalization, weep system, vapor retarder, fixings and anchorage, flatness and stability of facing, or moisture management.
C. General Performance: Comply with performance requirements specified, as determined by preconstruction testing of manufacturer's standard glazed storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Glazed storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
   2. Failure also includes the following:
      a. Deflection exceeding specified limits.
      b. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
      c. Glazing-to-glazing contact.
      d. Sealant failure.
      e. Glass breakage.
      f. Noise or vibration created by wind and thermal and structural movements.
      g. Loosening or weakening of fasteners, attachments, and other components.
      h. Failure of operating units.
D. Deflection of Framing Members: At design wind pressure, as follows:
   1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
      a. For spans over 13 feet 6 inches limit deflection to L/240 + 1/4 inch.
   2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.

a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.

E. Story Drift (Interstory Movement): Accommodate design displacement of adjacent stories
1. Design Displacement: As indicated on Structural Drawings.
2. Meets criteria for passing based on building occupancy type when tested per AAMA 501.4 and below.
a. Run test procedure, apply and release loads through 10 cycles,
b. Visually inspect the specimen at each displacement.
c. Flex at anchors and racking of framing shall be recorded
3. Lateral Interstory Movement (In plane of Construction)
a. Test by applying a horizontal load to the frame supporting the mock-up specimen, so as to induce a deflection in the mock-up equivalent to the specified elastic interstory drift deflection.
b. Result: There shall be no glass breakage, permanent deformation/damage to any component, anchor failures or structural failures.
c. Result at 150% of design load: There shall be no fall-out or disengagement and release of any component.
4. Horizontal Interstory Movement (Normal to Construction)
a. Test by applying a horizontal load to the frame supporting the mock-up specimen, so as to induce a deflection in the mock-up equivalent to the specified elastic interstory drift deflection.
b. Result: There shall be no glass breakage, permanent deformation/damage to any component, anchor failures or structural failures
c. Result at 150% of design load: There shall be no fall-out or disengagement and release of any component.
5. Vertical Interstory Movement (Differential Deflection)
a. Test for live load deflection by applying a vertical load to the frame supporting the mock-up specimen, so as to induce a deflection in the mock-up equivalent to the specified live load deflection.
b. Result: There shall be no glass breakage, permanent deformation/damage to any component, anchor failures or structural failures.
c. Result at 150% of design load: There shall be no fall-out or disengagement and release of any component.

2.04 MATERIALS

A. Fiberglass Framed Exterior Storefront:
1. Basis of Design Product: Unviersal Series by Cascadia Windows and Doors.
2. Performance:
a. U-Value: variable maximum as indicated in Window Schedule, based on project specific frame types, spacer types and glass types.
b. Air Infiltration:
1) Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.002 cfm/sf. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 12 lbf/sq. ft.
c. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
1) Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2) Test Interior Ambient-Air Temperature: 75 deg F.

3) Test Performance: No buckling; stress on glass; sealant failure; or excess stress on framing, anchors, and fasteners; and no reduction of performance when tested according to AAMA 501.5.

3. Features:
   a. Framing Members: Manufacturer's standard framing members of thickness required and reinforced as required to support imposed loads.
   b. Sight Line: 1-7/8 inches.
   c. Depth: 3-7/8 inches.
   d. All units to have jamb and head compensating receptors.
   e. Manufacture to supply matching prefinished break metal for adjacent conditions.
   f. Finish: High-Performance Finish:
      1) Color: UC109852 Charcoal.

B. Glazing:
   1. Comply with Section 08 80 00 - Glazing.
   2. Glazing Gaskets, Spacers, Setting Blocks, Sealant Backings, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types compatible with sealants and suitable for joint movement and assembly performance requirements.
   3. Weatherseal Sealant: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant- glazed curtain-wall manufacturers for this use.
      a. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Finishes:
   1. High-Performance Finish: waterborne polyurethane finish complying with AAMA 625. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2.05 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
B. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer. or prefinished aluminum only.
C. Framing Sealants: Manufacturer's standard sealants with VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
D. Manufacturer's recommended compensation head channels.
E. Manufacturer's recommended offset clips as detailed.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.

3.04 FIELD QUALITY CONTROL

A. Scope:
   1. Extent of field test shall include the following:
      a. 1 – Fixed, punched window with operable unit,
      b. If testing fails two times, subsequent testing shall be paid for by Installer,

c. If retest fails, all windows shall be retested at cost to Installer.

B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

C. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
   1. Tests shall be conducted prior to installation of interior finishes including gypsum board.
      a. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft., of fixed wall area when tested according to ASTM E783 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft..
      b. Water Penetration: Areas shall be tested according to ASTM E1105 at a minimum uniform and cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under "Performance Requirements" Article, but not less than 6.4 psf, and shall not evidence water penetration.

D. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

3.05 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed Storefronts to comply with the following nonaccumulating maximum tolerances:
   1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
   2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
   3. Alignment:
      a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
      b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
      c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
   4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.
   5. Allowances for cumulative effect of all tolerances (fabrication, assembly, thermal, seismic, building and erection) and including the work of other sections, shall be made to ensure a weatherproof installation

3.06 ADJUSTING

A. Adjust operating windows, ventilators, hardware, and accessories for smooth function and tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

B. Adjust and lubricate hardware for proper operation.

3.07 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

END OF SECTION

SECTION 08 7100 – DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. Work under this section includes the complete finish hardware requirements for the project. Quantities listed are for the contractor's convenience only and are not guaranteed. Items not specifically mentioned, but necessary to complete the work shall be furnished, matching the items specified in quality and finish.

B. Related Sections:
1. Section 08 Hollow Metal Doors and Frames
2. Section 08 Wood Doors
3. Section 08 Aluminum Entrances and Storefronts
4. Section 28 Electronic Security and Safety

1.02 QUALITY ASSURANCE

A. Product Qualification:
1. To assure a uniform high quality of materials for the project, it is intended that only specified items be furnished. Comparable products may be accepted upon prior approval of architect.
2. Hardware to be new, free of defects, blemishes and excessive play. Obtain each kind of hardware (Mechanical latch and locksets, exit devices, hinges and closers) from one manufacturer except where specified.
3. Fire-Rated opening in compliance with NFPA80. Hardware UL10C/UBC-7-2 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved bearing hinges and smoke seal. Furnish openings complete.

B. Supplier Qualifications:
1. Hardware supplier will be a direct factory contract supplier who employs a certified Architectural Hardware Consultant (AHC) available at all reasonable times during the work for project hardware consultation to owner, architect and contractor.
2. Supplier will be responsible for detailing, scheduling and ordering of finish hardware.
3. Conduct pre-installation conference at jobsite. Initiate and conduct with supplier, installer and related trades. Coordinate materials and techniques and sequence complex hardware items and systems installation.
4. Key Conference shall be initiated and conducted with owner to determine system, keyway(s) and structure.

C. Installer Qualifications:
1. Installer to have not less than 3 years' experience specializing in installation of work in this section. Company must maintain qualified personnel trained and experienced in installing hardware.

1.03 REFERENCES

A. Washington State Building Code

B. NFPA80 – Fire Doors and Windows

C. NFPA101 – Life Safety Code

D. NFPA105 – Smoke and Draft Control Door Assemblies

E. ANSI A117.1 - Accessible and Usable Buildings and Facilities

F. BHMA – Builders Hardware Manufacturers Association

G. DHI – Door Hardware Institute

1.04 SUBMITTALS

A. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.

B. Hardware schedule: Submit digital copies of schedule. Organize DHI vertically formatted schedule into Hardware Sets with index of doors and headings, indicate complete designations of every item required for each door or opening. Include the following:

1. Type, style, function, size, quantity and finish of hardware items.
2. Name, part number and manufacture of each item.
3. Fastenings and other pertinent information.
4. Explanation of abbreviations, symbols and codes contained in schedule.
5. Door and frame sizes, materials, fire ratings, and degrees of swing.

C. Product Data: Submit digital copies for each product indicated.

D. Templates: Obtain and distribute templates for doors, frames, and other works specified to be prepared for installing door hardware.

E. Wiring/Riser diagrams: As required for electric hardware indicated.

F. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.

G. Keying Schedule: Prepared by or under the supervision of supplier, after receipt of the approved finish hardware schedule, detailing Owner’s final keying instructions for locks.

H. Samples: Upon request submit material samples.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle and protect products to project site under provisions of Division 1 and as specified herein.

B. Tag each item or package separately, with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver keys to Owner by registered mail.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Years from date of Substantial Completion, for durations indicated.

a.	Closers:	Thirty years
b.	Locksets:	ND series ten years L series three years

1.07 MAINTENANCE

A. Maintenance tools:

1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 PRODUCTS

2.01 MATERIAL AND FABRICATION

A. Provide all door hardware for complete work, in accordance with the drawings and as specified herein.

B. Provide items and quantities not specifically mentioned to ensure a proper and complete operational installation.

2.02 MANUFACTURERS

A. Approval of products from manufacturers indicated as “Acceptable Manufacturer” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

ITEM	SCHEDULED MANUFACTURER	ACCEPTABLE MANUFACTURER
Hinges	Ives (IVE)	Hager, Stanley
Flush Bolts & Coordinators	Ives (IVE)	Burns, Rockwood
Locksets & Deadlocks	Schlage (SCH)	None
Electric Strikes	Von Duprin (VON)	Trine, SDC
Power Supplies	Von Duprin (VON)	Falcon
Cylinders & Keying	Schlage (SCH)	None
Door Closers	LCN (LCN)	None
Automatic Operators	LCN (LCN)	Norton Horton
Door Trim	Ives (IVE)	Trimco, Burns
Protection Plates	Ives (IVE)	Trimco, Burns
Overhead Stops	Glynn-Johnson (GLY)	Rixson, Sargent
Thresholds & Weatherstrip	Zero (ZER)	NGP, Pemko

2.03 HANGING

A. Conventional Hinges: Hinge open width minimum, but of sufficient throw to permit maximum door swing. Steel or stainless-steel pins:

1. Three hinges per leaf to 7 feet, 6-inch height. Add one for each additional 30 inches in height or any fraction thereof.
2. Provide standard-weight 4 ½ x 4 ½ for 1 ¾” thick doors up to 3’5”. Provide heavy-weight 5 x 4 ½ on doors 36” and over.
3. Exterior outswing doors to have non removable (NRP) pins.
4. Pin tips, flat button, finish to match leaves.
5. Interior doors over 36” – Heavy weight.
6. Interior doors up to 36” – Standard weight.

2.04 LOCKSETS, LATCHSETS, DEADBOLTS

A. Heavy Duty Mortise Locks and Latches: Schlage L9000 Series

1. Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security.
2. Provide lock case that is multi-function and field reversible for handing without opening case, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
3. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
4. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
5. Provide electrified options as scheduled in the hardware sets.
6. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

    a. Lever Design: Schlage 17A

B. Extra Heavy Duty Cylindrical Locks and Latches: Schlage ND Series

1. Provide cylindrical locks conforming to ANSI A156.2 Series 4000, Grade 1.
2. UL listed for A label and lesser class single doors up to 4ft x 8ft.
3. Meets A117.1 Accessibility Codes.

4. Provide locksets able to withstand 1500 inch pounds of torque applied to locked outside lever without gaining access per ANSI A156.2 Abusive Locked Lever Torque Test and cycle tested to 3 million cycles per ANSI A156.2 Cycle Test.
5. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
6. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
7. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
8. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
9. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.

    a. Lever Design: Schlage Sparta

2.05 KEYS, KEYING, AND KEY CONTROL

A. See Keying Requirements in this section

2.06 CLOSERS

A. Surface Closers: LCN 4010/4110 Series
1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-1/2 inch (38 mm) diameter with 11/16 inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide stick on templates, special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.07 OTHER HARDWARE

A. Door stops: Provide stops to protect walls, casework or other hardware.
1. Except as otherwise indicated, provide stops (wall, floor or overhead) at each leaf of every swinging door leaf.
2. Where wall or floor stops are not appropriate, provide overhead holders.

B. Weatherstrip and Gasket
1. Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled.
2. Provide non-corrosive fasteners as recommended by the manufacturer for application indicated.

C. Thresholds
1. Except as otherwise indicated, provide standard metal threshold unit of type, size and profile as detailed or scheduled.

D. Silencers
1. Interior hollow metal frames, 3 for single doors, 2 for pairs of doors.

E. Kickplates
1. Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

2.08 HARDWARE FINISH

A. Provide the following finishes unless noted differently in hardware groups:

Hinges	630 Stainless Steel Exterior, 652 Dull Chrome Interior
Locksets	626 Dull Chrome
Exit Devices	626 Dull Chrome
Closers	689 Aluminum
Kickplates	630 Stainless Steel
Other Hardware	626 Dull Chrome
Thresholds	Aluminum
Weatherstrip/Sweeps	Aluminum

2.09 KEYING REQUIREMENTS

A. All keyed cylinders shall be subject to a new Schlage Masterkey system.

B. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

C. Furnish cylinders with construction cores. Following construction supply permanent keyed cores.

D. 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.

E. Initiate and conduct key conference with Owner to determine correct keyway(s) and structure. Owners written approval required prior to ordering product.

F. Key Quantities

6 EA Master Keys
4 EA Control Keys
2 EA Construction Control Keys
10 EA Construction Keys
3 EA Change Keys per keyed alike group

PART 3 EXECUTION

3.01 PREPARATION

A. Ensure that walls and frames are square and plumb before hardware installation.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes. Notify Architect of any code conflicts before ordering materials.

3.02 INSTALLATION

A. Do not install surface mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation.

B. Locate floor stops not more than 4 inches from the wall.

C. Drill pilot holes for fasteners in wood doors and/or frames.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, Installer's Architectural Hardware Consultant must examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 DEMONSTRATION

A. Demonstrate electrical, electronic and pneumatic hardware system including adjustment and maintenance procedures.

3.05 PROTECTION/CLEANING

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

DOOR HARDWARE GROUPS

HARDWARE GROUP NO. 01

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	EU MORTISE LOCK	L9092REU 17A CON 12/24 VDC		626	SCH
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	50AA-S		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER
			CARD READERS - WORK OF DIVISION 28			
			POWER SUPPLY - WORK OF DIVISION 28			

HARDWARE GROUP NO. 02

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050R 17A 09-544	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488FSBK PSA	BK	ZER

HARDWARE GROUP NO. 03

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050R 17A 09-544		626	SCH
1	EA	OH STOP & HOLDER	100H		630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488FSBK PSA		BK	ZER

HARDWARE GROUP NO. 04

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	L9080R 17A		626	SCH
1	EA	OH STOP	100S ..OR W.S.		630	GLY
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488FSBK PSA		BK	ZER

HARDWARE GROUP NO. 05

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	L9080R 17A		626	SCH
1	EA	ELECTRIC STRIKE	6210 FSE 12/16/24/28 VAC/VDC		630	VON
1	EA	OH STOP	100S VERIFY IF NEEDED		630	GLY
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488FSBK PSA		BK	ZER
			CARD READERS - WORK OF DIVISION 28			
			POWER SUPPLY - WORK OF DIVISION 28			

HARDWARE GROUP NO. 06

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	NOTE	HARDWARE BY DOOR SUPPLIER		

3.06

↯ = HARDWARE ITEM REQUIRING ELECTRICAL COORDINATION

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Glass glazing.
- B. Insulated glazing units.
- C. Fire-rated glazing.

1.02 RELATED REQUIREMENTS
- A. 08 1113 - Hollow Metal Doors and Frames: For assembly requiring components from this section.

1.03 SUBMITTALS
- A. Qualification Data: For installer, fabricator and design engineer.
- B. Early Performance Criteria Design Submittal: Submit design package identifying the following criteria, used to design aluminum framed entrances and storefront systems:
  1. Load criteria, including seismic load criteria, wind load criteria.
  2. Design Loads, including wind loads at typical locations and corners, corner zone width, glass dead load, and glazing makeup.
  3. Anticipated movements, including the following:
     - a. Horizontal Joint Movement:
       1) Live load deflection.
       2) Thermal expansion.
       3) Long-term DL creep.
       4) Column shortening.
       5) Total Movement.
     - b. Elastic Story Drift.
     - c. Lateral Drift.
     - d. Parallel-to-Wall Deflection.
     - e. Cantilever Deflection of Framing Members.
- C. Delegated-Design Submittal: For assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Include the following:
  1. Provide specific shadowbox calculations to determine if ventilation of the cavity is required
- D. Energy Performance Certificates: Certificates are required for this project including project specific frame types, spacer types and glass types. Project specific reports substantiate U-value, visual light transmission, and solar heat gain values required by the Energy Code for the project.
  1. For projects following the Energy Code - Prescriptive Path: Submit NFRC Report with gateway sizes indicating compliance with requirements.
  2. For projects following the Energy Code - Performance Path: Submit CMAST bid reports at time of product submittal. Prior to glazed assembly installation, submit NFRC-CMAST label certificates for the designed assemblies (not gateway sizes). Provide finite element computer thermal modeling and calculations per NFRC 100 and NFRC 200, using DOE/LBNL THERM 5.2 and WINDOWS 5.2 software.
- E. Product Data:
  1. Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
  2. Glazing Compounds & Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements and identify available colors.
- F. Shop Drawings: For any glazing installed with components from this section alone.

1. Submit shop drawings for glazing installed within other systems in accordance with the system submittal requirements.

G. Sample: Submit two samples in manufacturer's standard size of glass type units, showing coloration and design.
H. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
J. Maintenance Data: For user's operation and maintenance of system including:
1. Methods for maintaining system's materials and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

1.04 QUALITY ASSURANCE
A. Fabricators Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.
B. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.
C. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING
A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.06 WARRANTY
A. Sealed Insulating Glass Units: Provide a ten (10) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.
B. Laminated Glass: Provide a ten (10) year warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

2.01 DESCRIPTION
A. Glazing and accessories installed as monolithic glazing or insulating glazing units within framing systems and support structures specified elsewhere.

2.02 PERFORMANCE AND DESIGN CRITERIA
A. Thermal Performance:
1. U-Value:
a. Prescriptive Energy Code Limits: Based on NFRC 100 gateway size.
1) Fixed Glazing, including frame: U-value 0.38 maximum.
b. The project is utilizing Total Building Performance approach to compliance with 2Washington State Energy Code. Prescriptive limits above are provided as benchmarks. Refer to SCHEDULE below for weighted averages based on energy models.
1) U-Value, Maximum: For glass and frames, fixed and operable based on project specific opening sizes, configurations, frame types, spacer types and glass types. Advertised U-values substantiated by NFRC Bid Reports at time of bid.
2) U-Value Maximums are subject to change as the energy model is updated.
2. Solar Heat Gain Coefficient (SHGC), Maximum: For the overall glazed assembly vision area and adjacent framing.
3. Visible Light Transmission (VLT), Minimum: For the overall glazed assembly vision area and adjacent framing.
B. By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Roll Wave Maximum Distortion Tolerance: 0.003 inch target with 0.005 inch maximum peak to valley measurement.
D. Bow and Warp Maximum Tolerance: 50 percent of the maximum allowed in ASTM C1048.
E. Thickness: As required for loads indicated.
F. Deflection no greater than 1/175 of the longest dimension or 1/2 inch whichever is less.

2.03 GLAZING ASSEMBLIES

A. (GL-1) MONOLITHIC INTERIOR VISION GLAZING
   1. See Glazing Schedule on drawings for configurations, thicknesses and coatings.
B. (GL-2) INSULATING GLASS UNIT, DOUBLE GLAZED
   1. See Glazing Schedule on drawings for configurations, thicknesses and coatings.
C. (GL-3) (Per Door Manufacturer)
   1. See Glazing Schedule on drawings for configurations, thicknesses and coatings.
D. (GL-4) INSULATING GLASS UNIT, TRIPLE GLAZED
   1. See Glazing Schedule on drawings for configurations, thicknesses and coatings.
E. (GL-5) FIRE RESISTANCE RATED GLAZING
   1. See Glazing Schedule on drawings for configurations, thicknesses and coatings.

2.04 ACCESSORIES

A. Glazing Channels: Specification is based on CRL Wet Glaze U Channels by CRLaurence Co. Inc.
B. Vertical Glazing Gasket: Specification is based on CRL EZ Glaze Soundstrip by CRLaurence Co. Inc.
   1. Features:
      a. Color: Clear
      b. Depth: Selected to match glass panels.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.

3.04 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Gypsum Sheathing.
- B. Gypsum Board.

1.02 RELATED REQUIREMENTS
- A. 06 1000 - Rough Carpentry: Building framing and sheathing.
- B. 07 8400 - Firestopping: Top-of-wall assemblies at fire rated walls.
- C. 07 9005 - Joint Sealers: Acoustic sealant.

1.03 SUBMITTALS
- A. Qualification Data: For Installer and design engineer.
- B. Product Data: Provide data on gypsum board, glass mat faced gypsum board, accessories, joint finishing system, and cement board.
- C. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
- D. Test Reports: For all stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.04 QUALITY ASSURANCE
- A. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.

1.05 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Includes Gypsum wallboard finishing, metal trim and accessories, and acoustical sealants and insulation.

2.02 PERFORMANCE AND DESIGN CRITERIA
- A. Provide completed gypsum board assemblies complying with ASTM C840 and GA-216.
- B. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
  1. Air Pressure Within Shaft: Sustained loads of 7.5 lbf/sq ft with maximum mid-span deflection of L/240.
  2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire Rated Assemblies: Provide completed assemblies complying with UL listed assemblies indicated and ratings indicated on life safety drawings.
  1. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
  2. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL Fire Resistance Directory.
- D. Interior Partitions Indicated as Acoustic: Provide completed assemblies with the following characteristics:
  1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.03 MATERIALS
- A. Gypsum Board:

1. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
    a. Application: Use for vertical surfaces, unless otherwise indicated.
    b. Type X: Thickness 5/8 inch.
        1) Edges: Tapered.
        2) Products:
            (a) Georgia-Pacific Gypsum; ToughRock, and ToughRock Fireguard.
            (b) CertainTeed Gypsum, Inc.; GlasRoc.
    c. Type C: Thickness: As indicated.
        1) Edges: Tapered.
        2) Products:
            (a) ToughRock FireGuard C Gypsum Wallboard.
            (b) CertainTeed Gypsum, Inc.; Type C Fire-Resistant Drywall.

2.04 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
B. Acoustic Sealant:
    1. As specified in Section 07 90 05 - Joint Sealers.
C. Stepped outside corner trim: Fry reglet stepped outside corner
    1. Color: gun metal gray
D. Finishing Accessories:
    1. ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated.
        a. Types: As detailed or required for finished appearance.
        b. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.
E. Joint Materials:
    1. ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
        a. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
        b. Typical: Ready-mixed vinyl-based joint compound.
        c. Exterior Soffits: Chemical hardening type compound.
F. High Build Drywall Surfacer:
    1. Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
G. Anchorage to Substrate:
    1. Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
B. Comply with ASTM C840 and GA-216. Install to minimize butt end joints, especially in highly visible locations.
C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
E. Exterior Soffit Board: Install perpendicular to framing, with staggered end joints over framing members or other solid backing.
F. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   2. At exterior soffits, not more than 30 feet apart in both directions.
B. Corner Beads: Install at external corners, using longest practical lengths.
C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.05 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.
B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings typical.
   2. Level 4: Perforated gypsum.
   3. Level 4: For flat paint, a light final paint texture, or with lightweight wall covering.
   4. Level 3: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   5. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   6. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
   7. Level 0: Temporary partitions and surfaces indicated to be finished in later stage of project.
   8. Level 0: Surfaces indicated to be finished in later stage of project.
D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.06 FIELD OBSERVATION AT "PUNCH"

A. Finish will be judged from a viewing difference of 4 feet.
B. Ceilings will be viewed from a standing position.
C. Finished lighting system or temporary lighting similar to proposed finished lighting should be used for judging the wall.
D. Eye catching discrepancies and or blemishes, including “fuzzy” wall board surfaces, will be rejected.

3.07 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Suspended metal grid ceiling system.

1.02 RELATED REQUIREMENTS
- A. 07 9005 - Joint Sealers: Acoustical sealant.

1.03 ADMINISTRATIVE REQUIREMENTS
- A. Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 3100 - Project Management and Coordination.
  1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.04 SUBMITTALS
- A. Qualification Data: For manufacturer and installer.
- B. Product Data: Provide data on suspension system components, acoustical units, and perimeter molding/seismic connections.
- C. Samples: Submit two samples 4 x 4 inch in size illustrating material and finish of acoustical units.
- D. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- F. Maintenance Data: For user's operation and maintenance of system including:
  1. Methods for maintaining system's materials and finishes.
  2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

1.05 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum of 5 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.07 WARRANTY
- A. Provide 10 year manufacturer warranty on all acoustical panels for sagging and warping, grid system, rusting, and manufacturer's defects.
- B. Provide 15 year warranty for all products using additional "Humidity and Sag resistance" control systems.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Suspended metal grid ceiling systems with seismic edge clips and manufactured edge trim at changes in plane. Fiberglass and gypsum based acoustical units.

2.02 PERFORMANCE AND DESIGN CRITERIA
- A. Seismic Requirements:
  1. Classification: Conform to ASTM C635/C635M, Heavy Duty Classification.
  2. Code Compliance: IBC, American Society of Civil Engineers ASCE 7, and CISCA (AC) Guidelines. Comply with edition dates per local Authorities Having Jurisdiction.
- B. Components: Lock together in a positive manner.

C. Pull out tension:
   1. Cross Tee Connections: Minimum 300 pounds.
   2. Main Tee Splices: Minimum 200 pounds.
D. Seismic Lateral Design: Conform to IBC and ASCE 7 especially requirement for independent support from structure above for light fixture and mechanical services installed into acoustical lay-in panel ceiling systems.
E. Install to conceal plenum space above acoustical ceiling system and to allow access.
F. Make provisions for vertical as well as horizontal suspension systems.

2.03 MANUFACTURERS

A. Substitutions for products by manufacturers other than those listed: See Section 01 60 00 - Product Requirements.

2.04 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.
B. Acoustical Panels: (ACT-1): Painted mineral fiber, with the following characteristics:
   1. Basis of Design: Ultima High NRC 1942 by Armstrong.
   2. Classification: ASTM E1264, Type IV.
      a. Form: 2, water felted.
      b. Pattern "E", lightly textured.
   3. Size: 24 x 24 inches.
   4. Thickness: 7/8 inches.
   5. Thickness: Beveled Tegular.
   6. Color: White.
   7. Suspension System: Exposed grid.
   8. Substitutions: See Section 01 6000 - Product Requirements.

2.05 SUSPENSION SYSTEM

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlockign components, with perimeter moldings, hold down clips, stabilizer bars, clips and splices as required.
B. Exposed Suspension System, Type (ACT-1): Hot dipped galvanized steel grid and cap.
   1. Basis of Design: Suprafine XL 9/16 inch by Armstrong.
   2. Application(s): Seismic.
   3. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
   4. Prifile: Tee; 9/16 inch face width.
   5. Finish: Powder-Coated.
   6. Color: White with TrioGuard WH3G
C. Substitutions: See Section 01 6000 - Product Requirements.

2.06 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
B. Support Channels and Hangers:
   1. Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
C. Perimeter Moldings at Changes in Elevation:
   1. Same material and finish as grid.
      a. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid. Basis of Design: Axiom Trim and Transitions by Armstrong Commercial Ceilings.
      b. At Concealed Grid: Provide concealed molding.
D. Seismic Suspension Edge Clips:

1. Manufacturer's approved, to meet code required movement without 2 inch wall angles.
    a. Basis of Design: Seismic RX BERC2 clip components by Armstrong or ACM7 seismic clips components by USG.

E. Demountable Ceiling Grid Clips:
1. Basis of Design: C1430 variable placement hook clip by Armstrong.

F. Acoustical Sealant for Perimeter Moldings:

G. Touch-up Paint:
1. Type and color to match acoustical and grid units.

H. Perimeter trim axiom classic
1. 4" straight perimeter trim
2. Color: charcoal black

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.

B. Suspension system:
1. Install suspension system in accordance with ASTM C636/C636M and manufacturer's instructions and as supplemented in this section.
2. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
3. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
    a. See also reflected ceiling plans. Where 50 percent unit cannot be achieved, consult Architect before installation.
4. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
5. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.
6. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
7. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
8. Do not support components on main runners or cross runners if weight causes excess deflection.
9. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
10. Do not eccentrically load system or induce rotation of runners.
11. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.05 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Resilient base.

1.02 ADMINISTRATIVE REQUIREMENTS
- A. Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 3000 - Project Coordination.
  1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.03 SUBMITTALS
- A. Qualification Data: For installer.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Base and Accessory Samples: Submit manufacturer's complete set of color samples for initial selection.
- D. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- F. Maintenance Data: For user's operation and maintenance of system including:
  1. Methods for maintaining system's materials and finishes.
  2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
  3. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.04 MAINTENANCE MATERIAL
- A. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. Extra Wall Base: 20 linear feet of each type and color.

1.05 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 2 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.07 WARRANTY
- A. Provide minimum Manufacturers Limited 5 year commercial warranty for manufacturing defects.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Resilient base for transition to other flooring types.

2.02 PERFORMANCE AND DESIGN CRITERIA
- A. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.

2.03 RESILIENT BASE
- A. (RES-1) Resilient Base: ASTM F1861, top set Style A straight, and as follows:
  1. Basis of Design: Pinnacle Rubber Base by ROPPE.
  2. Type: Thermoset Rubber Base.

3. Thickness: 0.125 inch thick.
4. Material: TS - Thermoset Vulcanized Rubber
5. Finish: Satin.
6. Color: To be selected from available colors.
7. Styles: 4-inch standard toe base.
8. Length: Roll (4 foot sections are not acceptable except as maintenance stock).

2.04 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
B. Subfloor Filler:
   1. White premix latex; type recommended by adhesive material manufacturer.
C. Primers, Adhesives, and Seaming Materials:
   1. Waterproof; types recommended by flooring manufacturer.
D. Filler for Coved Base:
   1. Plastic.
E. Sealer and Wax:
   1. Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.
B. Verify existing conditions meet the manufacturer's requirements before starting work, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
C. Verify that wall surfaces are smooth and flat within the tolerances specified, are dust-free, and are ready to receive resilient base.
D. Cementitious Subfloor Surfaces: Verify that substrates meet moisture, internal relative humidity and alkalinity requirements of flooring and adhesive manufacturers.
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. General:
   1. Install all materials in accordance with manufacturer's instructions based on conditions present.
   2. Starting installation constitutes acceptance of subfloor conditions.
   3. Fit joints tightly.

3.04 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.
B. Initial cleaning and finishing is the responsibility of the contractor.
   1. Follow manufacturer's recommendations for initial cleaning and finishing procedures.

3.05 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Interior paint systems.
- B. Exterior paint systems.

1.02 RELATED REQUIREMENTS
- A. 05 0513 - Shop-Applied Coatings for Metal: For factory applied finishes.

1.03 ADMINISTRATIVE REQUIREMENTS
- A. Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 3100 - Project Management and Coordination.
  1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.04 SUBMITTALS
- A. Product Data: Provide product criteria, characteristics, accessories, jointing and seaming methods, and termination conditions.
- B. Sample: Submit three paper chip samples, 8.5 x 11 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
- C. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- D. Maintenance Data: For user's operation and maintenance of system including:
  1. Methods for maintaining system's materials and finishes.
  2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
  3. Recommendations on maintenance schedule.

1.05 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in the manufacture of paint and coating products used in the work of this section with minimum ten years of experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.

1.06 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Surface preparation and field application of paints, stains, varnishes, and other coatings.

2.02 MANUFACTURERS
- A. Provide all paint and coating products used in any individual system from the same manufacturer; unless noted otherwise below.
- B. Paints:
  1. S-W: Sherwin-Williams Co.: www.sherwin-williams.com.
- C. Substitutions for products by manufacturers other than those listed above: See Section 01 60 00 - Product Requirements.

2.03 MATERIALS
- A. Specification is based on products indicated in Interior Finish Schedule on drawings.
- B. Interior Paint
  1. (P-1) Field Paint
  2. (P-2) Door and Trim Paint
  3. (P-3) Ceiling Paint

4. (P-4) _____

C. Exterior paint systems:
   1. Primers:
      a. Alkyd Anticorrosive Metal Primer:
      b. Primer, Galvanized, Water-Based:
   2. Wood and Glass Matt GWB Primer:
   3. Latex Paint:
      a. Exterior Latex (Flat):
      b. Exterior Latex (Semigloss):
   4. Alkyd Paints:
      a. Exterior Alkyd Enamel (Flat):
      b. Exterior Alkyd Enamel (Semigloss):

2.04 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.

3.04 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

END OF SECTION

SECTION 10 2600
WALL AND CORNER PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Corner guards.

1.02 SUBMITTALS
- A. Product Data: Provide product criteria, characteristics, accessories, jointing and methods, and termination details for curtains, track and accessories.
- B. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- C. Maintenance Data: For users operation and maintenance of system including:
  1. Methods for maintaining system's hardware, operation, materials and finishes.
  2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
  3. Recommendations on maintenance schedule.

1.03 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum of 5 years of experience.

1.04 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.05 WARRANTY
- A. Installation Warranty: Contractor shall correct defective Work within a 2 year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Surface applied wall protection including corner guards and fiber reinforced plastic sheet.

2.02 PERFORMANCE AND DESIGN CRITERIA
- A. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.03 MATERIALS
- A. Corner guards.
  1. (CG-1) Corner Guards:
     - a. Basis of Design: Stainless Steel Corner Guard by InPro Corporation.
       - 1) Substitutions for products by manufacturers other than those listed: See Section 01 6000 - Product Requirements.
     - b. Material: 430 Stainless steel; 16 gauge (standard).
     - c. Finish: #4 Satin.
     - d. Height: Top of 4 inch base to 8 feet 0 inches length.
     - e. Leg Length: 3 inches.
     - f. Mounting: Standard screw-on.
  2. (CG-2) Corner Guards:
     - a. Basis of Design: Stainless Steel Corner Guard by InPro Corporation.
       - 1) Substitutions for products by manufacturers other than those listed: See Section 01 6000 - Product Requirements.
     - b. Material: 430 Stainless steel; 16 gauge (standard).

c. Finish: #4 Satin.
d. Height: Top of 4 inch base to 7 feet 0 inches length.
e. Leg Length: 3 inches.
f. Mounting: Standard screw-on.

3. (CG-3) Corner Guards:
a. Basis of Design: Stainless Steel Corner Guard by InPro Corporation.
1) Substitutions for products by manufacturers other than those listed: See Section 01 6000 - Product Requirements.
b. Material: 430 Stainless steel; 16 gauge (standard).
c. Finish: #4 Satin.
d. Height: Top of 4 inch base to 8 feet 0 inches length.
e. Leg Length: 2 x 2".
f. Mounting: Standard screw-on.

2.04 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work, including location of blocking.

3.02 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
B. Install components plumb, level, square, and in proper alignment with drawings.

3.04 ADJUSTING

A. Repair minor damages to finish in accordance with manufacturer’s instructions and as approved by Architect.

3.05 CLEANING

A. At completion of the installation, clean surfaces in maintenance instructions.

3.06 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Fire extinguishers.
- B. Fire extinguisher cabinets.

1.02 RELATED REQUIREMENTS
- A. 09 2116 - Gypsum Board Assemblies: Roughed-in wall openings and blocking.

1.03 BOISE CITY GREEN CONSTRUCTION CODE COMPLIANCE THROUGH INTERNATIONAL GREEN CONSTRUCTION CODE (IGCC)
- A. This project will comply with Boise City Green Construction Code. It is the Contractor's responsibility to familiarize themselves with this program, to determine which requirements in the system are relevant for this project and are influenced by their work, and to meet the requirements of those sections for this project.

1.04 SUBMITTALS
- A. Qualification Data: For manufacturer.
- B. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.
- C. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, and location.
- D. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- E. Maintenance Data: For user's operation and maintenance of system including:
  1. Test, refill or recharge schedules and re-certification requirements.
  2. Methods for maintaining system's materials and finishes.
  3. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

1.05 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Fire extinguishers, fire rated and non-rated cabinets, surface or recess mounted with accessories for proper use.

2.02 PERFORMANCE AND DESIGN CRITERIA
- A. Portable fire extinguishers shall be selected and installed in accordance with this section and NFPA 10.
  1. 2012 IBC.906.2.

2.03 MATERIALS
- A. Fire Extinguishers:
  1. Multi-Purpose Dry Chemical Extinguisher:
     a. Basis of Cost: Specification is based on MP Series by Larsen's Manufacturing Co.
        1) Comparable products by one of the following are also acceptable. See Section 01 60 00 - Product Requirements for submittal requirements.
           (a) JL Industries, Inc: www.jlindustries.com.
           (b) Ansul, Inc: www.ansul.com.

2) Substitutions for products by manufacturers other than those listed above: See Section 01 6000 - Product Requirements.

b. Performance Criteria:
1) Complying with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
2) Labeled by UL for the purpose specified and indicated.
3) Class: A:B:C.
4) UL Rating: 4A-80B:C.
5) Extinguisher Model: Larsen's #MP10.
6) Size: 10 pound.

c. Features:
1) Finish: Baked polyester powder coat.
2) Color: Red.

B. Fire extinguisher cabinets:
1. Semi-Recess Mounted Cabinets in Non-Fire Rated Walls:
a. Basis of Cost: Specification is based on Ridge Series Cabinet by Nystrom.
1) Comparable products by one of the following are also acceptable. See Section 01 6000 - Product Requirements for submittal requirements.
(a) Larsen's Manufacturing Co.
(b) JL Industries, Inc: www.jlindustries.com.
(c) Ansul, Inc: www.ansul.com.
2) Substitutions for products by manufacturers other than those listed above: See Section 01 60 00 - Product Requirements.

b. Performance Criteria:
1) Sized to fit specified fire extinguisher.
2) Provide Flame Shield option to maintain fire rating of assembly.

c. Features:
1) Door and Trim Material: Cold steel sheet with recoat able white polyester finish.
2) Door Style: Convex, clear plastic bubble window.
3) Trim Style: Flat with square corners.
4) Glazing: Clear Acrylic.
5) Finish of Cabinet Exterior Trim and Door: Red enamel.

2. Surface Mounted Cabinets:
a. Basis of Cost: Specification is based on Ridge Series Cabinet by Nystrom.
1) Comparable products by one of the following are also acceptable. See Section 01 60 00 - Product Requirements for submittal requirements.
(a) Larsen's Manufacturing Co.
(b) JL Industries, Inc: www.jlindustries.com.
(c) Ansul, Inc: www.ansul.com.
2) Substitutions for products by manufacturers other than those listed above: See Section 01 60 00 - Product Requirements.

b. Performance Criteria:
1) Sized to fit specified fire extinguisher.

c. Features:
1) Door and Trim Material: Cold steel sheet with recoat able white polyester finish.
2) Door Style: Convex, clear plastic bubble window.
3) Trim Style: Flat with square corners.
4) Glazing: Clear Acrylic.
5) Finish of Cabinet Exterior Trim and Door: White enamel.

2.04 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
B. Manufacturer's accessories required by the project:
    1. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify existing conditions meet the manufacturer's requirements before starting work.
3.02 PREPARATION
A. Prepare surfaces to receive work in accordance with manufacturer's instructions.
3.03 INSTALLATION
A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
3.04 ADJUSTING
A. Adjust and lubricate hardware for proper operation.
3.05 PROTECTION
A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.
3.06 SCHEDULE
A. (FEC-1): Typical: Recess Mounted Cabinet; with Multi-Purpose Dry Chemical Extinguisher, Type: A:B:C, Capacity: 10 pound.
B. (FEC-2): Garage: Surface Mounted Cabinet; with Multi-Purpose Dry Chemical Extinguisher, Type: A:B:C, Capacity: 10 pound.

END OF SECTION

SECTION 10 8013
MISCELLANEOUS SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Knox Box.
- B. Solar Powered Emergency Vehicle Caution System

1.02 SUBMITTALS
- A. Product Data: Manufacturer's printed product literature for each type of specialty, indicating colors, locations, overall dimensions.
- B. Samples: Submit sample of finish options for verification.
- C. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.03 DELIVERY, STORAGE, AND HANDLING
- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

PART 2 PRODUCTS

2.01 DESCRIPTION
- A. Exterior Specialties: Miscellaneous specialties on building exterior.

2.02 KNOX BOX
- A. High Security Industrial/Government Key Vault.
- B. Basis of Design: KnoxVault 4400 Series Single Lock Model by Knox Company.
- C. Finish: Dark Bronze.
- D. Options:
  1. Aluminization.
  2. Recessed Mounting Kit.
  3. Substitutions: See Section 01 6000 - Product Requirements.

2.03 SOLAR POWERED EMERGENCY VEHICLE CAUTION SYSTEM
- A. Product: ELTEC Solar Powered Emergency Vehicle Caution System (EVCS).
  1. Model: ELTEC #870445 wall-mounted push-button transmitter.
     a. 92 MHz
     b. Size: 3-1/2-inches x 2-1/4-inches x ¾-inches.
     c. Ten (10) 2-position (on/off) dip switch format.
     d. Optimal conditions range is up to 15000FT.
     e. 9V battery, metal visor clip, and antenna included.
     f. Long Range Receiver: ER294-1K.433.92 MHz
     g. Size: 4-1/2-inches x 3-1/2-inches x 1-1/4-inches (includes mounting tabs)
     h. Switchable between 12 and 24 Volt.
     i. Ten (10) 2-position (on/off) dip switch format.
- B. Standard Features:
  1. AC or Solar Powered.
  2. System Flexibility: Tailored to meet project requirements.
  3. Programmable timed vehicle exit
  4. CAUTION (amber) or STOP (red) Alerts: no price difference
  5. 8” or 12” LED Signal Heads: no price difference
  6. AC: Optional battery back-up.
  7. Solid state flasher.
  8. Meets MUTCD and ITE standards.
- C. Solar Powered:
  1. High efficiency self-cleaning solar modules with a 20 year warranty.

2. Controller with LCD display showing: battery voltage, solar amps, load amps.
3. Solid state flasher (FS-3).
4. Sized by computer program: ensures power generated meets/exceeds load requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install neatly, with horizontal edges level.
C. Protect from damage until Substantial Completion; repair or replace damage items.

3.03 SCHEDULE

A. Knox Box: As indicated on Drawings.

END OF SECTION

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 hydraulically designed (or pipe schedule only if acceptable by authorities having jurisdiction) system to NFPA occupancy requirements.
3. Determine volume and pressure of incoming water supply from water flow test data.
4. Interface system with building fire and smoke alarm systems.
5. 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 13 13	Wet-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.
2. National Electrical Code (NEC) NFPA 70.
3. Requirements of OSHA.
4. National Fire Protection Association (NFPA) Codes and Standards.
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. Electronic: **All sections of Division 21 shall be submitted together in one complete PDF file with bookmarks for each section. 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 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.

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 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.

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.

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 1 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.
   2. Bind each manual in a hard-backed loose-leaf binder.

C. Imprint on cover:
   1. Name of project.

2. Owner.
3. Location of project.
4. Architect.
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 2 NOT USED

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).

B. Steel Pipe: ASTM A53 Grade B, ASTM A135, ASTM A795 Schedule 40 black.
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.
2. Cast Iron Fittings: ASME B16.1 flanges and flanged fittings.
3. Joints: AWS D1.1, welded.
4. Protection: ASME C105 polyethylene jacket with heat shrink sleeves or double layer, half-lapped 10 mil polyethylene tape to 6" above grade.

C. Copper Tubing: Type K annealed. ASTM B75, ASTM B88, ASTM B251.
   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.
   1. Steel Fittings: ASME 16.9, wrought steel, butt welded; ASME B16.25, butt weld; ASTM A234, wrought carbon steel and alloy steel; ASME B16.5, steel flanges and fittings; ASME B16.11, forged steel socket welded and threaded.
   2. Cast Iron Fittings: ASME B16.1 flanges and flanged fittings; ASME B16.4, threaded fittings.
   3. Malleable Iron Fittings: ASME B16.3, threaded.
   4. Ductile Iron Fittings: ASTM A536, Grade 65-45-12. In applicable sizes, fittings shall be short pattern, with flow equal to standard pattern fittings. Basis of Design: Victaulic FireLock.
   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.
   7. 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.

C. Steel Pipe: ASTM A135 Grade A, UL threadable thin wall, black.
   1. Cast Iron Fittings: ASME B16.4, threaded fittings.
   2. Malleable Iron Fittings: ASME B16.3 threaded type.

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.
   2. Supervised valves provided with weatherproof actuator housing, handwheel, and supervisory switches. Basis of Design: Victaulic Series 728.

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.

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.
3. Exterior Sleeve: Braided stainless steel.
4. Joint: Flanged, threaded with union or welded, as specified for pipe joints.
5. Maximum offset: 3/4 inch.

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.
3. Seismically qualified for use pursuant to ICC-ES AC-156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.

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.
3. External sheet metal covers.
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 FIRE STOPPING-CAST IN PLACE

A. Manufacturers: Presealed Systems "Hydro Flame" or approved equal.

B. Product Description: Factory assembled for use in concrete floors, outer sleeve lined with intumescent strip, radial extended flange, waterstop gasket/mid-body seal.

C. General: UL listed system with 3 hour fire rating. Watertight, Class 1 with 3 feet head pressure for 72 hours.

D. Installation: Provide device based upon pipe type, size and concrete thickness. Align with penetration layout and nail in place. Secure cap prior to pouring concrete. Deburr and clean debris from pipe prior to installation. Coat pipe end with compatible lubricant as necessary.

2.11 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.

2.12 MECHANICAL FIRESTOPPING SLEEVE SEALS

A. Manufacturers: Metraflex Metraseal 120 or approved equal.

B. Product Description: Modular mechanical type, consisting of interlocking intumescent 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. UL listed for 2 hour fire protection.

2.13 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.

2.14 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.

2.15 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 for sprinkler systems.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. CPVC sprinkler piping may only be installed in areas where it is completely concealed, i.e. behind sheet rock or suspended ceilings. Otherwise piping must be metallic.

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.
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.
5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
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

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, FM approval guide, 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 light hazard occupancies.

C. Suspended T-bar Ceiling Type:
1. Type: Semi-recessed pendant type with matching escutcheon plate.
2. Sprinkler and escutcheon plate finish: Chrome plated factory finish.
3. Fusible link: Glass bulb type temperature rated for specific area hazard.

D. GWB Ceiling Type:
1. Type: Standard 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. Exposed Area Type:
1. Type: Standard upright type.
2. Finish: Brass
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

F. Side wall Type:
1. Type: Standard horizontal side wall type.
2. Sprinkler and escutcheon plate finish: Chrome plated factory finish.
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

G. 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 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.

B. Install buried shut-off valves in valve box. Furnish post indicator.

C. Install pressure gauges on each side of sprinkler alarm valve.

D. Place pipe runs to minimize obstruction to other work.

E. 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.

F. Install main piping in concealed spaces above finished ceilings or soffits; branch piping in joist space or other concealed space to sprinkler heads.

G. Center sprinklers in two directions in ceiling tile and install piping offsets.

H. Install guards on sprinklers exposed to potential damage.

I. Provide drains at system low points.

J. Hydrostatically test entire system.

K. 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

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. 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 14 00	Facility Storm Drainage
22 15 00	General Service Compressed Air Systems
22 23 00	Natural-Gas Systems
22 30 00	Plumbing Equipment
22 40 00	Plumbing Fixtures

B. 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.
3. International Building Code (IBC) with local amendments.
4. International Fuel Gas Code (IFGC) with local amendments.
5. National Electrical Code (NEC) NFPA 70.
6. Requirements of OSHA and EPA.
7. National Fire Protection Association (NFPA) Codes and Standards.
8. ASME code for construction of pressure vessels.
9. American Gas Association (AGA) Standards.
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.
14. Washington State Energy Code.

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.

B. Provide vibration isolation on motor driven equipment 0.5 hp or more, plus connected piping.

C. Provide minimum static deflection of isolators for equipment as follows:
1. 5 hp and less: 1 inch
2. Over 5 hp: 2 inch

D. Maintain rooms below the maximum sound levels, as defined by ASHRAE Handbook *HVAC Applications* and ANSI S1.8.

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. Electronic: **All sections of Division 22 shall be submitted together in one complete PDF file with bookmarks for each section. 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. Plumbing Shop Drawings: Submit PDF copies of shop drawings for approval prior to beginning work, drawn to scale not smaller than 1/8 inch equals 1 foot, including but not limited to:
1. All products, systems, and system components.
2. All pipe sizes.
3. All elbows, offsets, and turns clearly identified.
4. Indicate all relevant pipe, ceiling, and structural elevations and clearances.
5. All required valves.
6. Special supports which are not a standard catalog product and which may be fabricated for the Contractor or by the Contractor.
7. Piping system schematic with electrical and connection requirements.
8. Mounting and installation details.
9. General layout of control and alarm panels.
10. Heat exchanger dimensions, size of taps, and performance data.
11. Dimensions of tanks, tank lining methods, anchors, attachments, lifting points, taps, and drains.
12. Locations of access doors.
13. Flexible connectors, expansion joints, loops, offsets, and swing joints.
14. Weights of equipment.
15. Placement and location of openings, holes, or manholes.
16. Equipment substitutions and where installation will differ from design drawings.

B. 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.

C. By submission of plumbing shop drawings, the Contractor acknowledges that coordination has been done to ensure that all piping fits and 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 COMMISSIONING

A. See Division 01 and Section 22 08 00 / 23 08 00 for roles and responsibilities of commissioning.

B. Provide all necessary commissioning assistance, equipment and documentation as required by the Commissioning Plan.

C. The duty and responsibility for all Division 22 commissioning work shall be assigned to a specific individual. Inform the General Contractor, Commissioning Professional (CCXP) of the contact information for the person so assigned.

D. Perform corrective actions needed to resolve deficiencies identified during commissioning. Record action taken on commissioning deficiency log.

1.9 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. Plumbing contractor shall prepare all documents for additional required permit application(s), submit for and obtain the permit(s). All costs and fees to obtain the permit(s) shall be paid by the Plumbing Contractor. Additional permit(s) may include but are not limited to:

1. Mechanical permit for Heat Pump Water Heater Equipment.
2. Pressure Vessel permit for Hot Water Storage Tanks.

C. 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.

1.10 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.

1.11 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.

1.12 SEQUENCING

A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.13 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.

1.14 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.

1.15 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.

1.16 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.

1.17 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.

1.18 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.

1.19 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.

6. Overload Protection: Built-in thermal overload protection.
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.

1.20 EXTRA MATERIALS

A. Furnish one set of mechanical seals for each pump where such seals exist.

1.21 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.

1.22 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 1 hour

1.23 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.
   2. Bind each manual in a hard-backed loose-leaf binder.

D. Imprint on cover:
   1. Name of project.
   2. Owner.
   3. Location of project.
   4. Architect.
   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.

1.24 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.

1.25 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.

1.26 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.

1.27 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.

E. Test storm drainage 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

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

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. General Plumbing Valves.
2. Hangers and Supports.
3. Expansion Fittings and Loops.
4. Vibration and Seismic Controls.
5. Firestopping.
6. Access Panels
7. Tags and Identification.
8. 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 BALL VALVES – STAINLESS STEEL

A. Manufacturers: Victaulic (for specific use with Vic-press stainless steel piping system) or approved equal.

B. Stainless steel body, ball, and stem, PTFE seats, 304 stainless steel handle, nut, and stem washer, with Schedule 10S stainless steel type 316 Vic-Press™ and/or grooved ends. Victaulic Series P569.

2.5 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.
3. 2-1/2 inches and Larger: Lead-Free, NSF-61-8, MSS SP 71, Class 125, 200 psi CWP, cast iron body, bronze trim, bronze disc and seat, flanged ends. Nibco Model F-910-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.
3. 2-1/2 inches and Larger: Lead-Free, NSF-61-8, MSS SP 71, Class 125, 200 psi CWP, wafer style, cast iron body, Buna-N bonded to bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends. Nibco Model F-910-LF.

2.6 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.
6. Vertical Support: Steel riser 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. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis, with rigid insulation inserts and saddle.
3. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis, with rigid insulation inserts and saddle.
4. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger, with rigid insulation inserts and saddle.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
7. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
8. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
9. Wall Support for Hot Pipe Sizes 6 inches and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
10. Vertical Support: Steel riser clamp.
11. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
12. 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.
13. Floor Support for Hot Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

14. Copper Pipe Support: Copper-plated, Carbon-steel ring.

D. Steel Piping: Natural Gas, LPG, Fuel Oil
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
2. Hangers for 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 hooks.
5. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
6. Vertical Support: Steel riser clamp.
7. Floor Support for Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

E. 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.

2.7 HANGER ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.8 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.

2.9 PIPE ROOF SUPPORT

A. Manufacturers: Erico Caddy or approved equal.

B. General: Pyramid 50, polyethylene closed-cell form, electro-galvanized 16 gauge steel metal cover pipe clamp support.

C. 1-1/2” and smaller pipe: Pyramid EZ, UV stabilized EPDM, adjustable height.

D. 2”-6” or general use: Pyramid ST, strut support with galvanized finish, fixed or adjustable height, UV stabilized thermoplastic base with rubber mat.

E. 2”-6” pipe with expansion: Pyramid RL, thermoplastic rollers with galvanized supports, fixed or adjustable height, UV stabilized thermoplastic base with rubber mat.

2.10 ACCESS PANELS

A. Milcor or approved equal.

B. Include an allowance for a minimum of 4 access panels.

C. Architectural grade, 16-gauge frame and door, painted steel or stainless steel based on application.

2.11 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.

B. Flanges for Pipe 2-1/2 inches and Larger:
1. Ferrous Piping: Class 150, 300 psi CWP, forged steel, slip-on flanges.
2. Copper Piping: Class 150, 300 psi CWP, slip-on bronze flanges.
3. PVC Piping: PVC flanges.
4. CPVC Piping: CPVC flanges.
5. Gaskets: 1/16 inch thick preformed neoprene gaskets.

C. 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).

2.12 FLEXIBLE PIPE CONNECTORS

A. Manufacturers: Metraflex, Mason or approved equal.

B. Braided Stainless Steel (Pump Connection)
1. 304 Stainless Steel flexible hose, close pitch, annular corrugated.
2. 304 Stainless Steel double braided outer covering.
3. ANSI Class 150 carbon steel flanges or carbon steel male pipe thread.
4. UL listed, ANSI/NSF-61

C. Victaulic Style flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three (3) couplings, for each connector, shall be placed in close proximity to the source of vibration.

2.13 EXPANSION JOINTS

A. Manufacturers: Metraflex, Mason or approved equal.

B. Flexible Expansion Loop (seismic joints): Copper Pipe
1. Bronze hose & double bronze braid, copper fittings.
2. Two flexible sections of hose and braid, two 90° elbows and a 180° return, assembled.
3. Support nut and drain plug at bottom of 180° return.
4. Provide nesting for multiple pipe runs.
5. UL listed, ANSI/NSF-61

C. Flexible Expansion Loop (seismic joints): Steel Pipe
1. Stainless steel hose & double stainless steel braid, carbon steel fittings.
2. Two flexible sections of hose and braid, two 90° elbows and a 180° return, assembled.

3. Support nut and drain plug at bottom of 180° return.
4. Provide nesting for multiple pipe runs.
5. For natural gas service provide AGA certification.

2.14 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Metal Counterflashing: 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 thick sheet butyl; compatible with roofing.

E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.15 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.

C. Sleeves for Pipes through concrete walls, floors, footings, grade beams: Schedule 40 steel pipe.

D. Sleeves for below grade pipes below structural footings or grade beams: Schedule 40 steel pipe. See structural details.

E. Sealant: Acrylic

F. 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.

2.16 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.

2.17 MECHANICAL FIRESTOPPING SLEEVE SEALS

A. Manufacturers: Metraflex Metraseal 120 or approved equal.

B. Product Description: Modular mechanical type, consisting of interlocking intumescent 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. UL listed for 2 hour fire protection.

2.18 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.

2.19 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.

2.20 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.

2.21 FIRE STOPPING-CAST IN PLACE

A. Manufacturers: Presealed Systems "Hydro Flame" or approved equal.

B. Product Description: Factory assembled for use in concrete floors, outer sleeve lined with intumescent strip, radial extended flange, waterstop gasket/mid-body seal.

C. General: UL listed system with 3 hour fire rating. Watertight, Class 1 with 3 feet head pressure for 72 hours.

D. Installation: Provide device based upon pipe type, size and concrete thickness. Align with penetration layout and nail in place. Secure cap prior to pouring concrete. Deburr and clean debris from pipe prior to installation. Coat pipe end with compatible lubricant as necessary.

2.22 VIBRATION ISOLATORS

A. Manufacturers: Mason, Amber Booth or approved equal.

B. Restrained Closed Spring Isolators:
1. Spring Isolators:
   a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
   b. Code: Color code springs for load carrying capacity.
2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.

C. Spring Hanger:
1. Spring Isolators:
   a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
   b. Code: Color code springs for load carrying capacity.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
3. Housings: Incorporate [neoprene isolation pad meeting requirements for neoprene pad isolators] [rubber hanger with threaded insert].
4. Misalignment: Capable of 20 degree hanger rod misalignment.

D. Neoprene Pad Isolators:
1. Rubber or neoprene-waffle pads.
   a. 30 durometer.
   b. Minimum 1/2 inch thick.
   c. Maximum loading 40 psi.
   d. Height of ribs: not to exceed 0.7 times width.
2. Configuration: Single layer.

E. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches deflection with threaded insert.

F. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.

G. Seismic Snubbers:
1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
2. Neoprene Elements: Replaceable, minimum of 0.75 inch thick.
3. Capacity: 4 times load assigned to mount groupings at 0.4 inch deflection.
4. Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.

2.23 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.

2.24 PIPE MARKERS

A. Color and Lettering shall conform to ASME A13.1 and UPC. Specific examples are noted in the table below.

Service	Background Color	Letter Color	Legend
Domestic Cold Water	Green	White	DOMESTIC COLD WATER
Domestic Hot Water	Green	White	DOMESTIC HOT WATER
Domestic Recirculation	Green	White	DHW RECIRC
Tempered Domestic Water	Green	White	TEMPERED WATER
Waste	Black	White	SANITARY SEWER
Vent	Black	White	SANITARY VENT
Condensate Drain	Black	White	CONDENSATE
Storm Drainage	Black	White	STORM
Solar Water	Black	White	SOLAR HEATING WATER
Non-potable Water (NPW)	Yellow	Black	CAUTION: NONPOTABLE WATER, DO NOT DRINK
Reclaimed Water (RCW)	Purple	Black	CAUTION: RECLAIMED WATER, DO NOT DRINK
Compressed Air	Blue	White	COMPRESSED AIR {xxx} PSI
Natural Gas	Yellow	Black	NATURAL GAS
Propane	Yellow	Black	PROPANE GAS
Fuel Oil	Yellow	Black	FUEL OIL

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.

D. Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, imprinted with service type in large letters, manufactured for direct burial service.

E. Underground Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with service type in large letters.

2.25 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color-coded head.

B. Color code plumbing valves green.

2.26 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. 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 22 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.

N. 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 – VIBRATION ISOLATION

A. Install isolation for motor driven equipment.

B. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.

C. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other ends. Install in horizontal plane unless indicated otherwise.

D. Provide grooved piping systems with minimum of three flexible couplings instead of flexible connector supported by vibration isolation.

E. Bases:
1. Set steel bases for 1 inch clearance between housekeeping pad and base.
2. Set concrete inertia bases for 2 inch clearance between housekeeping pad and base.

F. Adjust equipment level.

G. Install spring hangers without binding.

H. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

I. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

J. Provide resiliently mounted equipment and piping with seismic snubbers. Provide each inertia base with minimum of four seismic snubbers located close to isolators. Snub equipment designated for post disaster use to 0.05 inch maximum clearance. Provide other snubbers with clearance between 0.15 inch and 0.25 inch.

K. Support piping connections to isolated equipment resiliently to nearest flexible pipe connector or as follows:
1. Up to 4 inch Diameter: First three points of support.
2. 5 to 8 inch Diameter: First four points of support.
3. 10 inch Diameter and Over: First six points of support.
4. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.16 INSTALLATION – EXPANSION FITTINGS AND LOOPS

A. Provide support and anchors for controlling contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

B. Install Work in accordance with ASME B31.9.

C. Rigidly anchor pipe to building structure. Provide pipe guides to direct movement only along axis of pipe. Erect piping so strain and weight is not on cast connections or apparatus.

D. Provide expansion loops as indicated in Drawings.

3.17 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.

3.18 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by firestoppping material installation.

3.19 SCHEDULES

A. Pipe Hanger Spacing

PIPE MATERIAL	MAXIMUM HANGER SPACING (Feet)	HANGER ROD DIAMETER (Inches)
ABS (All sizes)	4	3/8
Aluminum (All sizes)	10	1/2
Cast Iron (All Sizes)	5	3/8
Cast Iron (All Sizes) with 10 foot length of pipe	10	3/8

CPVC, 1 inch and smaller	3	1/2
CPVC, 1-1/4 inches and larger	4	1/2
Copper Tube, 1-1/4 inches and smaller	6	1/2
Copper Tube, 1-1/2 inches and larger	10	1/2
PVC (All Sizes)	4	3/8
Steel, 3 inches and smaller	6	1/2
Steel, 4 inches and larger	12	3/8

B. Pipe Isolation Schedule:

Pipe Size Inch	Isolated Distance from Equipment
1	120 diameters
2	90 diameters
3	80 diameters
4	75 diameters

C. Equipment isolation schedule:

ISOLATED EQUIPMENT	BASE		ISOLATOR	
	TYPE	THICKNESS	TYPE	DEFLECTION
Inline Pumps	N/A	N/A	Braided Flex	
Air Compressor	Concrete	4”	Neoprene	
Water Heater			Copper Flex	

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Piping system insulation.
2. Equipment insulation.
3. Pipe insulation jackets.
4. Equipment insulation jackets.
5. 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 (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 greater than 10 feet.

B. R-values shall be based on insulation at 75 F mean temperature difference.

C. For rigid or spray foam the aged R-value per inch shall be provided in submittals.

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.

C. Rigid clamp/hanger insert: Armacell Armafix, polyurethane insert and aluminum jacket, single piece with self-adhering closure.

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.
3. Connections: Brush on welding adhesive.

B. Canvas Equipment Jacket:
1. Fabric: 6 oz/sq yd, plain weave cotton.
2. Composite of insulation, jacket and laces.

C. Aluminum Pipe Jacket:
1. Thickness: 0.016 inch thick sheet. ASTM B209.
2. Finish: Embossed
3. Joining: Longitudinal slip joints and 2 inch laps.
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 and jacket heat exchangers, storage tanks and buffer tanks.

E. Insulate flanges and unions with removable sections and jackets.

F. 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.

G. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.

H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

I. Exterior Piping Applications: Use only elastomeric closed-cell foam insulation with support inserts. 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.

J. Exterior Piping Applications: Provide continuous heat trace of piping, joints and valves.

K. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size insulation large enough to enclose pipe and heat tracer.

L. Exposed Equipment: Locate insulation and cover seams in least visible locations.

M. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

N. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

O. Finish insulation at supports, protrusions, and interruptions.

P. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

Q. 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 Energy Code requirements.

		PIPE SIZE			
Service	**Insulation Type**	**<1”**	**1" to 1-1/4”**	**1-1/2" to 4"**	**4" to 8”**
Domestic Cold Water	Glass Fiber RIGID	1/2"	1/2"	1/2"	1/2"
Domestic Hot Water Supply(Not Recirculated)	Glass Fiber RIGID	1"	1"	1-1/2"	1-1/2"
Domestic Hot Water Recirc.	Glass Fiber RIGID	1"	1"	1-1/2"	1-1/2"
Condensate Drains	RIGID / FOAM	1/2"	1/2"	1/2"	1/2"
Roof Drain & Overflow Bowls in conditioned area	Glass Fiber RIGID	1/2"	1/2"	1/2"	1/2"
Rainleader & Overflow Piping in conditioned area	Glass Fiber RIGID	1/2"	1/2"	1/2"	1/2"

1. Do not insulate direct burial rain leader.
2. Do not insulate direct burial cold water.

B. Equipment: Provide on equipment as listed below.

Service	**Insulation Type**	**Thickness**	**Jacket**
Hot Water Storage Tank	Glass Fiber BLANKET	4"	Reinforced White-Kraft Paper
Expansion Tank	Glass Fiber BLANKET	2”	Reinforced White-Kraft Paper
Valves, strainers, and other domestic piping accessories	Glass Fiber BLANKET / Cellular FOAM	Per pipe schedule	Canvas bag with wire ties.

END OF SECTION

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.

B. This section includes domestic hot and/or cold water consumption metering with data collection and billing software.

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, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Tubing: Type K hard drawn or annealed. ASTM B88.
1. Fittings: ASME B16.22, ASTM B75, wrought copper.
2. Joints: Brazed
a. Copper to copper: Silver/phosphorus/copper alloy (15 percent silver). AWS A5.8 BCuP-5.
b. Copper to brass or steel: AWS Bag-5 Silver (45 percent silver)

2.2 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tubing: Type L hard drawn seamless. ASTM B88.

1. Fittings:
   a. Wrought copper and bronze. ASME B16.22, ASTM B75.
   b. Copper press with EPDM O-ring, ASME B16.22, 200 psi.
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. Stainless Steel Piping: ½” through 2” Vic-Press Type 304/304L, Schedule 10S, ASTM A312.
1. Fittings: Austenitic stainless steel, Type 304/304L, complete with synthetic rubber HNBR o-rings (UL classified in accordance with ANSI/NSF-61 for hot (+180°F) and cold (+86°F) potable water service) and pipe stops.
2. Use a Victaulic "PFT" series tool with the proper sized jaw for pressing.
3. Joints: Stainless steel, pressure-sealed, Victaulic Vic Press 304™

2.3 TRAP PRIMER PIPING

A. Copper Tubing: ½” Type L soft annealed seamless, ASTM B88
1. Fittings: Flared compression.

B. PEX: ½” Uponor, Viega or approved equal
1. PEX-a (Engel-Method Crosslinked Polyethylene) Piping: NSF 61, ASTM F 876 and F877.

2.4 PRESSURE GAUGES

A. Manufacturers: Marsh, Trerice, Weiss or approved equal.

B. Gauge: Rotary stainless steel movement, 316 stainless steel socket, front calibration adjustment, black scale on white background. ASME B40.1. Trerice 700.
1. Case: 304 stainless steel
2. Bourdon Tube and wetted parts: 316 stainless steel.
3. Dial Size: 4 inch diameter within 7' of floor, 6 inch diameter over 7'.
4. Mid-Scale Accuracy: 1/2 percent.
5. Scale: PSI.

2.5 PRESSURE GAUGE TAPS

A. Needle Valve: 316 stainless steel, 1/4 inch NPT for minimum 300 psi. Trerice 735.

B. Pulsation Damper: 316 stainless steel, 1/4 inch NPT connections. Trerice 870

C. Pressure Snubber: 316 stainless steel, 1/4 inch NPT connections. Trerice 872

D. Siphon: 316 stainless steel, 1/4 inch NPT angle or straight pattern. Trerice 885.

2.6 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.
3. Stem: 304SS, 3/4 inch NPT.
4. Accuracy: 2 percent.
5. Calibration: Degrees F.

2.7 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.

C. 5 inch and Larger: Flanged, 200 psi CWP, iron body, epoxy coated, Y-pattern with 3/64 inch stainless steel perforated screen. Apollo 125YF

2.8 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.

2.9 TEMPERING VALVE (EMERGENCY)

A. Manufacturers: Haws, Lawler, Powers, Acorn or approved equal.

B. General: Prepackaged, fully engineered and tested system for providing tempered water to emergency showers and/or eyewashes. Mixing valve to close on cold water failure and bypass cold water on hot water failure. Haws TWBS.EWE, TWBS.SHE

C. Construction: NSF 61 Lead-Free brass

D. Assembly: Valve and piping assembly with wall bracket, thermostatic mixing valve, high temperature limit valve, bypass valve, outlet temperature gauge with stainless steel stem, pipe unions. Certified to ASSE 1071 standard.

E. Accessories:

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 - BURIED PIPING SYSTEMS

A. Verify connection to existing piping system size, location, and invert are as indicated on Civil Drawings.

B. Provide connections to site mains as indicated on drawings.

C. 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.

D. Establish elevations of buried piping with not less than 3 ft of cover.

E. Establish minimum separation from other services piping in accordance with Code.

F. Route pipe in straight line.

G. Install pipe to allow for expansion and contraction without stressing pipe or joints.

H. Install plastic ribbon tape continuous over top of pipe.

I. Install trace wire continuous over top of pipe.

3.3 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. Grooved Joints: Install in accordance with the manufacturer's (Victaulic) guidelines and recommendations. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

K. Provide access panel where valves and fittings are not accessible.

L. Install non-conducting dielectric connections wherever jointing dissimilar metals.

M. Slope piping and arrange systems to drain at low points. Provide hose bibb if low point is not at a plumbing fixture.

N. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

O. Insulate piping. Refer to Section 22 07 00.

P. Install pipe identification in accordance with Section 22 05 00.

3.4 INSTALLATION – VIC-PRESS STAINLESS STEEL

A. Victaulic’s factory trained representative shall provide on-site training for contractor’s field personnel prior to installation in the use of PFT tools, application, and installation of products.

B. Use Vic-Press in lieu of soldered copper for pipe sizes ½” through 2”.

C. Use Vic-Press end valves where possible. Install Vic-Press 304 flange or threaded adapters where flanged or threaded valves are required.

D. Victaulic’s representative shall periodically visit the jobsite and review installation. Contractor shall remove and replace any joints deemed improperly installed.

3.5 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.

3.6 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.

3.7 INSTALLATION - THERMOMETERS AND GAUGES

A. Install pressure gauges on each side of domestic water service assembly (i.e double check, PRV, etc.).

B. Install one pressure gauge for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gauge.

C. Install gauge taps in piping.

D. Install pressure gauges with pulsation dampers. Provide needle valve or ball valve to isolate each gauge.

E. 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.

F. Provide instruments with scale ranges selected according to service with largest appropriate scale.

G. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

H. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.8 INSTALLATION - SERVICE CONNECTIONS

A. Provide new water service complete with approved double check back-flow preventer, pressure reducing valve, by-pass valves, pressure gauges and strainer.

B. Provide sleeve in wall for service main and support at wall with reinforced-concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

C. Provide 18 gauge galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

3.9 FIELD QUALITY CONTROL

A. Test domestic water piping system at 100 psig minimum for a period of not less than 4 hours.

3.10 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 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.

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. Joints: Solvent weld. ASTM D2235.

C. PVC Pipe: Schedule 40 solid wall PVC, bell and spigot solvent sealed ends. NSF Standard 14, ASTM D1785, ASTM D1784.
1. Fittings: Schedule 40, PVC, ASTM D2665.
2. Joints: Solvent weld with ASTM D2564 solvent cement.

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 (Super-Duty) 4000, Clamp-All 125, Ideal Tridon Super Heavy-Duty, Mifab QXHUB Heavy Duty or approved equal.

B. Copper Tube (Use only for short piping sections where dimensional constraints require thin wall pipe): ASTM B306 DWV.
1. Fittings: Long Pattern, ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
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.
2. Joints: Threaded.

D. **[VENT ONLY]** ABS Pipe: Schedule 40, ABS, DWV, Cellular Core, bell and spigot style solvent sealed ends (If approved by local authorities). NSF Standard 14, ASTM F628, ASTM D3965. **Not for use in air plenum.**
   1. Fittings: ABS, DWV, ASTM D2661.
   2. Joints: Solvent weld. ASTM D2235.

E. **[VENT ONLY]** PVC Pipe: Schedule 40 solid wall PVC, bell and spigot solvent sealed ends (If approved by local authorities). NSF Standard 14, ASTM D1785, ASTM D1784. **Not for use in air plenum.**
   1. Fittings: Schedule 40, PVC, ASTM D2665.
   2. Joints: Solvent weld with ASTM D2564 solvent cement.

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.

B. CPVC Pipe: Schedule 40. ASTM D2846. **Not for use in air plenum.**
   1. Fittings: Schedule 40 CPVC. ASTM D2846.
   2. Joints: Solvent weld with ASTM F493 solvent cement. 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.

C. See 221100 for trap primer piping.

2.9 TRAP PRIMER TAIL PIECE

A. Manufacturers: PPP or approved equal.

B. Construction: 1-1/2” tail piece trap primer assembly with ½” stainless steel flexible priming water line and chrome plated escutcheon.

C. See 221100 for trap primer piping.

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 minimum separation from other services piping in accordance with Code.

G. Provide sleeves per 22 05 00 for all concrete penetrations and below structural footings or grade beams. See structural details.

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. Storm water piping, buried within 5 feet of building.
2. Storm water piping, above grade.
3. Roof drains.
4. Cleanouts.

PART 2 PRODUCTS

2.1 STORM WATER 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. ASME B16.45 or ASSE 1043, long pattern cast iron, hubless.

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. Joints: Solvent weld. ASTM D2235.

C. PVC Pipe: Schedule 40 solid wall PVC, bell and spigot solvent sealed ends. NSF Standard 14, ASTM D1785, ASTM D1784.
1. Fittings: Schedule 40, PVC, ASTM D2665.
2. Joints: Solvent weld with ASTM D2564 solvent cement.

2.2 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: 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 (Super-Duty) 4000, Clamp-All 125, Ideal Tridon Super Heavy-Duty, Mifab QXHUB Heavy Duty or approved equal.

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 ROOF DRAINS

A. Manufacturers: Zurn, Josam, J.R. Smith, Wade or approved equal.

B. Coated cast iron body with aluminum dome, membrane flange and clamp, underdeck clamp, roof sump receiver, waterproofing flange, adjustable extension sleeve for roof insulation. On overflow drains provide 2” internal water dam.

2.5 CLEANOUTS

A. Manufacturers: Zurn, J.R. Smith, Josam, Wade or approved equal.

B. Exterior Surfaced Areas: Round cast nickel bronze access frame with bronze gasket threaded plug and non-skid cover.

C. Exterior Unsurfaced Areas: Line type with lacquered cast iron body and bronze gasket threaded plug.

D. 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.

E. 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.

F. Interior Unfinished Accessible Areas: Threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify and provide required extensions, clamps and drain styles to match deck or roof construction and finish.

3.2 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. 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.

E. Establish elevations of buried piping with not less than 3 ft of cover.

F. Establish minimum separation from other services piping in accordance with Code.

G. Route pipe in straight line.

H. Install pipe to allow for expansion and contraction without stressing pipe or joints.

I. Install shutoff and drain valves at locations indicated on Drawings.

J. Install plastic ribbon tape continuous over top of pipe.

K. Install trace wire continuous over top of pipe.

3.3 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. Sleeve pipe passing through partitions, walls and floors.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. 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.

H. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

I. 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.

J. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

K. Install piping penetrating roofed areas to maintain integrity of roof assembly.

L. Insulate piping. Refer to Section 22 07 00.

M. Install pipe identification in accordance with Section 22 05 00.

3.4 INSTALLATION - STORM DRAINAGE PIPING SYSTEMS

A. Install storm drainage piping systems in accordance with ASME B31.9 and local plumbing code.

B. Support cast iron drainage piping at every joint.

C. 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 that 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.

3.5 FIELD QUALITY CONTROL

A. Obtain written approval of local Plumbing Authority prior to covering or concealing any work.

B. Test storm piping system to hydrostatic test of 10 feet head of water.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Compressed air piping and accessories.
2. Compressed air outlets.
3. Air pressure reducing valve.
4. Pressure regulators.
5. Hose connectors.

1.2 SCOPE

A. Furnish and install air compressor, piping and accessories for a complete compressed air system.

1.3 MAINTENANCE MATERIALS

A. Furnish two quart containers of compressor oil for each compressor.

PART 2 PRODUCTS

2.1 COMPRESSED AIR PIPING

A. Steel Pipe: ASTM A53, Schedule 40 black, seamless. Manufactured in the USA.
1. Fittings: ASME B16.3, malleable iron Class 150, or ASTM A234, forged steel welding type, Class 150.
2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

B. Copper Tubing: ASTM B88, Type K hard drawn.
1. Fittings: ASME B16.22, wrought copper fittings and silver brazed joints.

C. Copper Tubing: ASTM B88, Type K drawn.
1. Copper Press Fittings: Conforming to ASME B16.18 cast copper alloy or ASME B16.22, wrought copper and bronze with EPDM O-ring seals.
2. Joints: Compression type made with manufacturer’s tool. 200 psi working pressure.

D. Stainless Steel Piping: Vic-Press Type 304/304L, Schedule 10S, ASTM A312
1. Fittings: Austenitic stainless steel, Type 304/304L, complete with synthetic rubber HNBR o-rings and pipe stops.
2. Use a Victaulic "PFT" series tool with the proper sized jaw for pressing.
3. Joints: Stainless steel, pressure-sealed, Victaulic Vic Press 304™

2.2 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 with brazed joints.
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flanges for Pipe 2-1/2 inches and Larger:
   1. Ferrous Piping: Class 150, 300 psi CWP, forged steel, slip-on flanges.
   2. Copper Piping: Class 150, 300 psi CWP, slip-on bronze flanges.
   3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.3 BALL VALVES

A. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham or approved equal.

B. 2 inches and Smaller: MSS SP 110, 600 psi CWP, bronze, two piece body, type 316 stainless steel ball, full port, Teflon (TFE) seats, blow-out proof stem, solder or threaded ends with union, lever handle. Nibco Model 585-70-66.

2.4 BALL VALVES – STAINLESS STEEL

A. Manufacturers: Victaulic (for specific use with Vic-press stainless steel piping system) or approved equal.

B. Stainless steel body, ball, and stem, PTFE seats, 304 stainless steel handle, nut, and stem washer, with Schedule 10S stainless steel type 316 Vic-Press™ and/or grooved ends. Victaulic Series P569.

2.5 CHECK VALVES

A. Swing Check Valves:
   1. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham or approved equal.
   2. 2 inches and Smaller: MSS SP 80, Class 125, 200 psi CWP, bronze body and cap, bronze disc with TFE seat, Y-pattern design, solder or threaded ends. Nibco Model T/S-413-Y.

B. Spring Loaded Check Valves:
   1. Manufacturers: NIBCO Model 480, W-910 or equal by Apollo, Hammond, Milwaukee, Stockham or approved equal.
   2. 2 inches and Smaller: MSS SP 80, Class 125, 250 psi CWP, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, solder or threaded ends. Nibco Model T/S-480.

2.6 STRAINERS

A. Manufacturers: Apollo/Conbraco, Metraflex, Titan or approved equal.

B. 2 inch and Smaller: Class 250, ASTM B62 bronze body, 400 psi CWP, Y pattern with 60 mesh stainless steel perforated screen.

C. 2-1/2 inch and Larger: Class 250, ASTM A126 cast iron body, flanged ends, epoxy coated, 400 psi CWP, Y pattern with 20 mesh stainless steel perforated screen.

2.7 FLEXIBLE CONNECTORS

A. Manufacturers: Mason Industries, Metraflex or approved equal.

B. 2 inches and Smaller: Braided stainless steel hose with single layer of stainless steel exterior braiding, maximum working pressure 170 psig. Mason Industries BSS/Braided Stainless Steel Hose, GU-MN ¾" by 10" or approved.

C. 2-1/2 inches and Larger: Corrugated stainless steel hose with single layer of stainless steel exterior braiding, Class 150 flanged ends; maximum working pressure 190 psig.

2.8 RELIEF VALVES

A. Relief Valves: Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

2.9 COMPRESSED AIR OUTLETS

A. Manufacturers: Lincoln #815 or approved equal.

B. Compressed Air Outlets: Quick Connector: 3/8 inch brass, snap on connector with self closing valve.

2.10 AIR PRESSURE REDUCING VALVE

A. Manufacturers:

B. Air Pressure Reducing Valve: Consisting of automatic reducing valve and bypass, and low pressure side relief valve and gauge. Furnish oil separator.

C. Valve Capacity: Reduce pressure from 200 psi to 30 psi, adjustable upward from reduced pressure.

2.11 PRESSURE REGULATORS

A. Manufacturers: Parker, Norgren or approved equal.

B. Pressure Regulators: Diaphragm \ Pilot operated, bronze body, direct acting, spring loaded, manual pressure setting adjustment, rated for 250 psig inlet pressure.

C. Pressure Regulators: Aluminum alloy or plastic body, diaphragm operated, direct acting, spring loaded, manual pressure setting adjustment, and rated for 250 psig inlet pressure.

2.12 PRESSURE GAUGE

A. Manufacturers: Marsh, Trerice, Weiss or approved equal.

B. Gauge: ASME B40.1, with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
   1. Case: Cast aluminum.
   2. Bourdon Tube: Phosphor bronze or Type 316 stainless steel.
   3. Dial Size: 4-1/2 inch diameter within 7' of floor, 6 inch diameter over 7'.
   4. Mid-Scale Accuracy: 1/2 percent.
   5. Scale: 0-200 Psi.

2.13 AUTOMATIC DRAIN TRAP

A. Manufacturers: Posi-Drain, Norgren or equal model by compressor manufacturer.

B. Float seal design, self-cleaning, 120 V solenoid, full adjustment of both drain cycle (5sec - 50min) and valve open periods (1-15sec), NEMA 4X enclosure.

2.14 FLEXIBLE HOSE CONNECTORS

A. Hose Connectors: Corrugated stainless steel tubing with stainless steel wire braid covering and ends welded to inner tubing.

B. Working Pressure: 250 psig minimum.

C. End Connections:
1. 2 inches and Smaller: Threaded steel pipe nipple.
2. 2-1/2 inches and Larger: Class 150 Flanges.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

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 - ABOVE GROUND PIPING - COMPRESSED AIR SYSTEMS

A. Slope main piping to compressor or additional system low points at 0.5-1.0% grade.

B. Install drip legs at low points of piping system with drain valves. Locate drain values in accessible locations.

C. Install take-off to outlets from top of main, with shut off valve after take off. Slope take-off piping to outlets.

D. Install compressed air couplings, female quick connectors, and pressure gauges where outlets are indicated.

E. Install tees instead of elbows at changes in direction of piping. Fit open end of each tee with plug.

F. Cut pipe and tubing accurately and install without springing or forcing.

G. Stainless Steel Pipe with press-type Joints: Square cut ends to plus or minus 0.030 inches tolerance. Remove burrs and clean ends. Fully insert tubing into fitting and mark pipe ends to ensure full insertion into coupling or fitting during assembly. Press joint using manufacturer’s tool with proper sized jaw.

H. Copper Pipe with press-type Joints: Remove burrs and clean ends. Fully insert tubing into fitting and mark pipe ends to ensure full insertion into coupling or fitting. Check alignment against mark to assure tubing is fully inserted. Press joint using manufacturer’s tool.

I. Install pipe sleeves where pipes and tubing pass through walls, floors, roofs, and partitions.

J. 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.

K. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.

L. Install pipe identification.

M. Except where indicated, install manual shut off valves with stem vertical and accessible for operation and maintenance.

N. Install strainers on inlet side of pressure reducing valves. Install pressure reducing valves with bypasses and isolation valves to allow maintenance without interruption of service.

O. Install strainers on inlet side of pressure regulators.

3.3 INSTALLATION – VIC-PRESS STAINLESS STEEL

A. Victaulic’s factory trained representative shall provide on-site training for contractor’s field personnel prior to installation in the use of PFT tools, application, and installation of products.

B. Use Vic-Press in lieu of brazed copper or threaded black iron for pipe sizes ½” through 2”.

C. Use Vic-Press end valves where possible. Install Vic-Press 304 flange or threaded adapters where flanged or threaded valves are required.

D. Victaulic’s representative shall periodically visit the jobsite and review installation. Contractor shall remove and replace any joints deemed improperly installed.

3.4 FIELD QUALITY CONTROL

A. Compressed Air Piping Leak Test: Prior to initial operation, clean and test compressed air piping in accordance with ASME B31.1 or ASME B31.9.

B. Verify for atmospheric pressure in piping systems, other than system under test.

C. Test entire system with dry compressed air or dry nitrogen at 150 psig for a minimum duration of 2 hours, prove tight. If loss of pressure occurs, determine cause and remake joints. Caulking or patching not permitted.

3.5 CLEANING

A. Blow systems clear of free moisture and foreign matter.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Natural gas piping buried within 5 feet of building.
2. Natural gas piping above grade.
3. Coordination with local gas company
4. Valves & Strainers.
5. Natural gas pressure regulators.

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, equipment.

C. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

1.3 QUALITY ASSURANCE

A. Comply with requirements and recommendations of NFPA 54 and the International Fuel Gas Code.

B. Perform work in accordance with applicable code and local gas company requirements.

C. Furnish shutoff valves complying with ASME B16.33 or ANSI Z21.15.

1.4 COORDINATION

A. Refer to plans for meter location and coordinate with the Gas Company for installation and size. Facilitate application for gas service and pay all charges necessary for complete installation.

PART 2 PRODUCTS

2.1 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53, Schedule 40 black, seamless. Manufactured in the USA.
1. Fittings: ASTM A234, forged steel welding type.
2. Joints: ASME B31.9, welded.
3. Jacket: AWWA C105 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

2.2 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53, Schedule 40 black, seamless. Manufactured in the USA.
1. Fittings: ASME B16.3, malleable iron, or ASTM A234, forged steel welding type.
2. Joints: 2 inch and smaller pipe - Threaded.

3. Joints: 2-1/2 inches and larger pipe – welded.

B. Steel Pipe: ASTM A53, Schedule 40 black, seamless. Manufactured in the USA.
1. Fittings: Compression type, Viega MegaPress G or NIBCO BenchPressG. ANSI LC4-2012, zinc and nickel coating, HNBR sealing element, 420 stainless steel grip ring, 304 stainless steel separator ring and smart connect feature.
2. Joints: 4 inch and smaller pipe - Viega MegaPress G or NIBCO BenchPressG tool press.

2.3 BALL VALVES

A. Manufacturers: Nibco, Stockham, Milwaukee, or approved equal.

B. 1/2 inch to 3/4 inch (appliance shutoff valve): 1/2 psi rated for indoor appliance connections per ANSI Z21.15. Forged brass body, chrome plated brass ball, fluorocarbon o-rings, brass stem, painted aluminum lever handle. (Nibco G10)

C. 1/4 inch to 1 inch: MSS SP 110, Class 125, two piece, threaded ends, bronze body, chrome plated bronze ball, reinforced teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, full port. (Nibco T585-70-UL)

D. 1-1/4 inch to 3 inch: MSS SP 110, Class 125, two piece, threaded ends, bronze body, chrome plated bronze ball, reinforced teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, conventional port. (Nibco T580-70-UL)

2.4 FLEXIBLE PIPE CONNECTIONS

A. Tubing: Annealed, 304 stainless steel, ASTM A240

B. Fittings: Brass or stainless steel.

C. Coating: Yellow polymer.

2.5 QUICK CONNECT FITTING

A. Manufacturers: T&S or approved equal.

B. 3/4" one-way shut-off coupling and plug body. Bass body construction with stainless steel internal parts.

2.6 EXTERIOR WALL OUTLET

A. Manufacturer: Burnaby #GR0101-SS or approved equal.

B. Recessed stainless steel gas outlet box with brushed finish, 1/2" NPT pipe connection, shutoff valve, 3/8” quick disconnect plug, lockable access door.

2.7 STRAINERS

A. 2 inch and Smaller: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

B. 2-1/2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

2.8 NATURAL GAS PRESSURE REDUCING VALVES

A. Manufacturers: Fisher or approved equal.

B. Product Description: Quick-reacting, low-shock natural gas, spring loaded pressure regulator, ductile Iron body, aluminum casings and orifice, nitrile diaphragm and o-rings, full internal relief, 125 psi inlet rated. Threaded or flanged ends depending on size.

2.9 NATURAL GAS PRESSURE REDUCING VALVES (VENTLESS)

A. Manufacturers: Maxitrol 325-L Series or approved equal.

B. Product Description: High leverage linkage assembly with positive dead-end lockup pressure regulator. Aluminum housing, threaded ends. Provide with VLimiter vent limiting devise.

PART 3 EXECUTION

3.1 GAS METERS AND DISTRIBUTION

A. Refer to plans for meter location and coordinate with the Gas Company for installation and size. Facilitate application for gas service and pay all charges necessary for complete installation.

B. Request Gas Company to provide service meter with a pulse transmitter (5-15 VDC). Complete necessary forms and pay applicable fees.
   1. Pulse output shall be set so 1 pulse equals 1 therm.
   2. If such meter cannot be provided then install a sub-meter downstream of the service meter.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside of pipe, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION - BURIED PIPING SYSTEMS

A. Install natural gas piping in accordance with NFPA 54 and the International Fuel Gas Code.

B. Verify connection to existing piping system size, location, and invert.

C. Establish elevations of buried piping with not less than 2 ft of cover.

D. Establish minimum separation from other services piping in accordance with code.

E. Install pipe on prepared bedding.

F. Route pipe in straight line.

G. Install pipe to allow for expansion and contraction without stressing pipe or joints.

H. Install plastic ribbon tape continuous over top of pipe and buried 6 inches below finish grade, above pipe line.

I. Install trace wire continuous over top of pipe and plastic ribbon tape continuous buried 6 inches below finish grade, above pipe line.

3.4 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

A. Install natural gas piping in accordance with NFPA 54 and the International Fuel Gas Code.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Grade horizontal pipe not less than ¼" in 15 feet.

D. Route piping in orderly manner and to conserve building space and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide 6" long drip leg at bottom of vertical pipe.

G. Take from top or side of horizontal pipe.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Sleeve pipe passing through partitions, walls and floors.

J. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.

K. Provide clearance for access to valves and fittings.

L. Provide access doors where valves and fittings are not exposed.

M. Do not embed any building service low pressure pipe in concrete, in masonry, or below grade. Install such pipe in Schedule 40 welded pipe sleeves and vent to roof.

N. Provide support for utility meters in accordance with requirements of utility company.

O. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.

P. Install identification on piping systems.

Q. Install valves with stems upright or horizontal, not inverted.

R. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

3.5 INSTALLATION – EQUIPMENT CONNECTION

A. Provide shutoff valve and flexible pipe at connections to all equipment. Use sufficient flexible pipe length to allow for 4" of movement.

B. Connect piping to unit, full size of unit gas train inlet. Arrange piping with clearance for burner and equipment service.

C. Provide drip leg.

D. Provide strainer.

3.6 INSTALLATION – APPLIANCES

A. Dryers: Install gas piping through knock-out in dryer box (by MC) where provided. Where no dryer box is provided, gas piping installation shall not prevent dryer from being fully installed against wall.

B. Range: Align gas piping with recess behind appliance. Coordination size and location of recess with range manufacturer's installation instructions. Gas piping installation shall not prevent range from being fully installed against wall.

3.7 PRESSURE REDUCING VALVES

A. Install per manufacturer's recommendations. If PRV is installed indoors determine routing to an approved location and provide independent relief pipe to outside. Size relief vent pipe full port size, ¾" minimum. Increase vent pipe size one pipe size for lengths greater than 15'. Increase vent pipe size two pipe sizes for lengths greater than 25'.

3.8 INSTALLATION - METERS

A. Install per manufacturer's recommendations. Allow recommended upstream and downstream straight pipe diameters.

B. Use Integral style electronics where meter is installed:
1. In an accessible location.
2. Above accessible ceilings up to 9'-0" AFF.
3. Exposed in mechanical room mounted at maximum 5'-0" AFF.

C. Use remote style electronics where meter is installed:
1. In an inaccessible location.
2. Above inaccessible ceiling or ceiling over 9'-0" AFF.
3. Exposed in mechanical room mounted over 5'-0" AFF.
4. Where indicated on drawings.

D. Install remote style electronics at 4'-6" AFF.

E. Do not install meter or electronics exposed in finished spaces.

F. Use in-line meters for pipe sizes 1-1/2" and smaller. Use insertion meters for pipe sizes 2" and larger.

3.9 FIELD QUALITY CONTROL

A. Pressure test natural gas piping in accordance with NFPA 54 and the International Fuel Gas Code.

B. Subject pipe to air pressure of 60 psig for 30 minutes with no perceptible drop in pressure.

C. When pressure tests do not meet specified requirements, remove defective work, replace and retest.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Water heaters.
2. Diaphragm-type expansion tanks.

1.2 VENTING

A. Provide plastic venting and combustion air for water heaters and boilers in this section.

1.3 COORDINATION

A. For equipment which requires metal venting coordinate required material and location with Division 23.

1.4 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 ELECTRIC WATER HEATERS

A. Manufacturers: A.O. Smith, 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.

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. Provide integral heat traps at 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 SUMMARY

A. Section Includes:
1. General Plumbing Fixtures: Water closets, Urinals, Lavatories, Sinks, Service sinks, Bathtubs, Showers, Drinking fountains, Electric water coolers.
2. Faucets and valves
3. Emergency Fixtures: Emergency showers, Emergency Eye and Face Wash.
4. Hose bibbs & Hydrants.
5. Accessories.

1.2 SCOPE

A. This section includes all plumbing fixtures, trim and installation, to include owner furnished equipment.

1.3 REQUIREMENTS

A. All china fixtures shall be white or manufacturer's standard unless otherwise indicated.

B. Ensure that that all china fixtures install in a room or area are the exact same color and hue, especially if from different manufacturers.

C. Fixtures by type and material shall be of the same manufacturer except when scheduled or approved otherwise.

D. Fixtures shall be designed or equipped to meet the following water use efficiency standards:
1. Sink faucets 2.2 GPM

PART 2 PRODUCTS

2.1 WASH FOUNTAINS

A. Manufacturers: Acorn, Bradley or approved equal.

B. Bowl: Semi-circular, stainless steel.

C. Accessories: Foot controlled self-closing valve, spray head, supporting tube, spud and strainer, operating mechanism, foot levers and rail, combination stop, strainer and check valves.

2.2 EMERGENCY SHOWER

A. Manufacturers: Haws, Bradley, Guardian, Acorn or approved equal.

B. All stainless steel drench shower with 10" showerhead, stay-open ball valve, triangular pull rod, CSA certified to meet ANSI Z358.1. Include universal emergency signage 8"x11".

2.3 EMERGENCY EYE AND FACE WASH

A. Manufacturers: Haws, Bradley, Guardian, Speakman, Acorn or approved equal.

B. Wall mounted eye/face wash with 11” stainless steel bowl, wall bracket, twin soft anti-surge eyewash heads, stainless steel face spray ring, hand flag control, chrome plated waste tailpiece and trap, dust cover, brass stay-open ball valve, in-line 50x50 mesh brass strainer, CSA certified to meet ANSI Z358.1. Include universal emergency signage 8”x11”.

2.4 HOSE BIBBS

A. Manufacturers: Woodford, Zurn, JR Smith or approved equal.

B. Interior: Bronze or brass with integral mounting flange, automatic draining, anti-siphon vacuum breaker, 3/4” hose thread, wheel handle.

2.5 HOSE REELS

A. Manufacturers: Graco, Reelcraft or approved equal.

B. Heavy duty type, steel construction, dual pedestal frame, powder coat finish, hand crank retractable, ¾” inlet, ¾” outlet, 300 psi rated.

C. Hose: ¾” 125 psi rated.

D. Accessories:
1. Mounting bracket and stainless steel hardware.
2. Hose inlet kit.

2.6 FIXTURE SUPPLIES

A. Manufacturers: Brass Craft, McGuire, Chicago or approved equal.

B. Chrome plated all brass angle stops with brass stems (no plastic). Fixed key metal handle and chrome plated escutcheon. Chrome plated copper flexible supplies for exposed connections, braided supplies acceptable where concealed. Provide stop and supply type as applicable to specific fixtures. Supply shall be marked with manufacturer’s name and comply with ANSI NSF 61 “No Lead”.

2.7 TRAPS

A. Manufacturers: Brass Craft, Dearborn Brass, McGuire or approved equal.

B. Adjustable type, polished chrome plated cast brass, 17 gauge, with escutcheon. Provide type as applicable to specific fixture installation. PVC acceptable only where concealed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify electric power is available and of correct characteristics.

C. For all lavatories and sinks verify required number of holes and hole spacing before ordering.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures and in accordance with manufacturer's details.

B. Locate fixtures in accordance with architectural drawings, details on structural drawings and/or Engineer's direction in field. Mount ADA fixtures according to dimensions on architectural drawings.

C. If drain, tailpiece, strainer or other accessories are not furnished by fixture manufacturer then provide accessories by Brass Craft or approved equal.

D. Provide vandal proof features on faucets, aerators, bubblers and pop-up waste assemblies on fixtures in public areas.

E. Coordinate shower enclosure floor recess for ADA threshold height or hidden mounting flange on polished concrete floors.

F. Coordinate in wall blocking for wall mounted equipment such as hose reels.

3.3 INSTALLATION

A. Install shut-off valves on water lines servicing a fixture group.

B. Support piping at stop, valve or flush valve.

C. Align fixtures and equipment installed in accord with architectural drawings.

D. Seal fixtures to wall and floor surfaces with silicon sealant, color to match fixture.

E. Mount hose reels directly to wall/ceiling where blocking is provided or span framing with Unistrut.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop-drawings. Confirm location and size of fixtures and openings before rough in and ordering.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. Adjust flush lever or valve for intended flow rate and operation.

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. 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 08 00	Project Commissioning
23 09 00	Instrumentation and Control for HVAC
23 23 00	Refrigerant Piping
23 31 00	HVAC Ducts and Casings
23 33 00	Air Duct Accessories
23 34 00	HVAC Fans
23 35 16	Vehicle Engine Exhaust Systems
23 37 00	Air Outlets and Inlets
23 55 00	Fuel-Fired Heaters
23 72 00	Energy Recovery Units
23 81 26	Split-System Air-Conditioners & Heat Pumps

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.
3. International Building Code (IBC) with local amendments.
4. International Fuel Gas Code (IFGC) with local amendments.
5. National Electrical Code (NEC) NFPA 70.
6. Requirements of OSHA and EPA.

7. National Fire Protection Association (NFPA) Codes and Standards.
8. ASME code for construction of pressure vessels.
9. American Gas Association (AGA) Standards.
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.
14. Washington State Energy Code.

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.

B. Provide vibration isolation on motor driven equipment over 0.5 hp, plus connected piping and ductwork.

C. Provide minimum static deflection of isolators for equipment as follows:
1. 5 hp and less: 1 inch
2. Over 5 hp: 2 inch

D. Maintain rooms below the maximum sound levels, as defined by ASHRAE Handbook *HVAC Applications* and ANSI S1.8.

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: **All sections of Division 23 shall be submitted together in one complete PDF file with bookmarks for each section. 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.

E. Piping Shop Drawings: Submit one PDF copy of hydronic piping system for approval prior to beginning work, drawn to scale not smaller than 1/8 inch equals 1 foot, including equipment, critical dimensions, flexible connectors, expansion joints and sizes.

F. Ductwork Shop Drawings: Submit one PDF copy of duct fabrication drawings for approval prior to beginning work, drawn to scale not smaller than 1/8 inch equals 1 foot, indicating:
1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.
2. Duct layout, indicating pressure classifications and sizes in plan view.
3. Fittings.
4. Reinforcing details and spacing.
5. Seam and joint construction details.
6. Penetrations through fire rated and other walls.
7. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.
8. Indicate shop fabricated assemblies including volume control dampers and duct access doors.
9. Indicate size and configuration of fan assembly, mountings, weights, ductwork and accessory connections.

1.8 COMMISSIONING

A. See Division 01 and Section 23 08 00 for roles and responsibilities of commissioning.

B. Provide all necessary commissioning assistance, equipment and documentation as required by the Commissioning Plan.

C. The duty and responsibility for mechanical commissioning work shall be assigned to a specific individual. Inform the General Contractor and Certified Commissioning Professional (CCXP) of the contact information for the person so assigned.

D. Perform corrective actions needed to resolve deficiencies identified during commissioning. Record action taken on commissioning deficiency log.

1.9 COMMISSIONING PLAN

A. The Commissioning Plan shall be submitted with other mechanical submittals.

B. Approval of commissioning plan is required before commencement of work.

1.10 HVAC PERMIT

A. HVAC contractor shall prepare all documents for mechanical permit application, submit for, and obtain the permit. HVAC Contractor shall pay all costs and fees to obtain the permit.

B. Contractor shall not commence work until permit is obtained. Contractor is solely responsible to ensure 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 Load Calculations (Mechanical Consultant will provide load calculations to the Contractor).
2. Acoustical Reports. Mechanical Contractor shall obtain the required acoustical reports from the acoustical engineer for the project.

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.

1.11 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.

1.12 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.

1.13 SEQUENCING

A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.14 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.

1.15 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.

1.16 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.

1.17 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.

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 mechanical 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 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.

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.

N. Coordinate all equipment with building control work.

O. Coordinate installation of
1. Condensing units with roof structure.
2. Air handling units with building structure.
3. Unit installation with roof structure, piping systems, and ceiling for unit access.

1.18 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.

1.19 SALVAGE

A. 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.

1.20 ELECTRICAL

A. 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.

B. Power Wiring: By Electrical Contractor.

C. 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.

1.21 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.

1.22 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.

1.23 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	4 hours
2.	Control Systems	2 hours

1.24 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.
2. Bind each manual in a hard-backed loose-leaf binder.

E. Imprint on cover:
1. Name of project.
2. Owner.
3. Location of project.
4. Architect.
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.

1.25 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.

1.26 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.

1.27 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

1.28 COMMISSIONING REPORT

A. Submit three (3) copies of the preliminary commissioning report as required by the Washington State Energy Code, as outlined on drawing commissioning notes and specifications of this Division. This report is an execution and fulfillment of the commissioning plan. This report shall be completed before the final mechanical permit inspection. At a minimum this report shall include:
1. Test and balance report
2. Complete equipment startup checklists
3. Functional test reports
4. Sequence of Operation test reports
5. O&M materials
6. Record drawings
7. Owner training documentation
8. Note any discrepancies observed during testing and any corrective actions taken or date when corrective action will be taken.
9. Note any tests which could not be performed due to weather conditions.

B. After receiving review comments from the preliminary commissioning plan make corrections indicated and submit three (3) copies of the final commissioning report. At a minimum this report shall include the information from the preliminary commissioning report and the following:
1. Corrective measures taken in response to preliminary report or field observation report.

1.29 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 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.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Hangers and Supports.
2. Vibration and Seismic Controls.
3. Motors
4. Firestopping.
5. Access Panels
6. Tags and Identification.
7. 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. Concrete Inserts:
1. Continuous channel - Unistrut or approved.
2. Universal, malleable iron - Type 18, FS WW-H-171.

G. Beam Clamps and Attachments as required.

2.2 DUCT ROOF SUPPORT

A. Manufacturers: Caddy or approved equal.

B. Pyramid H-Frame thermoplastic base with rubber bottom, pre-installed strut nuts and hardware kit to construct frame. All steel components shall be hot-dipped galvanized. 750 lb load rating per base.

2.3 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.

2.4 HANGER ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.5 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.

2.6 PIPE ROOF SUPPORT

A. Manufacturers: Erico Caddy or approved equal.

B. General: Pyramid 50, polyethylene closed-cell form, electro-galvanized 16 gauge steel metal cover pipe clamp support.

C. 1-1/2” and smaller pipe: Pyramid EZ, UV stabilized EPDM, adjustable height.

2.7 ACCESS PANELS

A. Milcor or approved equal.

B. Include an allowance for a minimum of 6 access panels.

C. Architectural grade, 14 guage frame and door, painted steel or stainless steel based on application.

2.8 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 gauge minimum; 16 gauge at fire resistant elements.

2.9 EQUIPMENT CURBS

A. Manufacturers' curbs where indicated on drawings.

B. Fabricated: Welded 18 gage galvanized steel shell and base, mitered 3-inch cant, variable step to match roof insulation, 1-1/2 inch thick insulation, wood nailer.

2.10 EQUIPMENT RAIL SUPPORTS

A. Manufacturers: Greenheck GESR or approved equal.

B. Prefabricated insulated galvanized steel equipment support. 4, 6 or 8 inch width, select based on equipment supported. Provide with same coating as fan, otherwise Polyester Urethane. Select height based on roofing and insulation requirements. Select length based on equipment supported.

2.11 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.

2.12 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.

2.13 MECHANICAL FIRESTOPPING SLEEVE SEALS

A. Manufacturers: Metraflex Metraseal 120 or approved equal.

B. Product Description: Modular mechanical type, consisting of interlocking intumescent 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. UL listed for 2 hour fire protection.

2.14 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.

2.15 MOTORS

A. General:
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. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors.
4. 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.
5. Overload Protection: Built-in thermal overload protection.
6. Name Plate: Indicate full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

B. Motors <= 1 hp:
1. Provide ECM motor with speed control.

C. 1 hp > Motors < 7.5 hp:
1. Provide ECM or NEMA Premium efficiency motor.

D. Motors >= 7.5 hp:
1. Provide NEMA Premium efficiency motor rated for VFD usage.
2. Provide with Variable Frequency Drive.

E. All motor efficiencies shall conform to Washington State Energy Code and NEMA MG-1.

2.16 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.

2.17 FIRE STOPPING-CAST IN PLACE

A. Manufacturers: Presealed Systems "Hydro Flame" or approved equal.

B. Product Description: Factory assembled for use in concrete floors, outer sleeve lined with intumescent strip, radial extended flange, waterstop gasket/mid-body seal.

C. General: UL listed system with 3 hour fire rating. Watertight, Class 1 with 3 feet head pressure for 72 hours.

D. Installation: Provide device based upon pipe type, size and concrete thickness. Align with penetration layout and nail in place. Secure cap prior to pouring concrete. Deburr and clean debris from pipe prior to installation. Coat pipe end with compatible lubricant as necessary.

2.18 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.

2.19 CONDENSATE OVERFLOW SWITCH

A. Manufacturer: Rectorseal Safe-T-Switch or approved equal.

B. Sealed, waterproof reed/magnet float switch installed on the overflow outlet of drain pans or on an auxiliary drain pan. UL 508, 24 volt AC.

2.20 VIBRATION ISOLATORS

A. Manufacturers: Metraflex, Mason, Amber Booth or approved equal.

B. Restrained Closed Spring Isolators:
   1. Spring Isolators:
      a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
      b. Code: Color code springs for load carrying capacity.
   2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
   3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
   4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.

C. Neoprene Pad Isolators:
   1. Rubber or neoprene-waffle pads.
      a. 30 durometer.
      b. Minimum 1/2 inch thick.
      c. Maximum loading 40 psi.

d. Height of ribs: not to exceed 0.7 times width.

2. Configuration: 1/2 inch thick waffle pads bonded each side of 1/4 inch thick steel plate.

D. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches deflection with threaded insert.

2.21 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.

2.22 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1. Specific examples are noted in the table below.

Service	Background Color	Letter Color	Legend
Refrigerant	Purple	White	R-{TYPE} REFRIGERANT (EXAMPLE: R-410A REFRIGERANT)

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.

2.23 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.
3. Heating/cooling valves: Blue.

2.24 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.

2.25 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.

2.26 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 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. 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-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.

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 is specifically required for but not limited to:
1. All smoke control ductwork.
2. All ductwork associated with life safety systems (Including stair and elevator pressurization.
3. All ductwork with a cross sectional area of 6 square feet or a diameter of 34 inches or greater.

C. 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 - EQUIPMENT BASES AND SUPPORTS

A. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

B. Construct supports of formed steel channel or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

C. Provide rigid anchors for pipes after vibration isolation components are installed.

3.10 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.

3.11 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.

3.12 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.

3.13 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.

3.14 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.

3.15 INSTALLATION-VIBRATION ISOLATION

A. Install isolation for motor driven equipment.

B. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.

C. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other ends. Install in horizontal plane unless indicated otherwise.

D. For grooved piping systems the use of three flexible couplings followed by a rigid coupling shall be considered equivalent to a flexible pipe connector.

E. Bases:
1. Set steel bases for 1 inch clearance between housekeeping pad and base.

F. Adjust equipment level.

G. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

H. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

I. Provide resiliently mounted equipment, piping, and ductwork with seismic snubbers. Provide each inertia base with minimum of four seismic snubbers located close to isolators. Snub equipment designated for post disaster use to 0.05 inch maximum clearance. Provide other snubbers with clearance between 0.15 inch and 0.25 inch.

J. Support piping connections to isolated equipment resiliently to nearest flexible pipe connector or as follows:
1. Up to 4 inch Diameter: First three points of support.
2. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.16 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 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.

E. Connect condensate pump alarm wiring to unit served power terminals per manufacturer’s installation instructions. Coordinate with electrical contractor. Unit served shall shut down when condensate reservoir is full to prevent overflow.

3.17 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.

3.18 CLEANING

A. Contractor shall make all mechanical components free of dust and dirt prior to startup.

3.19 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

3.20 SCHEDULES

A. Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8

3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8

3.21 SCHEDULES

A. Pipe Isolation Schedule:

Pipe Size Inch	Isolated Distance from Equipment diameters
1	120 diameters
2	90 diameters

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

A. Testing, adjusting and balancing of air systems.

B. Measurement of final operating conditions of above systems.

C. Duct pressure (leakage) testing as required by 23 31 00.

D. 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, and Exhaust Fans (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.
i. Belt size and quantity.
j. Static-pressure controls final operating set points.

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.	TAC Services	360-255-5306
D.	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.

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 ENERGY RECOVERY VENTILATION (ERV) SYSTEM TOLERANCE

A. Test and balance ERVs to maintain scheduled airflow differential between outside air and exhaust air quantities. The tested differential in airflows shall not be less than scheduled.

B. Spaces which have both outside air and exhaust air from an ERV shall maintain tolerance on the differential between the air quantities. Outside air and exhaust air flow rates shall be measured and adjusted to deliver final flow rates whose differential is within 10% and within 50 cfm of design rates, whichever is less.

3.5 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. Verify recorded data represents actual measured or observed conditions.

F. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

G. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.

H. Report defects and deficiencies noted during performance of services, preventing system balance.

I. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

J. After completion of testing and balancing, operate systems under normal conditions for at least two days of 8 hours each to demonstrate specified performance.

3.6 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.

J. Smoke testing, or some other approved means, may be required to determine leak locations if air balance report indicated that any system's CFM total is less than 10 percent of design CFM. Prior to test, verify that system's duct joints have been sealed as specified and that air moving device in question is supplying required design system air flow. Architect will approve test method required. If smoke test is selected, use following procedure. Provide necessary precautions to protect those performing or observing test from being exposed to smoke.
   1. Use zinc chloride smoke candles, titanium tetrachloride ampules or sticks, or other devices acceptable to Architect to generate smoke.
   2. Close openings in duct except for one opening at farthest end of duct run.
   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.

3.7 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 provides 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.

3.8 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.

END OF SECTION

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.
4. 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 (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 greater than 10 feet.

B. External duct insulation shall be legibly printed or identified 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 at 75 F mean temperature difference.

D. For rigid or spray foam the aged R-value per inch shall be provided in submittals.

1.4 REQUIREMENTS

A. Where multiple products are listed for the same application, select a single product to provide throughout.

B. For round and flat oval ductwork use only liner specific for round application. Using flat liner is not acceptable.

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 FLEXIBLE GLASS FIBER DUCT LINER (SOUND LINER)

A. Manufacturers: Johns Manville Linacoustic RC or equal by Knauf, Manson or approved equal.

B. Description: Flexible duct liner, glass fiber bonded with thermosetting resin, airstream surface protected with reinforced coating.
1. ASTM E84, UL 723
2. Installed R Value: 1" R-4.2, 2" R-8.0
3. Maximum service temperature: 250 degrees F.
4. Maximum Velocity on Coated Air Side: 6,000 fpm.
5. Acrylic polymer coating to prevent dust incursion and biological growth.

C. Liner Fasteners: Galvanized steel, impact applied or welded with integral head.

D. Field coat edges with Superseal edge treatment.

2.4 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, 2.5" R-6, 3" R-8.3, 4.5" R-12, 5.75" R-16.
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.

2.5 PIPE INSULATION AND EQUIPMENT JACKETS

A. Aluminum Pipe Jacket:
1. Thickness: 0.016 inch thick sheet. ASTM B209.
2. Finish: Embossed
3. Joining: Longitudinal slip joints and 2 inch laps.
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. 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.

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. Insulate exhaust air ductwork where it is outside the insulated building envelope to prevent condensation.

M. For all insulated ductwork:

1. Provide insulation with vapor retarder jackets.
2. Finish with tape and vapor retarder jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

3.3 SCHEDULES

A. Piping: Provide on piping as listed below.

		PIPE SIZE			
Service	**Insulation Type**	**<1”**	**1” to <1-1/2"**	**1-1/2 to < 4"**	**4" to < 8”**
Refrigerant Suction(1)	Elastomeric Cellular FOAM	1"	1"	1-1/2"	-
Refrigerant Hot Gas	Elastomeric Cellular FOAM	1"	1"	1-1/2"	-

1. Note: Insulate Refrigerant Liquid lines same as Suction lines on all heat pump 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.

Service	**Location**	**Insulation Type**	**Approx. Thickness**	**Min. Installed R-Value**	**Jacket**
Outside Air (5)	Within Building downstream of damper. <2800 cfm	Duct Wrap / Duct Liner	3"	R-8	FSK
Outside Air (ERV supply)	Within Building between ERV & building spaces	Duct Wrap / Duct Liner	1-1/2"	R-3.3	FSK
Exhaust Air (Environmental Air)	Attic, crawlspace, parking garage or uninsulated area within building.	Duct Wrap	2.5"	R-6	FSK
Exhaust Air (Environmental Air)	Within Building upstream of damper.	None, Except Duct Liner shown on Plans.			
Relief / Exhaust Air	Between damper & building exterior. <2800 cfm	Duct Wrap	3”	R-8	FSK
Exhaust Air (ERV Discharge)	Indoor between ERV & building exterior. (Zone 4C)	Duct Wrap	3"	R-8	FSK

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. External insulation is not required on internally sound lined ductwork with sufficient insulating value. For internally insulated ductwork, the required insulation thickness supersedes sound lining requirements.
3. Concealed space: Any space within the insulated building envelope that is concealed from view, i.e. behind ceiling, wall, shaft, soffit, etc.
4. For exposed ductwork in finished spaces which is required to be insulated provide internal liner with equivalent R-value.
5. In addition to the insulation requirements, outside air ductwork shall meet all air leakage and building envelope insulation requirements of the WSEC C402 and building envelope vapor control requirements from the IBC.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Project commissioning description.
2. Project commissioning responsibilities.
3. Project commissioning documentation.
4. Commissioning Compliance Checklist

1.2 GENERAL

A. The goal of the commissioning process is to verify the proper operation, functionality and control of building systems and equipment. The by-product of this process is the commissioning plan and report which provides a confirmation record of procedures used and results obtained. The effort and goal is focused on having all systems operating efficiently and correctly.

B. The mechanical contractor shall retain a Commissioning Agent (CA) and commissioning services from one of the following companies or approved equal.
1. AIRTEST Co., Inc. 425-313-0172
2. Neudorfer Engineers, Inc. 206-621-1810

C. The mechanical contractor is responsible for the commissioning process with required documentation and shall furnish labor and material directly or through the Commissioning Agent to accomplish building commissioning as specified herein.

D. The mechanical contractor is responsible to correct deficiencies discovered during the commissioning process.

1.3 COMMISSIONING DESCRIPTION

A. The purpose of the commissioning process is to provide Owner assurance that the systems have been installed in the prescribed manner and will operate within the performance guidelines. Commissioning is intended to enhance the quality of system start-up and aid in the orderly transfer of systems to beneficial use by the Owner.

B. Commissioning includes complete and thorough investigations of mechanical systems to ensure proper installation and operation of all components and systems. It consists of but is not limited to the following elements:
1. The Commissioning Plan
2. Testing and startup of HVAC equipment and systems.
3. Equipment control and system verification checks.
4. Air balancing.
5. Functional performance testing.
6. Sequence of operations testing.
7. Completion of record drawings.
8. Owner training.
9. Operation & Maintenance materials.
10. Preliminary Commissioning Report with deficiencies noted.
11. Final Commissioning Report with corrective actions taken.

1.4 COMMISSIONING AGENT

A. The Commissioning Agent (CA) is the person who manages the commissioning process, prepares the Commissioning Plan, schedules and coordinates commissioning activities in execution of the Commissioning Plan and compiles the Commissioning Report.

B. The CA may directly perform commissioning functions and documentation or may observe tasks assigned to others.

C. The CA provides the Owner an unbiased, objective view of the system's installation, documentation, operation, and performance.

D. The CA will observe the Commissioning procedures and results performed by the Contractor. The Contractor is expected to verify the functional readiness of systems to be tested prior to performing the tests in the presence of the Commissioning Agent.

1.5 COMMISSIONING SUBMITTALS

A. See 23 00 00.

B. Commissioning Plan: Submit copies with mechanical submittals.
1. Narrative description of activities.
2. Start-up test procedure and checklists
3. Functional performance test checklists.
4. Commissioning schedule

C. Preliminary Commissioning Report: Submit three (3) copies at substantial completion.
1. Complete start-up checklists
2. Complete functional test reports
3. Test & Balance report
4. Deficiency report
5. Commissioning Compliance Checklist

D. Final Commissioning Report: Submit three (3) copies at project close out.
1. Preliminary Commissioning Report contents
2. Record drawings
3. Owner training report
4. Deficiency & corrective action report
5. O&M manuals

E. Complete the Commissioning Compliance Checklist and submit with the Preliminary Commissioning Report for Owner Representative review and signature. Signed checklist is required for final mechanical inspection and building certificate of occupancy. A copy of the signed checklist shall be provided to the building official.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with NEBB or AABC.

B. Perform Work in accordance with ASHRAE Guideline 1.

C. Perform Work in accordance with Commercial Energy Code Section C408.

1.7 COMMISSIONING MEETINGS

A. The CA shall schedule a preliminary commissioning meeting to review the commissioning plan and schedule approximately two weeks prior to the start of commissioning work. The General Contractor, Mechanical Contractor, Electrical Contractor and Electrical Commissioning Agent, applicable sub-contractors and the Engineer shall be invited.

B. The CA shall schedule additional commissioning meetings as necessary for coordination or information with the required participants.

C. The General Contractor, Mechanical Contractor and Mechanical Sub-Contractors are required to attend commissioning meetings when requested by the CA or Engineer.

1.8 SCHEDULING

A. The CA shall prepare a schedule indicating anticipated start dates for the following:
1. Piping systems pressure testing (domestic, gas, hydronic, refrigerant).
2. Piping system flushing and cleaning.
3. Ductwork cleaning.
4. Ductwork pressure testing.
5. Equipment and system startups.
6. Automatic temperature control system checkout.
7. Testing, adjusting, and balancing.
8. Functional performance tests
9. System orientation and training.
10. Operation and maintenance manual submittals.

B. Schedule seasonal tests of equipment and systems during peak weather conditions (actual or simulated) to observe full-load performance.

C. Schedule occupancy sensitive tests during conditions of both minimum and maximum occupancy use.

D. Schedule such that the Preliminary Commissioning Report can be submitted to the Owner for review with written acceptance obtained prior to the final mechanical inspection and the building certificate of occupancy.

E. Within 90 days of receipt of the building certificate of occupancy, the Record Drawings, O&M Manuals, Final Balancing Report, Final Commissioning Report and documentation of completed Owner Training shall be submitted for review.

1.9 COORDINATION

A. The mechanical contractor shall verify the commissioning schedule and notify the Commissioning Agent a minimum of two weeks in advance of the following:
1. Scheduled equipment and system startups.
2. Scheduled automatic temperature control system checkout.
3. Scheduled start of testing, adjusting, and balancing work.
4. Commissioning schedule changes.

B. Coordinate programming of automatic temperature control system with construction and commissioning schedules.

C. Coordinate commissioning of this section with Electrical commissioning.

D. Provide overall coordination and management of the commissioning program as specified herein. The commissioning process will require cooperation of the Contractor, subcontractors, vendors, Architect, Commissioning Agent, and Owner. The commissioning team shall be comprised of the following:
1. Contractor
2. Project Manager
3. Test & Balance Engineer
4. Subcontractors
5. Commissioning Agent
6. Project Engineers
7. Owner Representative(s)
8. Architect
9. Mechanical Consultant
10. Electrical Consultant

PART 2 DOCUMENTATION

2.1 COMMISSIONING PLAN

A. The Commissioning Plan shall be prepared and executed by the Commissioning Agent and at a minimum contain the following.

B. The Commissioning Plan shall be in a hard-backed loose-leaf binder with typewritten or printed index and tabbed dividers between principal categories.
1. Spine: Name of Project
2. Cover: Name of Project, Owner, Location & Commissioning Agent
3. Project Directory: Owner, Architect, Engineer, Commissioning Agent, General Contractor, Mechanical Contractor(s), Plumbing Contractor, Electrical Contractor, Test & Balance Contractor, Controls Contractor.
4. Responsible Party: Include responsible party for each contractor.

C. Narrative:
1. Describe building size, type of use and occupancy.
2. Provide an overview of the building equipment, systems, controls and their functionality.
3. Describe the activities involved in each phase of the commissioning process, including the personnel intended to accomplish each task.

D. Roles and Responsibilities:
1. Define the tasks necessary to complete the commissioning process and assign responsibility for each to a member of the commissioning team.

E. Commissioning Schedule:
1. Provide timeline of commissioning process tasks and information submittals with milestones for general scopes of work.
2. Include task for sub-contractors, contractors, vendors and CA.
3. Include owner training schedule.

F. Start-up Test Procedure and Checklists:
1. Include a list of all equipment and systems to be tested.
2. Intent: To test individual equipment for standalone function and operation.
3. Use manufacturer's startup checklist when available.
4. Utilize vendor startup and checklists for specific equipment when available.

G. Functional Performance Test checklists:
   1. Intent: To test system performance and operation including controls, relays and sequences.
   2. Include tests for all functions noted in Sequence of Operations.
   3. Indicate conditions under which the test needs to be performed.
   4. Indicate the measured criteria required to meet the performance.
   5. Include space on forms to note deficiencies.

2.2 FUNCTIONAL PERFORMANCE TESTING

A. Demonstrate the correct installation and operation of each component, system, and system-to-system intertie relationship. Control systems shall be tested to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with the sequence of operation.

B. Test all system modes and all functions describe in the Sequence of Operations.

C. Test systems under full-load, part-load (if applicable) and emergency conditions (if applicable).

D. Test any redundant or automatic back-up mode.

E. Test performance of all alarms and safeties.

F. Test mode of operation upon loss of power and power restoration.

G. Independently test all similar systems. Sampling reference systems is not acceptable.

H. Physically verify by visual inspection or calibrated meter reading the operation being tested. Control system displays shall not be used as proof of function.

2.3 PRELIMINARY COMMISSIONING REPORT

A. The Preliminary Commissioning Report shall be assembled and produced by the Commissioning Agent with information obtained from the Mechanical Contractor, Controls Contractor and Test & Balance Contractor. The report shall contain the following.

B. The Commissioning Report shall be in hard-backed loose-leaf binder(s) with typewritten or printed index and tabbed dividers between principal categories.
   1. Spine: Name of Project
   2. Cover: Name of Project, Owner, Location & Commissioning Agent
   3. Project Directory: Owner, Architect, Engineer, Commissioning Agent, General Contractor, Mechanical Contractor(s), Test & Balance Contractor, Controls Contractor.

C. System Description: Describe building systems and their intended function(s). Include equipment associated with each system.

D. Test & Balance Report: See 23 05 93

E. Start-up Test Checklists: Include completed start-up checklists.

F. Functional Performance Test Checklists:
   1. Include completed functional performance checklists.
   2. Include sequence of operations checklists.

3. Record conditions under which the tests were performed.
4. Record the measured criteria.

G. Deferred tests: Indicate any tests not performed due to climatic conditions with anticipated date of completion.

H. Deficiency Report: Compile any deficiencies noted on start-up or functional performance tests on to a single report.

I. Owner Training: Include documentation of owner operating and maintenance instruction completed to date. See section 23 00 00.

J. Commissioning Compliance Checklist: This checklist included at the end of this section shall be completed and included for Owner review and signature.

2.4 FINAL COMMISSIONING REPORT

A. The Final Commissioning Report shall be assembled and produced by the Commissioning Agent with information obtained from the Mechanical Contractor, Controls Contractor and Test & Balance Contractor. The Final Commissioning Report shall contain all the information provided in the Preliminary Commissioning Report and the following.

B. The Commissioning Report shall be in hard-backed loose-leaf binder(s) with typewritten or printed index and tabbed dividers between principal categories.
1. Spine: Name of Project
2. Cover: Name of Project, Owner, Location & Commissioning Agent
3. Project Directory: Owner, Architect, Engineer, Commissioning Agent, General Contractor, Mechanical Contractor(s), Test & Balance Contractor, Controls Contractor.

C. Test & Balance Report: Provide updated and/or corrected report if required.

D. Deficiency and Corrective Action Report: Include the deficiency report from the Preliminary Commissioning Report with the corrective action taken noted for each entry.

E. Owner Training: Include documentation of completed owner operating and maintenance instruction. See section 23 00 00.

F. Record Drawings: Include contractor's record drawings in each copy of the commissioning report. See section 23 00 00.

G. Operating and Maintenance Manuals: Include contractor's O&M manuals with each copy of the commissioning report. (Separate binders are OK) See section 23 00 00.

PART 3 EXECUTION

3.1 GENERAL

A. Contractor shall provide an individual to accompany the Commissioning Agent to assist, operate and/or make adjustments as necessary.

B. Contractor shall provide ladders, scaffolding, additional dampers and clean filters as required.

C. Contractor shall put all systems and equipment into operation and shall continue operation until all adjusting, balancing, testing, demonstrations, and instructions have been completed.

D. Commissioning shall not begin until systems are completed, in good working order and have been cleaned.

E. Check motors for proper rotation, coupling and drive alignment, belt tension and freedom from vibration, etc.

3.2 INSTALLATION

A. Contractor shall provide additional balancing dampers, balancing valves, access doors, test ports, and pressure and temperature taps required by Commissioning Agent or to address Commissioning deficiency.

B. Contractor shall provide replacement sheaves and belts to obtain system performance.

C. Contractor shall install test holes in ductwork and plenums as requested by Commissioning Agent for taking air measurements. Seal test holes after measurements.

D. Prior to start of functional performance testing, Contractor shall install clean filters in equipment.

3.3 DEFICIENCIES

A. The Commissioning Agent shall report all observed system deficiencies to the Architect and General Contractor and shall include them in the Preliminary Commissioning Report.

B. The Contractor shall rectify all deficiencies, detail the corrective action(s) taken on each item, initial each item of the report as "corrected" and return the deficiency report.

C. Upon receipt of the return report, the Commissioning Agent will visit the site and inspect the corrected deficiencies. The Commissioning Agent will also initial the items of the report as "checked" and include them in the Final Commissioning Report.

D. Further site visits by the Commissioning Agent to check deficiencies not corrected in back check, will be at the Contractor’s expense.

END OF SECTION

COMMISSIONING COMPLIANCE CHECKLIST

Project Information	**Project Name:** **Project Address:** **Commissioning Authority:**
Commissioning Plan (Section C408.1.1)	❑ **Commissioning Plan was used during construction and included items below** • A narrative description of activities and the personnel intended to accomplish each one • Measurable criteria for performance • Functions to be tested
Systems Balancing (Section C408.2.2)	❑ **Systems Balancing has been completed** • Air and Hydronic systems are proportionately balanced in a manner to first minimize throttling losses • Test ports are provided on each pump for measuring pressure across the pump.
Functional Testing (Sections C208.2.3, C408.3.1, C408.4.1.3 and C408.5.1)	❑ **HVAC Equipment Functional Testing has been completed** (Section C408.2.3.1) HVAC equipment has been tested to demonstrate the installation and operation of components, systems and system-to-system interfacing relationships in accordance with approved plans and specifications ❑ **HVAC Controls Functional Testing has been completed** (Section C408.2.3.2) HVAC controls have been tested to ensure that control devices are calibrated, adjusted and operate properly. Sequences of operation have been functionally tested to ensure they operate in accordance with approved plans and specifications ❑ **Economizer Functional Testing has been completed** (Section C408.2.3.3) Economizers operate in accordance with manufacturer's specifications ❑ **Lighting Controls Functional Testing has been completed** (Section C408.3.1) Lighting controls have been tested to ensure that control devices, components, equipment, and systems are calibrated, adjusted and operate in accordance with approved plans and specifications ❑ **Service Water Heating System Functional Testing has been completed** (Section C408.4.1) Service water heating equipment has been tested to ensure that control devices, components, equipment, and systems are calibrated, adjusted, and operate in accordance with approved plans and specifications ❑ **Pool and Spa Functional Testing has been completed** (Section C408.4.1.3) Pools and spas have been tested to ensure service water heating equipment, time switches and heat recovery equipment are calibrated, adjusted and operate in accordance with approved plans and specifications ❑ **Metering System Functional Testing has been completed** (Section C408.5.1) Energy source meters, energy end-use meters, the energy metering data acquisition system and required display are calibrated, adjusted and operate in accordance with approved plans and specifications
Supporting Documents (Section 408.1.3.2)	❑ **Manuals, record documents and training have been completed or are scheduled** • System documentation has been provided to the owner or scheduled date:_____ • Record documents have been submitted to owner or scheduled date:_____ • Training has been completed or scheduled date:_____
Commissioning Report (Section C408.1.2)	❑ **Preliminary Commissioning Report submitted to Owner and includes items below.** • Deficiencies found during testing required by this section which have not been corrected at the time of report preparation • Deferred tests, which cannot be performed at the time of report preparation due to climatic conditions
Certification	❑ I hereby certify that all requirements for commissioning have been completed in accordance with the Washington State Energy Code, including all items above. _____ Building Owner or Owner's Representative Date

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Thermostats
2. Timers
3. Electric actuators.
4. Sensors
5. Magnetic Door Switches

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 as specified, 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 Thermostat (Electronic Programmable): TH2110D
1. Sensor Element: Thermistor.
2. Accuracy: +/- 1 degrees F.
3. 24 VAC or 750 mV control.
4. LCD backlight display.
5. Dual powered battery/hardwire.

D. Low Voltage Heating/Cooling Commercial Thermostat (Electronic Programmable): TC500A-N
1. Sensor Element: Thermistor.
2. Accuracy: +/- 1 degrees F.
3. 24 VAC electrical.
4. Color LCD backlight touchscreen display.
5. BACnet capable.
6. WiFi connectivity.
7. 365-day programming with 4 occupied/unoccupied periods per day.
8. P+I+D temperature control.
9. Economizer control.
10. 5H/3C Heat Pump, 3H/3C Conventional and modulating heat systems.
11. Heat-Off-Cool-Auto system selection.

E. 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 TEMPERATURE SENSOR

A. Manufacturers: Honeywell or approved equal.

B. Thermistor, 3-wire, wall mounted cover.

2.3 DELAY TIMER

A. Manufacturers: Airotronics THCU0300SCS or approved equal

B. Solid state delay-on-make timer. Totally encapsulated, sealed case. Application of input voltage starts the time delay; the delay is reset by removal of input voltage. 1 amp rated, universal voltage. Factory fixed time delay of 300 seconds (5 minutes).

C. Supplier: Stoneway Electric p/n STWY.

2.4 CONTROL AIR DAMPERS

A. See Section 23 33 00.

2.5 ELECTRIC DAMPER ACTUATORS

A. Manufacturers: Belimo or approved equal.

B. Operation: Two-position, proportional or reversing type as required for application, 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 \ 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.

2.6 GAS SENSORS (CO & NO2) FOR PARKING GARAGES

A. Manufacturer: AirTest Technologies (1-888-855-8880) or approved equal.

B. CO Sensor: Electrochemical, 0-200 ppm linear range, +/- 5% accuracy, T90 response time of less than one minute, span and zero adjustments, temperature corrected, 4-20 mA output signal. (TR2000)

C. NO2 (Nitrogen Dioxide) Sensor: Electrochemical diffusion sensor, 0-10 ppm range, +/- 5% accuracy, 4-20 mA output signal. (TR3210)

D. Control Panel: NEMA 1 panel with LCD display, remote horn and strobe alarms. 16 or 32 sensor inputs, two (2) VFD 4-20 mA fan control outputs. Programmable PLC control with occupied/unoccupied schedule, minimum VFD setpoint, adjustable alarm levels,

analog VFD control, display of CO concentration from each sensor and customized functions and outputs. (CN72xx-VFD)

2.7 WARNING ALARM

A. Manufacturer: Edwards Signals 874 or approved equal.

B. Surface mount vibrating horn for heavy-duty indoor use. Corrosion resistant finish, adjustable volume, completely assembled. 24VAC

2.8 MAGNETIC DOOR SWITCHES

A. Manufacturers: George Rick Industries, Nascom or approved equal.

B. Steel Man Door: 180 Series, 1” recessed magnetic contract, UL listed.

C. Rollup Door: 4700-A Series, multi-position adjustable magnet bracket, armored cable.

D. Provide hardware, mounting brackets, adapters and plates required for magnetic contact switch installation.

E. Coordinate and match switch color with door frame.

2.9 ENCLOSURES

A. All enclosures to be UL listed and all metal construction. All controls and instruments logically assembled at one or more panels.

2.10 CONTROL RELAYS

A. Manufacturers: Functional Devices RIB or approved equal.

B. 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.

2.11 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.

2.12 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, 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. Coordinate provision of door contacts for interface with mechanical controls.

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 homeruns between components without splices.
6. Select wiring gauge based on length of run and power requirement for a maximum of 10% voltage drop.

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, 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 devises at 48” centerline above finished floor to comply with ADA accessibility per ANSI A117.1. Align thermostats and devises with light switches and other controls.

B. Coordinate wall location of thermostats and other wall mount devises with light switches and controls provided by others. All devises in the same vicinity should be grouped at a common elevation with regular horizontal spacing intervals.

C. Mount garage CO sensors at 48” centerline above finished floor.

D. Mount garage NO2 sensors at 18” centerline above finished floor.

E. Mount CO/NO2 sensor controllers at 54” centerline above finished floor, CO sensor at 48” centerline above finished floor and NO2 sensor at 18” centerline above finished floor.

3.5 MAGNETIC DOOR SWITCHES (HVAC HEATING AND COOLING LOCKOUT)

A. Furnish door switches for installation by G.C. Coordinate required door locations.

B. Coordinate control transformer power and locations with E.C.

C. Provide all required control transformers, relays, door switches, count down timers and low voltage wiring required for a fully functional system with complies with Energy Code C403.4.1.6.

D. Provide access panels where required for transformer, relays or other control components.

3.6 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.

3.7 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

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Refrigerant piping.
2. Pipe insulation protection.
3. Refrigerant moisture and liquid indicators.
4. Valves.
5. 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. Provide receivers on systems as required by manufacturer's installation instructions, sized to accommodate pump down charge.

D. Provide receivers on systems with piping runs exceeding manufacturer's published limitations.

E. Flexible Connectors: Use at spring isolated air handlers and condensers greater than six tons.

F. 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.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.

2.2 COPPER PRESSURE-SEAL FITTINGS FOR REFRIGERANT PIPING

A. Manufacturers: RLS – Rapid Locking System, Nibco – PressACR, or approved equal.

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:
   1. Maximum Rated Pressure (MRP): 700 psig.
   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.
   5. Vacuum Pressure Capability: 20 Microns.
   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, 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.
   3. R-410A, 700 PSI rated.

2.4 PIPE INSULATION PROTECTION

A. Manufacturers: Airex EFlex Guard or approved equal.

B. Construction: Non-laminated flexible PVC with, antifungal and UV resistant properties.
   1. Fire Performance: Testing Standard ASTM E 84 / UL 723.
   2. Rated Class “A” Material -25 Flame/450 smoke index
   3. Accelerated Weatherization and U. V. Testing Standard: ASTM G153
   4. Fungal resistance for interior & exterior: ASTM G21- “0”growth.
   5. Water/Vapor Permeability Testing Standard ASTM E96 Rated 1 ≤ perm.
   6. Rated Class II Vapor Retarder
   7. Tensile strength and Elongation for Vulcanized Rubber and Thermoplastic Elastomers ASTM D412.

C. Fasteners: No material shall be cemented or applied by adhesives.
   1. Reusable, Heavy-Duty, Dual-Bonded Velcro fasteners and U. V. Cable Ties.
   2. Velcro fasteners construction method: Molecular Fusion bonded and double stitched.

D. Color: Black or White

E. Install per Airex Manufacturing Inc. Instructions.

2.5 REFRIGERANT PIPE WALL PENETRATION GASKET SEAL

A. Manufacturers: Airex TGS or approved equal.

B. Construction: ASA (Acrylonitrile Styrene Acrylate) outdoor Polymer. High impact strength material, UV resistant, and extreme weather resistant material. UL 746C (rated F1). Built-in pitch or slope design away from the exterior wall to prevent water or moisture build-up.

C. Wall Gasket Seal System receiver shall be attached to the building wall with the use of screws for self-tapping, concrete, plaster, mortar, and all materials and to include 2,000 lbs. (psi) pull rating. The screws are to be pre-loaded with neoprene washers for an air-tight seal.

D. The wall trim receiver shall have a surface edge perimeter pre-mounted gasket for proper wall sealing and a mounted duct seal that is highly flexible and that properly receives, and seals, with an tight fit around the insulated line set with an elastomeric sleeve.

E. There shall be combined holding action by the elastomeric sleeve with an outside diameter, adjustable stainless steel clamp, to create a fully isolated, supported, sealed, and secured penetrating line set connection.

F. Installation shall be according to Airex Manufacturing installation instructions.

G. Color: Gray or White (Paintable)

2.6 UNIONS, FLANGES, AND COUPLINGS

A. Copper Pipe: Bronze, soldered joints.

2.7 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.
3. Sight glass: Color-coded paper moisture indicator and plastic cap.
4. Maximum working pressure: 500 psig
5. Maximum working temperature: 200 degrees F.

2.8 VALVES

A. Manufacturers: Alco Controls, Parker Hannifin, Sporlan Valve or approved equal.

B. Diaphragm Packless Valve:
1. UL listed for refrigeration service.
2. Globe or angle pattern, forged brass body and bonnet solder or flared ends.
3. Phosphor bronze and stainless steel diaphragms, rising stem and hand wheel.
4. Stainless steel spring, nylon seats, disc with positive back seating.
5. Maximum working pressure: 500 psig.
6. Maximum working temperature: 275 degrees F.

C. Packed Angle Valve:
   1. Forged brass, solder or flared ends.
   2. Forged brass seal caps with copper gasket, rising stem and seat, molded stem packing.
   3. Maximum working pressure: 500 psig.
   4. Maximum working temperature: 275 degrees F.

D. Ball Valves:
   1. Two piece forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals.
   2. Maximum working pressure: 500 psig.
   3. Maximum working temperature: 300 degrees F.

E. Service Valve:
   1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve.
   2. Maximum working pressure: 500 psig.
   3. Maximum working temperature: 300 degrees F.

F. Globe Check Valve:
   1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc.
   2. Maximum working pressure: 500 psig.
   3. Maximum working temperature: 300 degrees F.

G. Straight Through Check Valve:
   1. Spring, neoprene seat.
   2. Maximum working pressure: 500 psig.
   3. Maximum working temperature: 250 degrees F.

2.9 REFRIGERANT PIPING SERVICE VALVE

A. Manufacturer: Diamondback or approved equal.

B. Full port, forged brass ball valve with Schrader valve, flare connections, Teflon seals and gaskets. 700 psig rated, R-410A compatible, fully factory assembled and pressure tested.

C. Provide with insulation cover of polyethylene foam with PVC cover and tape.

2.10 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.

2.11 REFRIGERANT FILTER-DRYERS

A. Manufacturers: Alco Controls, Parker Hannifin, Sporlan Valve or approved equal.

B. Replaceable Cartridge Angle Type:
   1. For systems six tons and larger.

2. Shell: ARI 710, UL listed, brass or steel, removable cap, for maximum working pressure of 500 psig.
3. Filter Cartridge: Pleated media with integral end rings, stainless steel support.
4. Filter/Dryer Cartridge: Pleated media with solid core sieve with activated alumina.
5. Wax Removal Cartridge: Molded bonded core of activated charcoal with integral gaskets.

C. Permanent Straight Through Type:
1. ARI 710, UL listed, steel shell with molded desiccant filter core, for maximum working pressure of 500 psig.
2. Rating: ARI 710 moisture rating, ARI 730 flow capacity.

2.12 REFRIGERANT SOLENOID VALVES

A. Manufacturers: Alco Controls, Parker Hannifin, Sporlan Valve or approved equal.

B. Valve: ARI 760, pilot operated, copper or brass body and internal parts, synthetic seat, stainless steel stem and plunger assembly, integral strainer, with flared, solder, or threaded ends; for maximum working pressure of 500 psig. Stem designed to allow manual operation in case of coil failure.

C. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box.

2.13 FLEXIBLE PIPE CONNECTORS

A. Manufacturers: Packless Ind, Metraflex, Mason or approved equal.

B. Braided Refrigeration Piping Connection
1. Bronze flexible hose and bronze braided outer covering.
2. Copper sweat connections, cleaned de-greased, and bagged.
3. R410a rated, 650 psi working pressure.

2.14 ROOF PIPE PORTAL

A. Manufacturers: RPH Vault or approved equal.

B. Powder coated heavy gauge aluminum assembly. Vandal resistant lid. Pre-insulated housing, R4.3 insulation. Insulation extension and curb. Stainless steel screws.

C. Weather-tight Silx14 exit seals for pipe penetrations. UV resistant, 20-year warranty.

D. Order size based on number of pipe penetrations. Allow for additional power and control conduit penetrations.

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. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

T. Fully charge completed system with refrigerant after testing.

U. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.

V. 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, continuous aluminum jacket or field fabricated GSM cover with steel angle supports.

B. Provide waterproof pipe entry into building with trim and flashing.

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.

D. Install pressure relief valves on ASME receivers. Install relief valve discharge piping to terminate outdoors.

E. Filter-Dryers:
1. Install permanent filter-dryers in low temperature systems.
2. Install permanent filter-dryer in systems containing hermetic compressors.
3. Install replaceable cartridge filter-dryer vertically in liquid line adjacent to receivers.
4. Install replaceable cartridge filter-dryer upstream of each solenoid valve.

F. Solenoid Valves:
1. Install in liquid line of systems operating with single pump-out or pump-down compressor control.
2. Install in liquid line of single or multiple evaporator systems.

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
4. Duct Pressure Testing

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.

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. Aluminum Ducts: ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.

C. Stainless Steel Ducts: ASTM A167, Type 304 \ 316.

D. Fasteners: Rivets, bolts, or sheet metal screws.

E. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 INSULATED FLEXIBLE DUCTS [GRD CONNECTION]

A. Manufacturers: Thermaflex G-KM or approved equal.

B. Product Description: Black polymer film supported by helical-wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film, UL 181 Class 1 complying with NFPA 90A & 90B.
   1. Pressure Rating: 6 inches wg positive and 1 inches wg negative.
   2. Maximum Velocity: 5000 fpm.
   3. Temperature Range: -20 degrees F to 250 degrees F.
   4. Thermal Resistance: R-4.2

C. Accessories:
   1. Hanger Strap: Thermaflex FlexTie – 1-1/2” wide, adjustable, plenum rated.
   2. Elbow: Thermaflex FlexFlow Elbow or Malco flexible duct support – One-piece adjustable design installs over flex duct.

2.3 SINGLE WALL SPIRAL ROUND DUCTS

A. Manufacturers: McGill AirFlow, Semco or approved equal.

B. Product Description: UL 181, Class 1, round spiral lockseam duct constructed of galvanized steel.

C. Elbows: Smooth radius or 5 section, 1.5D.

D. Application: Required for all exposed round ductwork; all round ductwork 12” dia. and larger; all round ductwork with static pressure over 1” w.g.. Optional for all round ductwork.

E. Construct duct with the following minimum gages:

Diameter	Gauge
3 inches to 14 inches	26

F. Construct fittings with the following minimum gages:

Diameter	Gauge
3 inches to 14 inches	24

2.4 DUCT SEALANT

A. Manufacturer: Design Polymerics, United McGill, Hardcast 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.

2.5 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.

G. Exterior Ductwork:
1. Construct one gauge heavier than SMACNA standard for size indicated.
2. Seal all joints and seams with heavy mastic. Duct shall be water tight.
3. Construct to prevent standing water on duct.

H. Exposed ductwork shall be Appearance Grade. Ductwork located in crawl spaces, shafts, and suspended ceiling spaces are not considered exposed.
1. All round ductwork shall be spiral seam (no snap-lock joints).
2. All joints clean and workmanlike.

3. Ductwork entirely free of dents.
4. Ductwork subject to denting due to space function construct one gauge heavier than SMACNA standard for size indicated.
5. All hangers trimmed of excess metal.
6. Plumb, level, parallel or perpendicular to building structure.
7. Sealed with transparent, paintable sealant to avoid streaking.

I. Flexible Duct:
1. Install insulated flexible duct in full extended condition free of sags and kinks.
2. Use minimum length required to make connection.
3. Length shall not exceed 10 feet.
4. Supported on 36" centers with minimum 1-1/2” wide strap. Do not crush.
5. Connect flexible ducts to metal ducts with draw bands.

J. Install duct hangers and supports in accordance with Section 23 05 00.

K. Use double nuts and lock washers on threaded rod supports.

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 PRESSURE (DUCT LEAKAGE) TESTING

A. Perform duct leakage rate testing in accordance with SMACNA Duct Leakage Test Procedures for the following.
1. All ductwork regardless of pressure class located exterior of the building or in an unconditioned space shall have a leakage rate of less than 6%.
2. At least 25% of all ductwork with a pressure class of 3” w.g. or more. The maximum duct leakage (CL) shall be 4.0 per Energy Code C403.2.8.3.3.

B. All ductwork found deficient by testing shall be resealed and retested until leakage compliance is reached.

C. Provide written documentation of testing to be included with the Test and Balance report, see 23 05 93. Include drawing(s) indicating where test measurements were taken.

3.6 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.

3.7 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.

3.8 SCHEDULES

A. Ductwork Material Schedule:

AIR SYSTEM	MATERIAL
Supply, Return, Exhaust, Relief	Galvanized Steel
Outside Air Intake	Galvanized Steel
Exterior	Aluminum, Stainless Steel

B. Ductwork Pressure Class Schedule: Install higher pressure class than indicated where corresponding fan system ESP (external static pressure) is higher.

AIR SYSTEM	PRESSURE CLASS
Constant Volume Low Pressure Supply	Minimum 1 inch wg.
Return, Exhaust	Minimum 1 inch wg

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Dampers
2. Duct access doors
3. Flexible duct connections

1.2 COORDINATION

A. Verify locations for access panels with Architect.

B. Coordinate damper power, control and fire alarm interface with other trades.

C. See 23 09 00 for Electric Damper Actuators.

1.3 QUALITY ASSURANCE

A. Dampers tested, rated and labeled in accordance with the latest UL requirements.

B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

PART 2 PRODUCTS

2.1 MANUAL BALANCING DAMPERS

A. Manufacturers: Ruskin, Greenheck or approved equal

B. Frames: Galvanized steel, minimum 20 gage.

C. Blades: Galvanized steel, minimum 20 gage, attached to minimum 3/8 inch shafts with locking handle quadrant. Provide 2” standoff for insulated ductwork applications.

D. Maximum Velocity: 1500 fpm.

E. Rectangular: 24” and under on a side Ruskin MD25; over 24” on a side Ruskin MD35 or equal.

F. Round: Ruskin MDRS25 or equal.

2.2 CONTROL DAMPERS

A. Manufacturers: Tamco, Ruskin, Greenheck or approved equal

B. Frame: Extruded aluminum (6063T5) channel of minimum 0.080” thickness with mounting flanges on both sides.

C. Blades: Extruded aluminum (6063T5) airfoil. Maximum blade size 6 inches wide, 48 inches long, attached to minimum 7/16 inch hex shafts.

D. Bearings: Celcon inner bearing fixed to blade pin, rotating within a polycarbonate outer bearing inserted in the frame.

E. Seals: EPDM blade seals and silicone frame seals.

F. Damper Leakage: AMCA Pressure Class 1A, maximum leakage rate of 3.0 cfm/ft^2 at 1.0 inch w.g. pressure differential.

G. Maximum Pressure Differential: 6 inches w.g.

H. Rectangular: Tamco 1000, Ruskin CD50, Greenheck VCD-43 or equal.

I. Round: Ruskin CDRS25, Greenheck VCDR-53 or equal up to 12" diameter, for larger sizes use rectangular damper with manufacturer's square-to-round transitions.

J. Options:
1. For dampers with a dimension over 48" provide multiple sections with jack shafts.
2. Provide parallel blade action for two position (open/closed) applications.
3. Provide opposed blade action for modulation or control applications.

2.3 INSULATED CONTROL DAMPERS

A. Manufacturers: Tamco, Ruskin, Greenheck or approved equal

B. Frame: Insulated extruded aluminum (6063T5) channel of minimum 0.080" thickness with mounting flanges on both sides.

C. Blades: Extruded aluminum (6063T5) airfoil internally insulated with expanded polyurethane foam and thermally broken. Maximum blade size 6 inches wide, 48 inches long, attached to minimum 7/16 inch hex shafts.

D. Bearings: Celcon inner bearing fixed to blade pin, rotating within a polycarbonate outer bearing inserted in the frame.

E. Seals: EPDM blade seals and silicone frame seals.

F. Damper Leakage: AMCA Pressure Class 1A, maximum leakage rate of 3.0 cfm/ft^2 at 1.0 inch w.g. pressure differential.

G. Maximum Pressure Differential: 6 inches w.g.

H. Rectangular Insulated: Tamco 9000, Ruskin CDTI-50, Greenheck ICD-44 or equal.

I. Round: Provide rectangular damper with manufacturer's square-to-round transitions.

J. Options:
1. For dampers with a dimension over 48" provide multiple sections with jack shafts.
2. Provide parallel blade action for two position (open/closed) applications.
3. Provide opposed blade action for modulation or control applications.

2.4 BACK-DRAFT DAMPERS

A. Manufacturers: Tamco Series 7000 or approved equal.

B. Frame: Extruded aluminum (6063T5) channel of minimum 0.060" thickness with mounting flanges on both sides.

C. Blades: Extruded aluminum (6063T5) blades of minimum 0.060" thickness. Maximum blade size 6 inches wide, 48 inches long, attached to minimum 1/2 inch shafts.

D. Bearings: Celcon bearing rotating on zinc-plated steel pivot points.

E. Seals: Silicone blade and side seals.

F. Linkage: System of hard alloy aluminum (6005T6) crank arms fastened to aluminum pivot rods.

G. Damper Leakage: Maximum air leakage rate of 20 cfm/ft^2 at 1.0 inch w.g. back pressure on a 24"x24" damper.

H. Operating Temperature Range: -72F to 212F.

I. Options:
1. For dampers with a dimension over 48" provide multiple sections.
2. For applications with set pressure operation from 0.01" w.g. to xxx "w.g. provide counterweighted damper, Tamco 7000 CW.
3. For application with set pressure operation from 0.15" w.g. to xxx provide weighted damper, Tamco 7000 WT.

2.5 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1 inch thick insulation with sheet metal cover.
1. Less than 12 inches square, secure with sash locks.
2. Up to 18 inches Square: Furnish two hinges and two sash locks.
3. Up to 24 x 48 inches: Three hinges and two compression latches.
4. Larger Sizes: Furnish additional hinge.
5. Access panels with sheet metal screw fasteners are not acceptable.

2.6 FLEXIBLE DUCT CONNECTIONS

A. Manufacturers: Duro-Dyne or approved equal

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

C. Double fold "Grip-Loc" metal-to-fabric connection.

D. Indoor Connector: "Metal-Fab", 24 ga, 3"metal - 3" fabric - 3" metal.
1. Fabric: UL listed fire-retardant Neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd, 500 lbs tensile strength.

E. Exterior Connector: "Metal-Fab", 24 ga, 3"metal - 3" fabric - 3" metal.
1. Fabric: Ul listed fire-retardant Hypalon coated woven galas fiber fabric conforming to NFPA 90A, minimum density 24 oz per sq yd, 250 lbs tensile strength.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify rated walls are ready for fire damper installation.

B. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.2 INSTALLATION.

A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.

B. See Section 23 34 00, paragraph 1.4 for damper installation.

C. Provide motorized in lieu of gravity back-draft dampers per Energy Code.

D. Provide control dampers where not furnished with packaged equipment.

E. Provide insulated control dampers where:
1. The damper is installed behind a louver.
2. The damper is installed in a roof penthouse or gravity ventilator.
3. The damper is unducted and open to a conditioned space.

F. Provide shroud (matching duct material) over flexible duct connections when installed outside.

G. Access Doors: Install access doors at the following locations and as indicated on Drawings:
1. Before and after each fire damper, smoke damper and combination fire and smoke damper.
2. Where access is required for a valve or damper.
3. Install at locations for cleaning kitchen exhaust ductwork in accordance with NFPA 96.

H. Access Door Sizes: Install minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated on Drawings. Review locations prior to fabrication.

I. Install temporary duct test holes as required for testing and balancing purposes. Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

3.3 INSTALLATION - FLEXIBLE DUCT CONNECTIONS

A. Provide flexible duct connection on supply outlet and return/exhaust inlet of all ducted fan powered equipment.

B. Support and align ductwork to avoid strain on flexible connection.

3.4 DEMONSTRATION

A. Demonstrate re-setting of fire dampers to Owner's representative.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fans.

1.2 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210-99 and bear AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300-96, and bear AMCA Certified Sound Rating Seal.

C. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

D. Balance Quality: Conform to AMCA 204.

1.3 DAMPERS

A. A gravity backdraft or motorized control damper is required on every exhaust fan.

B. Fans which are noted to operate continuously or have a capacity of 300 cfm or less shall have a gravity backdraft damper unless noted otherwise. All other fans shall have a motorized control damper.

C. See 23 33 00 for motorized control dampers.

D. Provide insulated control dampers where scheduled or where required by 23 33 00.

1.4 FAN EFFICIENCY

A. Single fan or multiple fans in parallel with combined motor nameplate over 5hp shall have a Fan Efficiency Grade (FEG) of 67 or higher and shall be selected to operate within 15% of the maximum total efficiency of the fan.

PART 2 PRODUCTS

2.1 CENTRIFUGAL ROOF EXHAUST FANS

A. Manufacturers: Greenheck, Cook or approved equal.

B. Construction: Spun aluminum with rigid internal support and aluminum birdscreen. Backward inclined aluminum (composite) wheel and inlet, statically and dynamically balanced.

C. Direct Drive:
1. Motor: Electronic Commutation DC brushless motor with internal solid state AC/DC converter circuitry and heavy duty ball bearings. Speed controllable down to 20% of full speed. Minimum 85% efficient at all speeds.
a. Motor mounted potentiometer speed control dial.
b. [or] 0-10 volt control signal speed input.
2. Accessories:

a. Motorized Control damper. (See Part I, Dampers)
b. Insulated roof curb with liner; matched to roof slope.
c. Curb seal.
d. Aluminum birdscreen.
e. NEMA disconnect switch.
f. Speed Control
g. See schedule for additional accessories

2.2 CENTRIFUGAL INLINE FANS

A. Manufacturers: Greenheck, Cook or approved equal.

B. Construction: Square galvanized steel with duct collars, two removable access panels. Backward inclined aluminum (composite) wheel and inlet, statically and dynamically balanced.

C. Direct Drive:
1. Motor: Electronic Commutation DC brushless motor with internal solid state AC/DC converter circuitry and heavy duty ball bearings. Speed controllable down to 20% of full speed. Minimum 85% efficient at all speeds.
a. Motor mounted potentiometer speed control dial.
b. [or] 0-10 volt control signal speed input.
2. Accessories:
a. Gravity backdraft (See Part I, Dampers)
b. Nema rated disconnect switch.
c. Insulated housing with 1" liner.
d. Speed Control.
e. Neoprene isolators
f. See schedule for additional accessories

PART 3 EXECUTION

3.1 ROOF CURBS

A. Verify roof curbs are installed and dimensions are as instructed by manufacturer.

B. Provide sound attenuation material in curb where so indicated on drawings.

3.2 INSTALLATION

A. Secure roof fans with cadmium plated steel lag screws to roof curb.

B. Suspended Fans: Install flexible connections between inlet and outlet of fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

C. Install safety screen where inlet or outlet is exposed.

D. Install gravity backdraft or motorized control dampers on discharge of exhaust fans and as indicated on Drawings.

3.3 MANUFACTURER'S FIELD SERVICES

A. Furnish services of factory trained representative for minimum of one day to start-up, calibrate controls, and instruct Owner on operation and maintenance.

3.4 CLEANING

A. Vacuum clean inside of fan cabinet.

3.5 DEMONSTRATION

A. Demonstrate fan operation and maintenance procedures.

3.6 PROTECTION OF FINISHED WORK

A. Do not operate fans for until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Engine exhaust system brand shall be Plymovent. No exception.

B. Provide (design and install) a complete source-capture exhaust system, with stationary duct drops and hoses with nozzles on retractors. System shall provided complete, turn-key.

C. Provide shop drawings that include: vehicle type and position, dimensions, sizes, weights, performance data, and also location and size of field connections.

D. Reference mechanical drawings for basic layout and equipment requirements.

E. Product Data: Provide manufacturers literature and data sheets (see Section 23 00 00). Include fan curve and sound level data with operating point clearly indicated.

F. Provide manufacturer's Installation, Operation and Maintenance Manual (see Section 23 00 00).

1.2 QUALIFICATIONS

A. Contractor shall be certified Plymovent installer, such as Air Exchange Inc. Contact Chris Koss, 800-300-2945.

B. Contractor shall have been engaged in work of this section for a period of at least five years and have installed at least five such systems of comparable size.

C. Contractor must supply names, addresses and phone numbers of twenty (20) active or completed fire station projects within Washington State of similar or equal scope as outlined within this specification.

PART 2 PRODUCTS

2.1 DUCT SYSTEM

A. Ducts, unless otherwise specified or approved, shall be round. Ducts shall be straight and smooth on the inside with airtight joints. Wherever ducts are used with crimped ends, the joint shall have crimp and bead arrangement. The bead shall provide a rigid stop for the mating open end to seat. Ducts shall be constructed of galvanized steel and sealed in accordance with standard SMACNA methods, for the system designed negative pressure in inches w.g. All duct joints to be sealed and air tight.

B. Reducing fittings shall have a minimum of 1" graduating increase in diameter per 8' in length. Elbows up to 12" in diameter shall have a centerline radius of not less than 1.5 times the diameter. Elbows beyond 12" in diameter shall have a centerline radius of not less than 2.5 times the diameter. Branches shall enter the mains at a specified angle of not less than 30 degrees with the centerline of the main duct in the direction of airflow, unless otherwise indicated or approved. Flexible connections to the main or branch duct shall be braced with approved metal straps or members.

C. Where duct of dissimilar metals are connected, or where sheet metal connections are made to fan inlet and outlet, only an approved fireproof flexible connection shall be used. The connection shall be installed and securely fastened by zinc coated steel clinch type draw bands for round ducts.

D. Duct sleeves shall be provided for all round ducts less than or equal to 15" in diameter that pass through floors, walls, ceilings, or roofs. Sleeves in non-load bearing walls shall be fabricated of 20-gauge steel conforming to ASTM A 525. Sleeves in load bearing walls shall be fabricated of standard weight galvanized steel pipe conforming to ASTM A 53. Collars for round ducts less than or equal to 15" shall be fabricated from 20 gauge galvanized steel. Round ducts >15" in diameter passing through floors, walls, ceilings, or roofs shall be installed through framed openings. Structural steel members for framed openings shall conform to ASTM A 36. Framed openings shall provide a 1" clearance between the duct and the opening. A closure collar of galvanized steel greater than or equal to 4" wide shall be provided on each side of the walls or floors where sleeves or framed openings are provided.

E. The exhaust discharge stackhead will be a no loss type as recommended by ACGIH or as otherwise specified. The stackhead design will protect against weather elements or introduction of debris.

F. Duct sizes by Plymovent installer/vendor.

2.2 EXHAUST FANS

A. Utility set type. Sized by Plymovent installer/vendor.

B. Provide with factory silencer on fan outlet.

2.3 EQUIPMENT

A. The equipment provided shall be a standard product of Plymovent.
Model: FE-125, Fixed Exhaust Extractor System.
Hose: EF2, 5” x 16’ of 570 Degree rated Flex Hose.
Saddle: 5” Rubber Saddle.
Balancer: BRL-300 Locking Balancer.
Safety Chain: Manufacturer’s Standard.
Nozzle: STPAV, 5” Stainless Steel Nozzle w/Vice Grip, Opening 7”.

2.4 CONTROLS

A. Provide ES-90 control panel.

B. Provide all sensors and wiring for complete system.

C. Provide complete factory controls, start-up and testing

PART 3 Model: FE-125, Fixed Exhaust Extractor EXECUTION

3.1 INSTALLATION

A. The exhaust removal system shall be installed as indicated and recommended by the manufacturer. Welding and brazing shall conform to ASME-17. Slip joints shall be sealed. Riser duct shall be supported to the structure as indicated on the drawings. Main duct shall be attached to building structural members.

3.2 TRAINING

A. See section 23 00 00.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Diffusers, Registers & Grilles
2. Louvers
3. Goosenecks

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 RADIAL SLOT INDUCTION CEILING DIFFUSER (Outside Air)

A. Manufacturers: Price RSD or approved equal.

B. Type: Radial swirl diffuser with high induction individually adjustable radial slots, square face. Adjustable air pattern controllers for variable direction one-way, two-way, three-way or four-way discharge patterns. Coated steel plenum and internal baffle. Round slot array pattern.

C. Frame:
1. 6” dia. - 12”x12” module for surface mount GWB ceiling or 24”x24” frame for lay-in T-bar ceiling.
2. 8”-12” dia. - 24”x24” module for lay-in T-bar ceilings or plaster frame for surface mount GWB ceiling.

D. Fabrication: Galvanized steel with white powder-coated finish. Black polycarbonate adjustable air pattern controllers.

E. Accessories:
1. Steel plenum, internal baffle and round side duct inlet assembly.

2.2 EGGCRATE EXHAUST / RETURN GRILLE

A. Manufacturers: Titus, Price, Krueger or approved equal.

B. Type: Fixed grilles of 1/2 x 1/2 x 1/2 inch aluminum core.

C. Frame: 1-1/4 inch margin with countersunk screw mounting or channel lay-in frame for suspended grid ceilings.

D. Fabrication: Aluminum with factory white enamel finish.

2.3 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.

G. Inset Screen: Aluminum 16x18 mesh, aluminum frame.

2.4 GOOSENECKS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, of minimum 18 gage aluminum. Provide termination insect screen.

2.5 CAPS

A. Pitched Roof Cap: Steel construction with black enamel finish, integral flashing flange, built in birdscreen with damper. Greenheck RJ (6x9 or larger) or approved equal.

B. Flat Roof Cap: All aluminum exterior construction, galvanized steel internal supports, integral birdscreen without damper, built in flashing flange. Greenheck GRSF or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify inlet and outlet locations with Architectural Plans.

B. Verify ceiling/wall type before ordering.

C. Verify diffuser air patterns are as indicated before starting air balance.

3.2 LOUVERS

A. Provide louvers with insect screen when louver is un-ducted or when scheduled.

3.3 INSTALLATION

A. Install diffusers to ductwork with airtight connection.

B. Install balancing dampers on duct take-off to diffusers, grilles, and registers, whether or not dampers are furnished as part of diffuser, grille, and register assembly.

C. Paint visible portion of ductwork behind air outlets and inlets matte black

3.4 INTERFACE WITH OTHER PRODUCTS

A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Gas fired unit heaters.
   2. Tubular infrared heaters.

1.2 QUALITY ASSURANCE

A. Gas-Fired Unit Heater Performance Requirements: Conform to minimum efficiency prescribed when tested in accordance with ANSI Z83.8.

B. Gas-Fired Duct Furnace Performance Requirements: Conform to minimum efficiency prescribed when tested in accordance with ANSI Z83.9.

1.3 WARRANTY

A. Furnish five year manufacturer warranty for heat exchanger.

PART 2 PRODUCTS

2.1 GAS FIRED UNIT HEATERS

A. Manufacturers: Reznor or approved equal.

B. Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, burner, controls, and accessories:
   1. Heating fuel: Natural gas fired, 83% efficiency.
   2. Gas Control: Single stage.
   3. Ignition System: Electric direct ignition.
   4. Location: Suspended overhead.

C. Cabinet: Powdercoated galvanized steel, fully gasketed access panel with safety interlock; insulated or double panel construction; roll-formed adjustable, horizontal louvers; fan guard.

D. Supply Fan: Propeller.

E. Heat Exchanger: Multicell, 4 pass serpentine style with tubes of Type 409 stainless steel.

F. Gas Burner: One piece burner with single orifice, continuous wound stainless steel ribbon, separated-combustion, power-vented.

G. Accessories:
   1. Concentric vent termination kit
   2. 409 stainless steel heat exchanger

2.2 TUBULAR INFRARED HEATERS (MODULATING)

A. Manufacturers: Roberts Gordon or approved equal.

B. Packaged, factory assembled burner, pre-wired unit consisting of cabinet, burner, heat exchanger, radiant tube, reflector and controls for natural gas.

C. Performance: Rated in accordance with AHRI Standard 1330. Minimum Infrared factor (IF) of 15.

D. Heat Exchanger: Aluminized tubular steel combustion chamber with aluminized steel tube with aluminum reflector.

E. Gas Burner:
1. Gas Burner: Modulating forced draft type with adjustable combustion air supply.
2. Gas valve provides 100 percent safety gas shut-off; 24-volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration and automatic electric valve.
3. Electronic pilot ignition, with hot surface igniter.
4. Non-corrosive burner air blower with permanently lubricated motor.

F. Gas Burner Safety Controls: Thermo-couple sensor prevents opening of solenoid gas valve until pilot flame is proven and stops gas flow on ignition failure.

G. Reflectors: High radiant reflective aluminum continuously over entire length of system with end caps. Parabolic design with lower edge of reflector extending below the bottom of the tube.

H. Controls: Low voltage electronic room thermostat modulates burner to maintain room temperature setting. Provide transform relay for multiple burner control.

I. Accessories:
1. Vented metal enclosure for thermostat.
2. Provide additional reflectors for use as heat shields where indicated on drawings.
3. Provide aluminum side shield reflectors when mounted within 5 feet of vertical surface. Do not mount heater reflectors at 45 deg angle.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify space is ready for installation of units and openings are as indicated on shop drawings.

3.2 INSTALLATION

A. Install units in accordance with NFPA 90A.

B. Installation – Tubular Heaters:
1. Support system to allow for free expansion of the tube and reflectors.
2. Enable suspension of the system so that the reflectors shields can be oriented at a fixed angle between 0 to 35 degrees.
3. The entire system shall be suspended from structure as indicated in the manufacturer’s installation manual.
4. Slope tubing per manufacturer’s installation instructions. (Typically downward away from burner.)
5. Seal seams of tubing and vent pipe with high temperature silicone.
6. Provide seismic restraint.

C. Install vent connections in accordance with NFPA 211. Install vents and stacks.

D. Provide hangers and supports for suspended units.

E. Provide operating controls.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Package ERV with core.

1.2 QUALITY ASSURANCE

A. Entire unit shall be ETL Certified per U.L. 1995 and bear an ETL sticker.

B. Blowers shall be AMCA Certified for airflow.

1.3 COORDINATION

A. Coordinate size and location of all building penetrations required for installation of each unit and associated hydronic, gas and electrical systems.

B. Contractor shall coordinate with roofing contractor to ensure curb unit is properly flashed.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Filters: 3 sets of disposable filters for each unit.

PART 2 PRODUCTS

2.1 RESIDENTIAL CORE AIR TO AIR HEAT RECOVERY (ERV)

A. Manufacturers: Panasonic “Intelli-Balance” or approved equal.

B. General: ERV shall be ceiling mount with built-in speed selectors for both supply and exhaust fans. Standard and mirrored symmetrical configurations. 0.4” w.g ESP capable. Testing per HVI 915 and 916 standards. Energy Star Rated.

C. Cabinet: 22-gauge galvanized steel. Four 4” or 6” duct connections. Built-in motorized outdoor air damper. Built-in motorized exhaust and outside air dampers. Filters on supply and exhaust side of the core. Four (4) pressure ports for airflow verification. Pre-drilled mounting bracket.

D. Energy Core: Capillary core technology with anti-hold treatment. Built-in frost prevention mode. Minimum 60% sensible recovery.

E. Motor/Blower: Two (2) enclosed DC brushless motors rated for continuous operation. 120V power. Motor thermal cut-off fuse control.

F. Filters: MERV 8 supply filter with replacement alarm.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install flexible connections between unit and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

3.2 MANUFACTURER'S FIELD SERVICES

A. Furnish services of factory trained representative for minimum of one day to start-up, calibrate controls, and instruct Owner on operation and maintenance.

3.3 CLEANING

A. Vacuum clean coils and inside of fan cabinet.

B. Install clean filters.

3.4 DEMONSTRATION

A. Demonstrate fan operation and maintenance procedures.

3.5 PROTECTION OF FINISHED WORK

A. Do not operate fans for until ductwork is clean, filters 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. Ductless split systems.
2. Condensate Overflow Switch
3. Pipe Penetration Wall Seal

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 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 DUCTLESS SPLIT SYSTEM AIR CONDITIONING & HEAT PUMP UNITS

A. Manufacturers: Mitsubishi or approved equal.

B. General: Indoor/Outdoor unit combination shall be manufacturer paired. ETL labeled, AHRI 240 rated. R-410a Refrigerant. Cooling operation from 14F to 115F. Heating operation from -4F to 75F. 5 year Manufacturer parts and defect warranty, 7 year compressor warranty.

C. Indoor unit (Ceiling Cassette): Four-way style ceiling recess unit with ceiling grille. Factory assembled, wired and run tested. Outside air intake with field installed filter. Adjustable air outlet for 4-way, 3-way or 2-way airflow.
1. Fan: Three speed, direct drive fan with permanently lubricated bearings, statically and dynamically balanced. Adjustable guide vane and automatic air swing.
2. Filter: Removable washable.
3. Coil: Smooth plate aluminum fins on copper tubing with inner grooves, silver alloy brazed, pressure tested, condensate pan and drain. Integral 19” condensate lift pump.

D. Outdoor unit: Horizontal discharge condensing unit constructed of galvanized steel. Factory assembled, piped and wired. Thermally fused acrylic or polyester powder coating with cadmium plated assembly hardware.
   1. Fan: Direct drive, variable speed DC motor, permanently lubricated bearings, mounted with vibration isolation, fan guard.
   2. Coil: Corrugated aluminum fins on copper tubing with protective metal guard and metering orifice. Pre-charged with refrigerant.
   3. Compressor: Hermetic, inverter driven, variable speed, dual rotary type. Refrigerant accumulator, internal thermal overload, high pressure safety switch. Pulse Amplitude Modulation (PAM) inverter drive.

E. Control: Microprocessor controlled self-diagnostic, 3-minute run time delay, auto restart after power loss, test run switch, automatic cooling, display set point and room temperature, 24/7 programmability.
   1. Microprocessor in each outdoor and indoor unit communicating via A-Control data over power transmission.
   2. Monitor return air temperature, indoor coil temperature.

F. Wired Remote Controller (PAR-31MAA)
   1. LCD display with 1 F increments, 12/24 volt.
   2. Weekly timer with 8 pattern settings per day.
   3. On/off, temperature adjustment, mode selector, timer control, fan speed selector, ventilation button.
   4. Built-in temperature sensor.

G. Accessories:
   1. Outdoor unit pan heater.

2.2 TRIM PANEL

A. Manufacturer: Mitsubishi PLFY-ITP1, PLFY-ITP2 or PMFY-ITP1

B. Ceiling cassette trim panel to adapt with t-bar ceilings. High performance ABS impact resistant polymer with a smooth white finish. Black finish optional.

2.3 REFRIGERANT PIPING SERVICE VALVE

A. Manufacturer: Diamondback or approved equal.

B. Full port, forged brass ball valve with Schrader valve, flare connections, Teflon seals and gaskets. 700 psig rated, R-410A compatible, fully factory assembled and pressure tested.

C. Provide with insulation cover of polyethylene foam with PVC cover and tape.

2.4 REMOTE CONTROLLERS

A. Manufacturers: Mitsubishi or approved equal.

B. Remote controllers shall operate indoor units. The wiring for the remote controllers shall be simple, non-polar, two-wire connections. All remote controllers shall be wall-mounted with an LCD display and contain a microprocessor that constantly monitors operation to maintain smooth indoor unit operation. Set temperature shall be adjusted in increments of 1°F or 2°F, depending on the systems and controllers. In the event of an abnormality, the remote controller shall display a four-digit error code and the indoor unit address.

C. PAR-40MAA: Deluxe MA Remote Controller
   1. Backlit display
   2. Capable of controlling up to 16 indoor units (defined as 1 group).
   3. Displays: Room temperature, relative humidity, operation status, setpoint.
   4. Control the following operations: On/Off, Operation Mode (cool, heat, auto, dry, and fan), temperature setting, fan speed setting, setback, hold and airflow direction setting.
   5. Timer settings of on/off/temperature up to 8 times in a day in 5-minute increments with an Auto Off timer and able to limit the set temperature range.
   6. Room temperature shall be sensed at the Controller.

2.5 CONDENSATE PUMPS

A. See Section 230500.

PART 3 EXECUTION

3.1 EXAMINATION

A. Coordinate size and location of roof support rails 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.

3.4 INSTALLATION - CONDENSING UNIT

A. Install condensing unit at roof on fabricated rails or curb with cap. Secure unit to support and seal.

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 GENERAL REQUIREMENTS

A. Conform to General Conditions, Supplementary Conditions, the modifications thereto and Division 01 - General Requirements for all work in Divisions 26, 27 and 28.

1.2 SUMMARY

A. Design Intent: The project includes Electrical, Fire Alarm and Low Voltage systems for Shop Addition to the Monroe Fire Station #31. The existing fire station and administration building will have a new vehicle maintenance bay added on to the existing apparatus bay.
   1. All Fire Alarm and Low Voltage Systems are Design-Build; Contract Documents (drawings and specifications) are meant to provide information (scope, performance requirements, preliminary quantities, and locations, etc) for Bidding by Design-Build Contractors only. All final quantities and locations of equipment and devices shall be coordinated with the Fire Marshal/ Local AHJ (as applicable), Architect and Owner prior to the start of construction.
   2. The Electrical Contractor shall submit Electrical Permit Set drawings prepared by the Engineer for plan review and shall permit, provide and install complete and fully operational and coordinated Electrical systems that meet all requirements of the Owner, local AHJ and as per the Project Contract Documents.
      a. The Electrical Contractor shall also coordinate with the Design-Build Fire Alarm and Low Voltage Contractors and shall provide all infrastructure (conduits, supports, racks, line voltage power connections, etc) required for these systems.
   3. The Design-Build Fire Alarm and Low Voltage Contractors shall design, submit for plan review, permit, provide and install complete and fully operational and coordinated Fire Alarm and Low Voltage systems that meet all requirements of the Owner, local AHJ and as per the Project Contract Documents.
   4. The Fire Alarm and Low Voltage Design-Build Contractor(s) shall be a subcontractor(s) to the Electrical Contractor.
   5. Fire Alarm Systems:
      a. In addition to administrative requirements of this Specification Section, see Specification Sections 28 46 00 and the Contract Drawings for system performance requirements for bidding by the Fire Alarm Design-Build Contractor.
   6. Low Voltage Systems:
      a. See Specification Section 27 00 00 for a complete list of Low Voltage Systems to be included in the Project.
      b. In addition to administrative requirements of this Specification Section, see all Division 27 and 28 Specification Sections and the Contract Drawings for system performance requirements for bidding by the Low Voltage Design-Build Contractor.

B. The Electrical Contractor shall provide all labor, materials, equipment and devices, supports, etc necessary for satisfactory installation of electrical work ready to operate in strict accordance with Code requirements and the Project specifications and drawings.

C. Related Sections: All Division 01, 26, 27 and 28 Specification Sections included in the Contract Documents.

D. Commissioning Activities and Submittals: The Project shall be commissioned per Energy Code requirements. The Contractor shall coordinate with the General Contractor,

Architect and Commissioning Agent and provide support for the complete commissioning process as required. See Divisions 01, 26, 27 and 28 for additional information.

1.3 CODES AND STANDARDS:

A. All work shall meet or exceed the requirements of the current versions of all applicable Federal, State, and Local Codes and Standards including but not limited to:
   1. National Electrical Code (NEC) with Local Amendments.
   2. Washington State Energy Code with Local Amendments.
   3. International Fire Code (IFC) with Local Amendments.
   4. International Building Code (IBC) with Local Amendments.
   5. International Mechanical Code (IMC) with Local Amendments.
   6. Uniform Plumbing Code (UPC) with Local Amendments.
   7. The Americans with Disabilities Act (ADA).
   8. Illuminating Engineering Society of North America (IESNA) Standards and Recommended Practices.
   9. National Fire Protection Association (NFPA) Standards and Recommended Practices.
   10. Applicable Standards of the following organizations (see subsequent Division 26, 27 and 28 sections for additional information):
      a. American National Standards Institute (ANSI).
      b. American Society for Testing Materials (ASTM).
      c. Building Industry Consulting Services International (BICSI).
      d. Institute of Electrical and Electronics Engineers (IEEE).
      e. National Electrical Manufacturer's Association (NEMA).
      f. Underwriter's Laboratories (UL) standards.
   11. Utility Service Provider Requirements.

1.4 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to International Building Code with local amendments, Fire Marshal, and UL for fire resistance ratings and surface burning characteristics.

B. Voltage Drop: Total voltage drop across feeder plus branch circuit shall be limited to 5% per Energy Code requirements.
   1. Refer to Branch Circuit Length Limit schedule in the drawings for required conductor sizes on branch circuits to limit voltage drop.
   2. The Electrical Contractor shall coordinate conductor sizes with equipment provided. Where voltage drop requires conductors larger than can be landed on a piece of equipment, the Contractor shall provide a junction box nearby in an accessible ceiling or back of house area and reduce conductor sizes as allowed by Code. Installation to meet all Code and AHJ requirements.

1.5 PRODUCT SUBSTITUTIONS

A. Manufacturers and models of equipment and material indicated in Divisions 26, 27 and 28 Specifications and on drawings are those upon which the electrical design is based and upon which the fire alarm and low voltage systems' designs are to be based; other manufacturers with products considered equal in general quality may also be listed without specific model designation. Manufacturers not listed shall be submitted for approval prior to submission of Bid by the Contractor, see Division 01.

B. Any equipment other than the basis of design is considered a substitution; this includes equipment from any alternate manufacturers listed without specific model designation in the Contract Specifications and / or Drawings.

C. Pre-Bid 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.

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. Approval of proposed substitution does not grant the Contractor approval for deviation from the contract requirements.

F. Unless indicated otherwise, “or pre-Bid approved equal” may be assumed for all products in Divisions 26, 27 and 28.

1.6 DESIGN DRAWINGS

A. All drawings, specifications and calculations prepared by the Fire Alarm Design-Build Contractors shall be stamped by an Engineer currently registered in the State of Washington.

B. The Fire Alarm and Low Voltage Design-Build Contractor shall submit drawings and diagrams for review and for job coordination:
   1. Permit / Construction Drawings for review. These drawings shall be submitted at two milestones as selected by the Architect in electronic PDF format.
      a. The Contractors’ drawings shall match the layout of the Architectural drawings.
      b. Fire Alarm systems shall be provided in a separate set of drawings by the Fire Alarm Contractor.
      c. Separate drawings shall be provided for Power, Lighting, and Low Voltage systems unless the drawings are set up to the scale of 1/4" = 1’-0” or larger.
      d. The Drawing Sets shall include at a minimum:
         1) Symbols, Legend and drawing list sheets.
         2) Low Voltage Systems (Telecom, CATV, access control, etc) floor plan drawings.
         3) Low Voltage Systems riser diagrams.
         4) Fire Alarm System sheets and calculations approved by the local Fire Marshal/ AHJ.

1.7 ELECTRICAL SYSTEMS STUDIES

A. As soon as the actual equipment being provided by the project has been selected by the Contractor, the Electrical Contractor shall perform Short Circuit / Fault Current and Arc Flash for the actual Electrical System to be installed.

B. These studies shall be prepared for the specific electrical equipment, overcurrent devices, utilization equipment and feeder and circuit lengths and types to be installed for the project.

C. Studies shall be prepared and stamped and signed by a professional Electrical Engineer currently registered in Washington State.

D. Studies shall be submitted with the Submittals for electrical panelboards, switchboards, overcurrent protective devices, etc. These equipment and devices will not be approved without the required Studies.

E. See Specification Section 26 05 73 for additional information and requirements.

1.8 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” of Divisions 26, 27 and 28 Specification Sections and all additional products noted on drawings or required for completion of sequence of operations (three submittal packages total; one for all of Division 26, one for Fire Alarm, and one for all other Low Voltage systems).

B. Provide the Submittals so as not to delay the construction schedule; allow at least two weeks for review of each submittal and re-submittal.

C. Electronic: Submittals shall be complete in one PDF file for each Division with bookmarks for each Specification Section and Principal Category. Multi-file submittals will be returned without review.
1. First Page: Name of Project, Owner, Location & Contracting Company.
2. Index Page: List of specification sections and principal categories with contents by Tag or item.
3. Bookmarks: Electronic bookmark of each specification section and principal category corresponding to listing in index.

D. Clearly indicate on each page the equipment schedule designation (Tag or Mark) and/or specification section, as applicable. Indicate selected model and all accessories intended for use.

E. Equipment vendor cover page with contact information shall precede submittal by that vendor.

F. Submitted product information shall include but not be limited to the following information (as applicable):
1. Product description.
2. Manufacturer and model.
3. Dimensions.
4. Performance Ratings.
5. Construction Materials.
6. Finish.
7. Ratings (i.e. UL, ASTM, NEMA, etc).
8. Electrical characteristics (Voltage, Phase, Wattage, Breakers, etc).
9. Engineering technical data.
10. Sound level data.
11. Vibration isolation.
12. Strength and fastening provisions.
13. Seismic qualification data.
14. Controls and wiring diagrams.
15. Accessories.

G. Where a third-party structural engineer has been engaged by the Contractor to provide support, anchoring and seismic calculations, the Contractor shall include these calculations and designs in their Submittal Package.

H. If requested in subsequent Specification Sections or by the Architect or Engineer, submit Manufacturer's Installation Instructions on any equipment, procedures, or certifications so requested.

I. Do no ordering, fabrication or manufacturing of products until return of approved submittals.

J. The Contractor agrees to pay for the Engineer's review cost of the Division 26, 27 and 28 Submittals beyond one resubmittal where resubmittals are required due to deficiencies in the Contractor's Submitted material.

1.9 SHOP DRAWINGS

1. For Electrical Gear (switchboards, panelboards, etc).
2. For Lighting Control Systems.
3. Slab plans marked up with all penetrations required for electrical, fire alarm and low voltage systems. Sizes of penetrations shall be indicated on the plans and penetration locations shall be dimensioned from major building lines. The Contractor shall submit these slab plans to the Architect for review.
4. As requested in subsequent Division 26, 27 and 28 Specification Sections.
5. For all special or custom-built items or equipment.
6. 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.
   a. By submission of revised design shop drawings, the Contractor acknowledges that coordination has been done with all other trades to ensure that all equipment fits and remains accessible with all Code required clearances and that no conflicts exist.

B. The Architect's and Engineer's review of shop drawings shall not relieve the Contractor of the responsibility for deviations from the Contract drawings or specifications, unless the Contractor has, in writing, called the attention of the Architect to such deviations at the time of the submission, nor shall it relieve the Contractor from responsibility for errors or omission in such shop drawings.

1.10 ILLUMINANCE CALCULATIONS

A. The Contractor shall include illuminance calculations for all substitution request packages for the project. Luminaire Submittals will not be approved until illuminance calcs are received.

B. Illuminance calculations shall include legible calculation points based on a calculation zone with row and column spacing of calculation points at no more than:
1. 1 ft x 1 ft for interior areas.
2. 5 ft x 5ft for exterior areas.

C. Illuminance calculations shall include a table showing all luminaires included, the ies files used for each, and the assumed light loss factors (LLF).
1. Calculation zones shall be named in ways that make it easy to identify each location (Office 130, Corridor 125, exterior sidewalk east, etc).
2. Floor Plans and Site Plans provided shall include boundaries between calculation zones and the names of all zones.

D. Illuminance calculations shall include a table showing the following for each calculation zone:
1. Average illuminance.
2. Minimum illuminance.
3. Maximum illuminance.
4. Max:Min Ratio.
5. Ave:Min Ratio.

1.11 UTILITY SERVICES

A. The Contractor shall verify the locations of any overhead or buried utilities on or near the Project site. Determine such locations in conjunction with all public and private utility companies and with all authorities having jurisdiction.

1.12 COMMISSIONING

A. See Division 01 and individual Section 26, 27, and 28 Spec Sections for additional roles and responsibilities of commissioning.

B. Provide all necessary commissioning assistance, equipment and documentation as required by the Commissioning Plan.

C. The duty and responsibility for electrical and low voltage commissioning work shall be assigned to a specific individual. Inform the General Contractor and Commissioning Agent of the contact information for the person so assigned.

D. Perform corrective actions needed to resolve deficiencies identified during commissioning. Record action taken on commissioning deficiency log.

1.13 PLAN REVIEW AND PERMITS

A. See Specification Section 28 46 00 for Fire Alarm Systems Permit requirements.

B. In addition to the requirements in other Specification Sections, the Electrical Contractor shall make all required submissions to the Authorities Having Jurisdiction (AHJ) for Plan Review, Permits and approval. The Contractor shall pay all fees related to said submissions and shall submit all comments received from the AHJ to the Architect and Engineer.

C. The Contractor shall not commence work until a permit (or “get started” permit where allowed by the AHJ) is obtained. The Contractor is solely responsible for ensuring that the permit application and any revisions are submitted in a timely manner so as not to impact the project schedule.

D. The Contractor shall retain the services of a third-party structural engineer to provide support, anchoring and seismic calculations for all applicable equipment where required by the AHJ.

1.14 QUALITY ASSURANCE

A. The Contractors shall perform all work per current versions of all applicable Codes and Standards with state and local amendments – see “Codes and Standards” paragraph above.

B. All equipment and devices shall be UL-Listed and Labeled and shall be acceptable to the Authority Having Jurisdiction as suitable for the use and location for which they are intended.

C. Provide all like items (receptacles, circuit breakers, electrical gear, etc) from one manufacturer.

1.15 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in Divisions 26, 27 and 28 Specification Sections with a minimum of three years’ experience.

B. Installer: Company specializing in performing Work included in Divisions 26, 27 and 28 on projects of similar type and scale with a minimum of three years' experience.

1.16 SCHEDULING

A. Coordinate and provide assistance in final adjustment and testing of life safety systems with the General Contractor and Fire Authority.

1.17 DELIVERY, STORAGE AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. The Contractor shall keep all equipment, devices, conduit, etc in a dry, secured, protected area. The location shall be coordinated with the Architect and General Contractor prior to the start of Construction. See Division 01 for additional delivery, storage and handling requirements.

C. Where original packaging is insufficient, provide additional protection. Maintain protection in place until installation.

D. Inspect all products and materials for damage prior to installation.

E. Protect conduit from all entry of foreign materials by providing temporary end caps or closures on conduit and fittings.

F. Protect materials and finishes during handling and installation to prevent damage.

G. Comply with manufacturer's installation instruction for rigging, unloading and transporting equipment.

1.18 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. Coordinate with General Contractor to have ventilation provided in areas to receive solvent cured materials.

C. Do not install underground conduit when bedding is wet or frozen.

D. Do not install equipment pads when ground is frozen or muddy.

1.19 FIELD MEASUREMENTS

A. Verify field measurements prior to ordering gear.

B. Verify by field measurements that equipment 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 and documenting exact locations of existing systems.

1.20 COORDINATION

A. The Contractor shall visit the site and become familiar with existing conditions affecting work. The Contractor shall include in their Bid the costs for all work and / or materials required to comply with the requirements of the Contract Documents based on the actual existing conditions. Failure to visit the Site and verify actual existing conditions does not relieve the Contractor of these requirements; no change orders will be paid due to lack of verification of existing conditions whether they are specifically noted in the Contract Documents or not.

B. The Contractor shall verify the locations of any overhead or buried utilities on or near the Project 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. 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.

E. Where the drawings or specifications call out for the contractor to field verify and / or coordinate locations and requirements this verification / coordination is to be completed prior to any equipment, devices, supports, conduits, etc are installed / roughed-in. Any equipment, devices, supports, conduits, etc installed at locations unacceptable to the design team (either for aesthetics or functionality) due to the contractor failing to field verify / coordinate shall be relocated at the contractor's expense.

F. Electrical and Preliminary Low Voltage Systems 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 as necessary to fit actual conditions.

G. 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.

H. 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 Electrical, HVAC, plumbing, and sprinkler contractors shall provide whatever materials, offsets, labor etc. is required to resolve the conflict.

I. Advise the Architect of any modifications required to suit the equipment furnished. Costs for modifications due to equipment substitution will be borne by the contractor.

J. 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.

K. 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.

L. Coordinate trenching, excavating, bedding, backfilling of buried systems with the requirements of the Contract Documents.

M. Coordinate wall openings, rough-in locations, concrete housekeeping pads, and conduit rough-in locations to accommodate Work of Divisions 26, 27 and 28.

N. The Contractor shall coordinate with the Architectural plans and Project structure when locating equipment and devices and routing conduit and cabling.

O. The Contractor shall coordinate with the General Contractor and provide slab plans marked up with all penetrations required for electrical, fire alarm and low voltage systems. Sizes of penetrations shall be indicated on the plans and penetration locations shall be dimensioned from major building lines. The Contractor shall submit these slab plans to the Architect for review.

P. The Contractor shall coordinate conduit and cabling routing and equipment and device locations with all other trades to ensure all Code required clearances are maintained and equipment and devices remain accessible after the work of all trades is complete.

Q. The Contractor shall consult the approved shop drawings of all other trades and crafts to ensure coordination with final locations of cabinetry, counters, appliances, equipment, structural members, etc. Conflicts are to be resolved with the Architect and General Contractor prior to rough-in. The Contractor shall not be paid for relocation work (including cutting, patching, and finishing) required due to a lack of coordination prior to installation.

R. See the Architectural drawings for the exact locations of electrical and low voltage devices. The Contractor shall make minor changes (less than 6-feet in any direction) in the location of conduit, boxes, devices, etc from the locations shown in the drawings without extra charge to the Owner where required by coordination or if directed by the Architect or Owner.

S. The Electrical Contractor shall coordinate with the mechanical and plumbing contractors to ensure that HVAC and plumbing equipment match the designed electrical infrastructure. Alert architect and engineer if there are discrepancies between the design documents and the submitted HVAC / plumbing equipment.

T. Short-Circuit Current Rating (SCCR): Coordinate final available fault currents per the Electrical Systems Studies with the Mechanical Contractor to ensure HVAC and refrigeration equipment have an SCCR rating as needed to meet Code requirements.

U. Motor Starters: By mechanical equipment manufacturer where factory mounted controls are provided. Variable frequency drives by Division 23. All other starters are to be provided by Electrical Contractor; coordinate with Mechanical and Plumbing Contractors to ensure compatibility with their equipment.

V. Wiring for HVAC Equipment:
1. Power Wiring for HVAC equipment: By Electrical Contractor.
2. Control Wiring for HVAC equipment: Responsibility of Division 23.
3. Owner will not entertain additional cost due to lack of coordination between HVAC Contractor and Electrical Contractor.

1.21 PROJECT CLOSEOUT

A. Completion, submission and approval of the following is required for final project closeout:
   1. Walk through the Project with the Owner and Architect to make note of deficiencies.
   2. Execution of Owner’s, Architect's and Engineer’s final observation reports (punchlist).
   3. Operating and Maintenance Instructions.
   4. Operating and Maintenance Manual.
   5. Equipment and Lens Cleaning.
   6. Record Drawings.
   7. Testing.
   8. Commissioning.
   9. Warranty.

B. See other Division 26, 27 and 28 Specification Sections for additional requirements.

C. See Division 01 for additional requirements.

1.22 OPERATING AND MAINTENANCE INSTRUCTIONAL TRAINING

A. General: In addition to requirements of Division 01, following initial operation of Electrical systems and prior to acceptance by the Architect, perform the following services:
   1. 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.
   2. 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, lighting controls setpoint and system adjustment, and safeties and alarms.
   3. 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.
   4. During demonstrations and instructions include and reference information from maintenance manuals and contract drawings.
      a. Provide documentation of all instruction which includes:
         1) Date and time of instruction.
         2) Name, affiliation and qualifications of the instructor.
         3) Name and affiliation of the attendees.
         4) Topics, systems, and equipment covered.
         5) Length of instruction.
   5. Minimum duration of instruction periods:

a.	Electrical Power Systems	4 hours
b.	Lighting Control Systems	2 hours
c.	Fire Alarm Systems	See Section 28 46 00
d.	Low Voltage Systems	See Section 27 00 00

1.23 OPERATING AND MAINTENANCE MANUALS

A. Contents: Furnish, in accord with Division 01, one PDF and one bound copy of operating and maintenance manuals to include the following:
   1. The Job name and address.

2. Names, addresses and telephone numbers of the Contractor, sub- contractors and local companies responsible for maintenance of each system or piece of equipment.
3. Manufacturers, suppliers, contractor names, addresses and phone numbers.
4. Written guarantees.
5. Warranty service contractors' names, address and phone numbers (if different from above).
6. Copies of approved brochures and Shop Drawings as applicable for all submittal items.
7. Manufacturer’s printed operating procedures to include start-up and routine and normal operating instructions; and control, shutdown, and emergency instructions.
8. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; and adjusting instructions.
9. Part numbers of all replaceable items.
10. Control diagrams and operation sequence.
11. Record drawings corrected and completed.
12. Completed systems start-up forms and checklists.
13. Final copy of testing reports.

B. Operation and Maintenance Data:
1. Include spare parts lists for all equipment as applicable.
2. Submit installation instructions, adjustment instructions, and spare parts lists 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.

C. Binders:
1. Furnish typewritten or printed index and tabbed dividers between Specification Sections and principal categories.
2. Bind each manual in a hard-backed loose-leaf binder.
3. Imprint on Cover:
   a. Name of Project.
   b. Owner.
   c. Location of project.
   d. Architect.
   e. Contractor.
   f. Year of Completion.
4. Imprint on backing:
   a. Name of Project.
   b. Year of completion.

D. PDFs:
1. Provide PDF with bookmarks for each Specification Section and Principal Category.
   a. First Page: Name of Project, Owner, Location & Contracting Company.
   b. Index Page: List of specification sections with contents by Tag or item.
   c. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

E. Submittal:
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.

1.24 RECORD DRAWINGS

A. Prepare record documents in accordance with the requirements of Division 01 Specification Section "Contract Closeout."

B. Label each drawing as "Record Drawing" with Electrical Contractors' name and date.

C. During construction, maintain an accurate record set of the drawings of the installation on project site at all times; keep this set in a safe location, protected from the environment.

D. Submit one digital file with all drawings in PDF format.

E. Make all notes and revisions on PDF set in red.

F. In addition to the requirements specified in Division 01 and in other Division 26, 27 and 28 Specification Sections, indicate installed conditions (locations, sizes, burial depths, arrangements, etc) for:
   1. Major raceway systems – Interior and Exterior – dimensioned from prominent building lines.
   2. Utility service conduit (power and telecom) and connections, dimensioned from prominent building lines.
   3. Conduits provided for future use with intended future use identified, dimensioned from prominent building lines.
   4. Control devices, equipment disconnects, distribution and branch electrical circuitry, and fuse and circuit breakers.
   5. Equipment locations (exposed and concealed) shown to scale and dimensioned from prominent building lines.
   6. Final schedules for panelboards, lighting controls, etc.
   7. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.25 TESTING

A. Provide completed start-up forms and checklists.

B. Perform testing of electrical, lighting control, fire alarm and other low voltage systems as described in Division 26, 27 and 28 Specification Sections and as required by applicable codes and ordinances.

C. Written verification of testing to be signed by Owner's Representative.

1.26 COMMISSIONING REPORT

A. Provide commissioning in compliance with Energy Code requirements, the commissioning notes in the contract documents and per the Project's Commissioning Plan.

1.27 WARRANTY 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. The Contractor shall, without cost to the Owner, correct all defects and failures discovered within one year from date of final acceptance for all electrical, fire alarm and low voltage systems, except when in the opinion of the Architect a failure is due to neglect or carelessness of the Owner.
   1. See individual Specification Sections for additional requirements.

C. 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.

D. The Contractor shall make all necessary lighting and receptacle control adjustments during first year of operation.

E. The presence of any inspector or observer at any point during construction does not relieve the Contractor from responsibility for defects discovered after completion of the work.

F. Refer to Division 01, 26, 27 and 28 Specification Sections for additional Warranty requirements.

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 the Contractor shall submit drawings, review with authority, and pick up subsequent approved drawings. The Engineer will revise and/or prepare electrical drawings for submittal. The Design Build Fire Alarm Contractor will revise and/or prepare Fire Alarm drawings for submittal.

3.2 MOCK-UPS

A. The Electrical Contractor shall completely mock-up all maintenance shop and new office areas by marking the intended locations of all equipment and devices (load centers, media boxes, luminaires, switches, receptacles, CATV and telecom outlets, thermostats, heaters/ HVAC equipment, etc).

B. Before starting installation of equipment and devices, the Electrical Contractor shall walk through all mocked-up areas with the Owner, Architect, and General Contractor to receive approval for all locations.

C. The Electrical Contractor shall relocate equipment and devices in the mock-ups per the Owner and Architect’s instructions.

D. The Electrical Contractor shall relocate any equipment and devices installed prior to the approval of the mocked-up areas by the Architect and Owner at the Electrical Contractor’s expense.

3.3 INSTALLATION

A. The Contractor shall conceal all conduit, cabling and boxes in finished areas unless indicated otherwise or granted specific permission by the Architect. Install all conduit and cabling perpendicular to or parallel with building lines wherever possible.

B. In open ceiling areas, all cabling shall be installed in conduit. In front of house (public) areas, conduit shall be painted; color as selected by the Architect.

C. Coordinate the locations of luminaires, lighting control devices and outlets with all other trades.

3.4 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 (including the electric and telecom utility providers for utility service infrastructure work).

B. Should any work be enclosed or covered up before such inspection and testing, the Contractor shall at their own expense uncover said work, and after it has been inspected, tested and approved, make all repairs as necessary to restore all work disturbed by the Contractor to its original condition including paying other trades to repair work under their scope that was disturbed.

3.5 FIELD QUALITY CONTROL

A. Conducts tests of equipment, devices, and systems as required by NFPA, BICSI, local Codes and the local AHJ.
   1. Provide a Journeyman Electrician with all tools, instruments, etc required to complete required tests.
   2. Coordinate with the Owner, Architect and General Contractor; tests should be performed in the presence of the Owner and Architect unless given specific permission otherwise in writing.

B. Refer to individual Division 26, 27 and 28 Specification Sections for additional requirements.

3.6 CLEANING

A. Clean adjacent surfaces of fire stopping materials.

B. Clean interior and exterior of all equipment and luminaire lenses. Equipment shall be free of dirt, construction debris, corrosion, etc.

C. Adequate provisions shall be made during construction to eliminate dirt, debris or other material from entering and collecting inside of conduit and equipment. Any collection of material shall be thoroughly cleaned before owner occupancy.

D. Clean exterior of all exposed conduit.

3.7 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 electrical 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 electrical installations.

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.

3.8 SALVAGE

A. Remove excess conduit and conductors. Remove scrap 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.

3.9 MANUFACTURERS' FIELD SERVICES

A. Refer to individual Division 26, 27 and 28 Specification Sections for requirements.

3.10 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 26 00 00

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Hangers and Supports.
2. Concrete Bases.
3. Vibration and Seismic Controls.
4. Sleeves and Sleeve Seals.
5. Firestopping.
6. Access Panels.
7. Execution.

1.2 RELATED SECTIONS

A. In addition to the requirements in Divisions 01, 26, 27 and 28 Specification Sections, see also the following Specifications for additional information and requirements:

05 50 00	METAL FABRICATIONS
03 30 00	CAST-IN-PLACE CONCRETE
03 30 53	MISCELLANEOUS CAST-IN-PLACE CONCRETE
07 84 13	PENETRATION FIRESTOPPING
09 91 13	EXTERIOR PAINTING
09 91 23	INTERIOR PAINTING
09 96 00	HIGH PERFORMANCE COATINGS

1.3 GENERAL REQUIREMENTS:

A. The Contractor shall retain the services of a third-party structural engineer currently licensed in the State of Washington to provide hangers, restraint, support, anchoring and seismic calculations and details for all applicable equipment where required by the AHJ.

B. The Contractor shall design supports for equipment, devices and raceways capable of supporting the combined weight of the supported systems and their contents. Anchoring, support and seismic restraint systems shall meet the requirements of applicable Codes with local amendments and the requirements of the Project Structural Engineer and the local AHJ. See the Structural drawings and specifications for requirements.

C. Seismic Performance:
1. The Contractor shall provide seismic support as required by IBC 1613 with local amendments, the local AHJ and the project Structural Engineer.
2. Seismic restraint and hangers and supports systems shall meet the seismic performance requirements of the Project's Structural Engineer and as per the requirements of Code and the local AHJ. See the Structural drawings and specifications for requirements.
3. The supported equipment and/ or devices will remain in place without any separation and will be fully operational after a seismic event of a strength per Structural and Code/ AHJ requirements.

D. Field Welding shall comply with AWS D1.1/D1.1M and D1.2/D1.2M as applicable.

E. Obtain permission from Architect/Engineer before drilling or cutting structural members.

1.4 REQUIREMENTS

A. Provide major equipment components with manufacturer's name, address, catalog number and capacity indicated on a nameplate, securely affixed in a conspicuous place.

B. Protect stored material and equipment against weather, corrosion and dirt. Protect installed electrical, fire alarm and low voltage systems components and equipment against weather damage, corrosion, dirt and construction dust. Seal equipment and conduit where and when necessary to be kept clean and weathertight.

C. Furnish standard and fabricated hangers and supports complete with necessary inserts, bolts, nuts, rods, washers and other accessories.

D. Provide vibration isolation on all transformers and motor driven equipment provided by the Electrical Contractor.

E. Provide structural work and equipment required for expansion and contraction of conduit. Verify anchors, guides, and expansion joints provide and adequately protect system.

F. Installed hangers, supports and restraints (as applicable) shall have a flame rating of Class 1 and shall be self-extinguishing per ASTM D635 when tested per ASTM 84 requirements unless the requirements of Code or the local Fire Marshal or AHJ are more stringent.

G. Firestop interruptions to fire rated assemblies, materials and components.

H. 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 or otherwise indicated on architectural or structural drawings or specifications.
   2. Surface Burning: UL 723 with maximum flame spread / smoke developed rating of 25/50.
      a. For nonmetallic slotted channel systems and accessories: Comply with ASTM E84. Flame Rating Class 1. Self-extinguishing per ASTM D635.
   3. Firestop interruptions to fire rated assemblies, materials, and components.

1.5 SUBMITTALS:

A. Provide product data for each type of product in Part 2 below. Mark on submittals specific equipment and devices intended for installation on product where multiple equipment and/ or devices are shown on a single catalog page. Include rated capacities and furnished specialties and accessories.
   1. Provide Shop Drawings for specially fabricated seismic restraint and hanger and support systems stamped by an Engineer currently registered in the State of Washington. Include design calculations for hangers and seismic restraints.

B. See Specification Section 26 00 00 "Electrical General Conditions" for additional requirements.

PART 2 PRODUCTS

2.1 HANGERS AND SUPPORTS

A. Manufacturers: Contingent upon meeting requirements of the Project, Code and local AHJ, provide products by one or more of the following:

1. Allied Tube & Conduit
2. Appleton Electric
3. Calbrite; a part of atkore International
4. Cooper (Eaton) B-Line, Inc.
5. ERICO Global Company; part of Pentair.
6. Cully-Minerallac Company.
7. O-Z / Gedney; Emerson Electric Co.
8. Thomas & Betts Corporation.
9. Unistrut; a part of atkore International.

B. Metallic Slotted Support Systems
   1. Comply with Metal Framing Manufacturers Association Standard Publication MFMA-4.
   2. Channels:
      a. Channels shall be galvanized steel / plain steel, or Type 304 / stainless steel.
      b. Channel widths shall be as required for the applicable load criteria and per requirements of the structural engineer.
   3. Fittings and Accessories shall be galvanized steel / plain steel or Type 304 / stainless steel.
   4. Coatings:
      a. Metallic: Hot-dip galvanized after fabrication; applied per MFMA-4 or zinc plated according to ASTM B633.
      b. Painted: Manufacturer's standard painted coating applied per MFMA-4. Protect finishes from damage during shipping.

C. Support Devices for Conduit and Cable:
   1. Designed for type and size of conduit / cabling being supported.
   2. Material: Steel.

D. Support Devices for Conductors in Vertical Conduit:
   1. Designed to adequately support the intended cabling plus safety factors without damaging the insulation or reducing the amount of insulation in the area where the cable is supported.
   2. Body Material: Malleable iron.

E. Fabricated Metal Supports:
   1. Design for weight and dimensions of supported equipment plus safety factor; coordinate with third-party structural engineer as required.
   2. Material: Black, Galvanized Structural Steel per ASTM A36/ A36M. Comply with Section 05 50 00 for steel shapes and plates.

F. Components for Mounting, Anchoring and Attachment:
   1. Manufacturers: Contingent upon meeting requirements of the Project, Code and local AHJ, provide products by one or more of the following:
      a. Cooper B-Line, Inc
      b. Hilti, Inc.
      c. ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      d. MKT Fastening, LLC.
      e. Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
      f. Unistrut; a part of atkore International.
   2. Provide fasteners listed for use in building material where used and with tension, shear and pullout capacities as required to support intended loads.
   3. Coordinate with and receive approval from the Structural Engineer for all locations of Powder-Actuated Fasteners prior to installation.
   4. Provided threaded steel hanger rods.

5. Concrete Inserts:
   a. Continuous channel slotted support system.
   b. Universal, malleable iron - Type 18, FS WW-H-171.
6. Provide beam clamps and attachments as required.

2.2 VIBRATION AND SEISMIC CONTROLS

A. Vibration Isolators
1. Where pad-style vibration isolators are used, arrange pads in a single or multiple layers so as to allow for uniform loading over the entire pad area as per the direction of the Architect or Acoustic Consultant. Coordinate dimensions with the equipment to be supported. Pads are to be of a resilient material; exact material to be per the Architect or Acoustic Consultant.
2. Spring isolators shall meet the requirements of the Architect or Acoustic Consultant. Provide seismic or limit-stop restrained spring isolators as required for equipment, local AHJ or the Acoustic Consultant.
   a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
   b. Color code springs for load carrying capacity.
3. For floor-mounted equipment, provide neoprene bushings intended for use for rigid equipment mountings. Match to type and size of equipment anchor bolts and studs.
4. For wall-mounted equipment, provide neoprene and steel assemblies intended for use for rigid equipment mountings. Match to type and size of anchorage assemblies used.

B. Seismic Controls
1. Manufacturers: Contingent upon meeting requirements of the Project, Code and local AHJ, provide products by one or more of the following:
   a. Cooper B-Line, Inc
   b. Hilti, Inc
   c. Kinetics Noise Control, Inc
   d. Mason Industries, Inc
   e. Unistrut; a part of atkore International
2. Match equipment seismic control restraints and restraint systems to the type and size of the anchor bolts and studs used. Coordinate with Structural Engineer and General Contractor.

2.3 SLEEVES AND SLEEVE SEALS

A. Manufacturers: Contingent upon meeting requirements of the Project, Code and local AHJ, provide products by one or more of the following:
1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. The Metraflex Company.
4. Pipeline Seal and Insulator, Inc.
5. Presealed Systems.
6. Proco Products, Inc.

B. Round tube sleeves for penetrations through Non-Fire-Rated floors and walls: 0.0239-inch thick (minimum) galvanized steel.

C. Rectangular sleeves for penetrations through Non-Fire-Rated floors and walls:
1. Sleeves with a perimeter less than 50 inches and having no side longer than 16 inches: Galvanized steel with minimum thickness of 0.052 inches.

2. All other rectangular sleeves: Galvanized steel with minimum thickness of 0.138 inches.

D. Wall Sleeves for penetrations at exterior walls below grade and exterior floors: Cast iron wall pipe with integral waterstop.

E. Wall sleeves for penetrations at exterior wall penetrations above grade: ASTM A53/A53M Steel pipe sleeves, zinc coated with mechanical sleeve seals.

F. Sleeve seal fittings for conduit penetrations at slab on grade or below grade exterior walls shall be listed and labeled for embedding in concrete slabs or walls in direct contact with earth and shall have plastic or rubber waterstop collars with center gap matching size of conduit to be installed in each penetration.

G. Sealing elements in sleeve seal systems used to fill space between sleeve and raceway for conduit penetrations in slabs on grade or below-grade exterior walls shall be interlocking links of EPDM rubber shaped to fit surface of pipe.

H. Grout shall be non-shrinking and recommended for interior and exterior applications; Grade B, post-hardening and volume-adjusting per ASTM Standard C1107/C1107M.

I. Where permitted by Code, the local AHJ and the Project Architect in Non-Fire-Rated gypsum assemblies silicone sealants may be used to seal penetrations provided they are listed for the intended use and location.
1. Silicone Sealants are to be of pourable (self-leveling) Grade intended for openings in Non-Fire-Rated horizontal assemblies.
2. Silicone Foams shall expand and cure in place when mixed, resulting in a flexible, non-shrinking foam.

J. All sealants shall meet the Sustainability requirements of the project. See the General Requirements paragraph of this Specification Section and Division 01 specification for requirements.

K. Size sleeves large enough to allow for movement due to expansion unless manufacturer’s instructions or Structural Engineer directs otherwise. Confirm seismic criteria requirements with structural engineer.
1. At exterior wall and floor penetrations allow for 1 inch of space between raceway and the sleeves for installation of mechanical sleeve seals or sleeve seal systems unless manufacturer’s instructions indicate or seismic criteria of project requires otherwise.

PART 3 EXECUTION

3.1 EXISTING WORK

A. Provide access to existing conduit, equipment and other installations remaining active and requiring access.

B. Extend existing cabling and conductor and conduit installations using materials and methods compatible with existing installations.

3.2 SURFACE PREPARATION

A. Examine areas and equipment for conditions that would affect performance of the Work. Proceed with installation only after unsatisfactory conditions have been addressed.

B. Degrease and clean surfaces of any matter that would affect the bond of paint, adhesives or firestopping material.

C. Remove incompatible materials affecting bond of paint, adhesives or firestopping.

D. Degrease and clean surfaces to receive adhesive for identification materials.

E. Obtain permission from Architect/Engineer before drilling or cutting structural members.

F. For adhesive anchors, clean holes and prepare per manufacturer and Structural Engineer's instructions prior to installation.

3.3 COORDINATION

A. Coordinate the locations of embedded anchors and other connection hardware with equipment attachment points (based on actual equipment to be provided for the project). Locate and avoid the locations of concrete reinforcement, formwork, prestressed tendons, and other embedded items prior to drilling holes.

B. Coordinate the locations of anchors, supports and seismic control assemblies and hardware with equipment mounting points and locations of concrete reinforcement, prestressed tendons, conduit, etc and other embedded items prior to drilling holes. Do not damage existing reinforcing or embedded items.
   1. Notify the structural engineer immediately if any embedded items are encountered during drilling.

C. Prior to drilling holes allow all concrete and masonry to reach full design strength; coordinate with and receive approval from the Architect and Structural Engineer.

3.4 INSTALLATION – CLEARANCE

A. Devices, equipment and control components shall be accessible for inspection, service, repair and replacement.

B. Ensure Code-required clearances are provided at all applicable equipment.

3.5 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 conduit 4 inches and larger.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, coordinate with General Contractor, Architect and Structural Engineer to drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.6 INSTALLATION – HANGERS AND SUPPORTS

A. Comply with NFPA 70, NECA 1, NECA 101, NECA 102, NECA 105 and NECA 111 for installation and application of hangers and supports for electrical equipment and systems

except if requirements in this Section, Manufacturer's written instructions, Structural Engineer or of the AHJ are stricter.

B. Install hangers, supports, anchors, etc per Code and manufacturer and Structural Engineer's instructions.

C. Minimum hanger rod size shall be 1/4-inch (6 mm) in diameter unless required otherwise by Code or Structural Engineer's requirements for the project.

D. Space supports as required by NFPA 70.

E. Secure raceways and cables with devices approved for the intended use by an agency acceptable to the AHJ. For conduit 1-1/2-inch (38 mm) and smaller above suspended ceilings, spring-steel clamps designed for supporting single conduits without bolts may be used for fastening conduit to trapeze supports.

F. Size and install support assembly components to meet the present and anticipated future loads with appropriate safety factors. Install hanger rod stiffeners where required to prevent the buckling of hanger rods by seismic forces. Coordinate with structural engineer as required.

G. Size and install trapeze-style support systems where used such that conduit / cabling capacity can be increased by at least 25% in the future. Coordinate with structural engineer as required.

H. Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise required by Code or Architectural or Structural drawings or specifications.
1. To Wood: Lag screws or Through Bolts.
2. To New Concrete: Bolt to Concrete Inserts.
3. To Existing Concrete: Expansion Anchor Fasteners.
4. To Hollow Masonry: Approved Toggle-type Bolts.
5. To Solid Masonry: Expansion Anchor Fasteners.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M with lock washers and nuts / Beam Clamps (MSS SP-58, Type 19, 21, 23, 25 or 27) complying with MSS SP-69 / Spring Tension Clamps.
7. To Light Steel: Sheet Metal Screws.
8. To Hollow Walls and Nonstructural Building Surfaces: Mount on slotted channel racks attached to substrate per seismic restraint and anchorage requirements and per structural engineer.

I. Use:
1. Interior Locations: Zinc-coated steel anchors
2. Exterior Locations: Stainless-steel anchors

J. Holes for expansion anchors shall be drilled to avoid the need for reinforcing bars.

K. Protect anchors from damage during installation.

L. Secure raceways and cabling to trapeze supports in a manner approved by the local AHJ.

M. Installation shall allow for the free movement of equipment within its intended normal mode of operation.

N. Install fabricated metal supports per requirements of Specification Section 05 50 00, “Metal Fabrications.”

3.7 INSTALLATION – CONCRETE BASES

A. Concrete bases shall be installed to provide at least 4 inches of base beyond the edges of the equipment supported in both directions unless indicated otherwise on the drawings or unless otherwise required by intended anchoring method.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete unless otherwise required by Architect, Structural Engineer or equipment to be supported.

C. Anchor equipment to concrete base per manufacturer’s written instructions or requirements of Structural Engineer.

3.8 INSTALLATION – VIBRATION AND SEISMIC CONTROLS

A. Provide hanger rod stiffeners where required by Code, local AHJ or Structural Engineer.

B. Install vibration and seismic control assemblies and devices per Code, local AHJ, Manufacturer’s written instructions, structural engineer and acoustic consultant.

C. Select and install seismic support assemblies where required to provide adequate strength to carry present and future static and seismic loads within loading limits per the requirements of Code, the local AHJ and the Structural Engineer.

D. Install resilient bushing assemblies for wall-mounted equipment.

E. Install resilient, bolt-isolation washers where the clearance between an anchor and the adjacent surface exceeds 0.125 inch (3.2 mm).

F. Unless otherwise required by Code, the local AHJ or the Structural Engineer, anchor bracing to structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

G. Install flexible connections in raceway, cable trays, busways, etc where they cross seismic joints, where adjacent sections are supported by different structural elements and where terminating to equipment that is anchored to a different structural element than the one supporting them where they approach said equipment.

H. Installation shall allow for the free movement of equipment within its intended normal mode of operation.

3.9 INSTALLATION – SLEEVES

A. Comply with NFPA 70, NECA 1, NEMA VE2 and the local Building Codes as applicable for installation and application of sleeves and sleeve seals for electrical penetrations except if requirements in this Section, Manufacturer’s written instructions, Structural Engineer or of the AHJ are stricter.

B. Exterior watertight entries: Seal with mechanical sleeve seals per manufacturer’s recommendations for intended penetrations locations and raceway sizes.
   1. Center raceway in sleeve. Install mechanical sleeve seals per manufacturer’s instructions to make watertight seal.
   2. At roof penetrations, seal individual penetrations with flexible boot-type flashing units unless directed otherwise by Architect or Envelope Consultant. Coordinate installation of flashing with the installation of the roof.

C. Set sleeves in position in and secure to forms as new walls and slabs are constructed. Provide reinforcing around sleeves.
   1. Cut sleeves for wall penetrations for mounting flush with both sides of the wall; deburr the sleeves after cutting.
   2. Where sleeves are used at floor penetrations, extend the sleeves 2 inches above the finished floor level or as otherwise directed by Architect or Engineer; deburr the sleeves after cutting.

D. At interior Non-Fire-Rated walls and floors comply with the requirements of Section 07 92 00, “Joint Sealants.” The space between the sleeve and raceway shall be sealed with joint sealant or compound intended for the specific application, use and location or the joint. The space outside the sleeves is to be sealed with solidly packed mortar or grout such that no voids remain in the sealing material; smooth exposed surfaces.

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.

F. Protect all sealants while curing.

G. Size sleeves large enough to allow for movement due to expansion unless manufacturer’s instructions or Structural Engineer directs otherwise. Confirm seismic criteria requirements with structural engineer.

H. At exterior wall and floor penetrations allow for 1 inch of space between raceway and the sleeves for installation of mechanical sleeve seals or sleeve seal systems unless manufacturer’s instructions indicate or seismic criteria of project requires otherwise.

3.10 EXAMINATION AND TESTING

A. Examine anchors and support rough-in work prior to the installation of equipment and raceways to verify actual locations and other conditions potentially affecting the completion of the installation.

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

C. The Contractor shall test at least five of each type and size of installed anchors and fasteners as selected by the Architect to 90 percent of the rated proof load of the device. If any of the test group of the installed anchors and fasteners fail the testing, all others of the same type installed on the project shall also be tested to 90 percent of the rated proof load of the device.

D. Equipment, devices, anchors, hangers, supports, etc will be considered defective if they do not pass tests and inspections.

E. The Contractor shall provide a test and inspection report summarizing all tests and inspections in this Section, the results or said tests and inspections, what actions were taken to correct any unsatisfactory conditions and devices, and retesting results confirming that any originally deficient installations have been corrected.

3.11 PAINTING

A. See Specification Sections 09 91 13 “Exterior Painting” / 09 91 23 “Interior Painting” / 09 96 00 “High Performance Coatings” for requirements.

B. For galvanized surfaces, after cleaning and preparing surface, apply a galvanizing-repair paint per ASTM A780.

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. Copper building wire rated 600 V or less.
2. Aluminum building wire rated 600 V or less.
3. Metal-clad cable, Type MC, rated 600 V or less.
4. Armored cable, Type AC, rated 600 V or less.
5. Mineral-insulated cable, Type MI, rated 600 V or less.
6. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:
1. Section 271313 "Communications Cabling" for twisted pair cabling used for data circuits.

1.3 DEFINITIONS

A. RoHS: Restriction of Hazardous Substances.

B. VFC: Variable-frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. MANUFACTURERS: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, an Atkore Brand.
2. Cerro Wire LLC.
3. Encore Wire Corporation.
4. General Cable Corporation.
5. Southwire Company.

2.2 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
   2. RoHS compliant.
   3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 or ASTM B496 for stranded conductors.

D. Conductor Insulation:
   1. Type NM: Comply with UL 83 and UL 719.
   2. Type USE-2 and Type SE: Comply with UL 854.
   3. Type THHN and Type THWN-2: Comply with UL 83.
   4. Type UF: Comply with UL 83 and UL 493.
   5. Type XHHW-2: Comply with UL 44.

2.3 ALUMINUM BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn aluminum current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
   2. RoHS compliant.
   3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Aluminum, complying with ASTM B800 and ASTM B801.

D. Conductor Insulation:
   1. Type NM: Comply with UL 83 and UL 719.
   2. Type USE-2 and Type SE: Comply with UL 854.
   3. Type THHN and Type THWN-2: Comply with UL 83.
   4. Type XHHW-2: Comply with UL 44.

2.4 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Standards:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
   2. Comply with UL 1569.
   3. RoHS compliant.
   4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Circuits:

1. Single circuit with color-coded conductors.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

D. Conductors:
1. Feeders and branch circuits #2 AWG and smaller: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
2. Feeders larger than #2 AWG: Aluminum, complying with ASTM B 800 and ASTM B 801.

E. Ground Conductor: Bare or insulated.

F. Conductor Insulation:
1. For Copper MC Cable: Type THHN/THWN-2: Comply with UL 83.
2. For Aluminum MC Cable: Type XHHW-2: Comply with UL 44.

G. Armor: Aluminum, interlocked.

H. Jacket: PVC applied over armor.

2.5 ARMORED CABLE, TYPE AC

A. Description: A factory assembly of insulated current-carrying conductors with or without an equipment grounding conductor in an overall metallic sheath.

B. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Comply with UL 4.
4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Circuits:
1. Single circuit with color-coded conductors.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

D. Conductors:
1. Feeders and branch circuits #2 AWG and smaller: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
2. Feeders Larger than #2 AWG: Aluminum, complying with ASTM B 800 and ASTM B 801.

E. Ground Conductor: Bare or insulated.

F. Conductor Insulation: Type THHN/THWN-2. Comply with UL 83.

G. Armor: Aluminum, interlocked.

2.6 MINERAL-INSULATED CABLE, TYPE MI

A. Description: Solid copper conductors encased in compressed metal oxide with an outer metallic sheath, rated 600 V or less.

B. MANUFACTURERS: Subject to compliance with requirements, provide products by one of the following:
   1. Pentair.
   2. Pyrotenax.
   3. Watlow Electric Manufacturing.

C. Standards:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
   2. UL 2196 for fire resistance.
   3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper.

E. Insulation: Compressed magnesium oxide.

F. Sheath: Copper.

2.7 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following or a pre-approved equal:
   1. 3M; Electrical Products Division.
   2. ABB, Electrification Products Division.
   3. AFC Cable Systems, Inc.
   4. Arlington Industries.
   5. Hubbell Power Systems, Inc.
   6. O-Z/Gedney; EGS Electrical Group LLC.
   7. Thomas & Betts Corporation.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
   1. Termination: Compression.

PART 3 EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders and Branch Circuits:
1. Copper for feeders and branch circuits #2 AWG and smaller; copper or aluminum for feeders and branch circuits larger than #2 AWG.
2. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. VFC Output Circuits Cable: Extra-flexible stranded for all sizes.

C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2 or XHHW-2, single conductors in raceway installed per Code and AHJ requirements.

B. Exposed Feeders: Type THHN/THWN-2 or Type XHHW-2, single conductors in metallic raceway. For exposed feeders that do not leave the Electrical Rooms and that are not subject to physical damage, the Electrical Contractor may also use Metal-clad cable, Type MC as allowed by Code.

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2 or Type XHHW-2, single conductors in raceway or Metal-clad cable, Type MC as allowed by Code or service-entrance rated cable, Type SE as allowed by Code.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

E. Feeders in Cable Tray: Cable trays are intended for low voltage systems cabling only; no power conductors or cable are to be installed in the cable tray.

F. Exposed Branch Circuits: Type THHN/THWN-2, single conductors in metallic raceway.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC or Nonmetallic-sheathed cable, Type NM as allowed by Code.

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

I. Branch Circuits in Cable Tray: Cable trays are intended for low voltage systems cabling only; no power conductors or cable are to be installed in the cable tray.

J. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. The Contractor shall conceal all conduit, cabling and boxes in finished areas unless indicated otherwise or granted specific permission by the Architect. Install all conduit and cabling perpendicular to or parallel with building lines wherever possible.

B. In open ceiling areas, all cabling shall be installed in conduit. Conduits shall be painted; confirm finish with Architect.

C. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

D. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

E. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

F. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

G. Support cables according to Section 260500, “Common Work Results for Electrical.”

3.4 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-486B.

B. Make splices, terminations, and taps that are compatible with conductor material[and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors].
   1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack unless otherwise noted on drawings.

D. Comply with requirements in Section 28 46 00 “Addressable Fire-Alarm System” for connecting, terminating, and identifying Fire Alarm System wires and cables.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260500.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
   2. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements:
      a. Panelboards.
   3. Perform each of the following visual and electrical tests:
      a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
      b. Test bolted connections for high resistance using one of the following:
         1) A low-resistance ohmmeter.
         2) Calibrated torque wrench.
         3) Thermographic survey.
      c. Inspect compression-applied connectors for correct cable match and indentation.
      d. Inspect for correct identification.
      e. Inspect cable jacket and condition.
      f. Continuity test on each conductor and cable.
   4. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
      a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
      b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
   5. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:
   1. Procedures used.
   2. Results that comply with requirements.
   3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

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 grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:
   1. Underground distribution grounding.
   2. Foundation steel electrodes.
   3. Ground mesh electrode system.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product in Part 2.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
      a. Plans showing as-built, dimensioned locations of system described in "Field Quality Control" Article, including the following:
         1) Test wells.
         2) Ground rods.
         3) Ground rings.
         4) Ground mesh system.
         5) Grounding arrangements and connections for separately derived systems.
      b. Instructions for periodic testing and inspection of grounding features at test wells, ground rings, ground mesh system, grounding connections for separately derived systems, based on NETA MTS.
         1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
         2) Include recommended testing intervals.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. 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.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, unless indicated otherwise on drawings provide products by one of the following:
1. ABB, Electrification Products Division.
2. Appleton Electric.
3. Burndy; Hubbell Incorporated.
4. Calbrite; a part of atkore International.
5. ERICO.
6. Harger Lightning & Grounding.
7. ILSCO.
8. O-Z/ Gedney; Emerson Electric, Co.
9. Siemens Industry, Inc.
10. Thomas & Betts Corporation.

2.3 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:
1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Unless indicated otherwise on the drawings or otherwise required by Code, provide the following:
   a. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
   b. Bonding Conductor: No. 2, solid conductor.
   c. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, sized as required and indicated on drawings, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V. See design drawings for additional requirements and information.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Non-reversible, high-compression type. Provide two-hole lugs and stainless hardware where indicated on drawings or as required by Code/ Local AHJ.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt or socket set screw.

I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

J. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

K. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

L. Straps: Solid copper, copper lugs. Rated for 600 A.

M. Tower Ground Clamps: Mechanical type, copper or copper alloy, see drawings for additional requirements.

N. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

O. Water Pipe Clamps:
   1. Mechanical type, two pieces with zinc-plated or stainless-steel bolts.
      a. Material: Die-cast zinc alloy.
      b. Listed for direct burial.
   2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel with 99.9% pure electrolytic copper coating; 5/8 by 96 inches (16 by 2400 mm).

1. Provide utility system ground rods per Utility requirements.

B. Ground Ring: Install a grounding conductor, electrically connected to each ground rod and to each indicated item, extending around the perimeter of building as indicated in the design drawings.

C. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet (6 m) of bare copper conductor. Coordinate with the General Contractor to ensure concrete into which ufer ground is encased is in direct contact with earth (i.e. no insulation, vapor barriers, etc). See design drawings for required conductor size and additional information.

D. Ground Mesh: #6 AWG copper conductor rated for direct burial in a 12-inch mesh at least 18-inches below grade. See design drawings for additional information and requirements.

PART 3 EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated in the drawings or specifications.

B. Underground Grounding Conductors: Install bare copper conductor, size as indicated on drawings.
1. Bury at least 30 inches (750 mm) below grade unless indicated otherwise on drawings or otherwise required by Code.
2. Where conductors come up from concrete or earth, protect conductors with rigid Schedule 40 PVC conduit.

C. Grounding Conductors: Green-colored insulation with continuous yellow stripe.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated on the drawings.
1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

B. Dry-Type Transformers: Ground non-utility transformers per Code requirements.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Ground all utility infrastructure per Utility requirements.

C. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

D. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

E. Utility Transformers: Ground all utility infrastructure per Utility requirements.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-

tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

E. Cable Tray Grounding
1. Ground cable trays according to NFPA 70 unless additional grounding is specified.
2. Cable trays shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.
3. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.
4. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors.".

3.6 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 (50 mm) 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.
2. Use exothermic welds for all below-grade connections.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.
1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

G. Ground Ring: Install a grounding conductor, electrically connected to each ground rod and to each indicated item, extending around the perimeter of area indicated on drawings.
1. Install tinned-copper conductor as indicated on design drawings.
2. Bury ground ring as indicated on design drawings.

H. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet (6 m) of bare copper conductor, size as indicated on design drawings.
1. Coordinate with the General Contractor to ensure concrete into which ufer ground is encased is in direct contact with earth (i.e. no insulation, vapor barriers, etc).
2. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation where in contact with earth.
3. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

I. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
   3. Test completed grounding system at the service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
      a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
      b. Perform tests by fall-of-potential method according to IEEE 81.
   4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:
   1. Power and Lighting Equipment or System: 5 ohms.
   2. Panelboards Serving Electronic Equipment: 1 ohm(s).
   3. Pad-Mounted Equipment: 5 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

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. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Delegated-Design Submittal: For fault-current/ short-circuit and arc-flash hazard studies.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1 and IEEE C2 as applicable.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Comply with NFPA 70E and Section 260573 "Electrical Systems Studies" requirements for arc-flash warning labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage and circuits.

B. Color-Coding for Phase-and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
   1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit].
   2. Colors for 208/120-V Circuits:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
   3. Colors for 240-V Circuits:
      a. Phase A: Black.
      b. Phase B: Red.
   4. Colors for 480/277-V Circuits:
      a. Phase A: Brown.
      b. Phase B: Orange.
      c. Phase C: Yellow.
   5. Color for Neutral: White or gray.
   6. Color for Equipment Grounds: Bare copper, Green or Green with a yellow stripe.

C. Raceways and Cables Carrying Circuits at More Than 600 V:
   1. Per Electrical Utility Company requirements.

D. Warning Label Colors:
   1. Identify system voltage with black letters on an orange background.

E. Warning labels and signs shall include, but are not limited to, the following legends:
   1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
   2. Bond Reference Warning: “"BOND REFERENCE FOR PORTABLE GENERATOR IS THE PERMANENTLY-INSTALLED GENERATOR BOND. DO NOT DISCONNECT PERMANENT GENERATOR OR NEUTRAL BOND AT PERMANENT GENERATOR."
   3. Workspace Clearance Warning: "WARNING – CODE REQUIREMENT - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 42 INCHES (915 MM)."

F. Equipment Identification Labels:
   1. Black letters on a white field.

2.3 LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-Bid approved equal:
   1. Brady Corporation.
   2. Hellermann Tyton.
   3. Marking Services, Inc.
   4. Panduit Corp.
   5. Seton Identification Products.

B. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

C. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

D. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, polyester or vinyl flexible label with acrylic pressure-sensitive adhesive.
   1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
   2. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

E. Self-Adhesive Labels: Polyester or Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
   1. Minimum Nominal Size:
      a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
      b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
      c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-Bid approved equal:
   1. Brady Corporation.
   2. Hellermann Tyton.
   3. Marking Services, Inc.
   4. Panduit Corp.

B. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameters and that stay in place by gripping action.

C. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F (93 deg C). Comply with UL 224.

2.5 TAPES AND STENCILS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-Bid approved equal:
   1. Carlton Industries, LP.
   2. Hellermann Tyton.
   3. Marking Services, Inc.
   4. Panduit Corp.
   5. Seton Identification Products.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.

D. Tape and Stencil: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers placed diagonally over orange background and are 12 inches (300 mm) wide. Stop stripes at legends.

E. Underground-Line Warning Tape:
   1. Tape:
      a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
      b. Printing on tape shall be permanent and shall not be damaged by burial operations.
      c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
   2. Color and Printing:
      a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
      b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
      c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE”.
   3. Feeder and Branch Circuits 600V and Less:
      a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with “Electric” compounded for direct-burial service.
      b. Width: 3 inches (75 mm).
      c. Overall Thickness: 5 mils (0.125 mm).
      d. Foil Core Thickness: 0.35 mil (0.00889 mm).
      e. Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
      f. Tensile according to ASTM D882: 70 lbf (311.3 N) and 4600 psi (31.7 MPa).

4. Electrical Utility Service Warning Tape:
   a. Provide as per utility service requirements.
   b. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
   c. Width: 3 inches (75 mm).
   d. Overall Thickness: 8 mils (0.2 mm).
   e. Foil Core Thickness: 0.35 mil (0.00889 mm).
   f. Weight: 34 lb/1000 sq. ft. (16.6 kg/100 sq. m).
   g. Tensile according to ASTM D882: 300 lbf (1334 N) and 12,500 psi (86.1 MPa).

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.6 TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-Bid approved equal:
   1. Brady Corporation.
   2. Carlton Industries, LP.
   3. Marking Services, Inc.
   4. Panduit Corp.
   5. Seton Identification Products.

B. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

C. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch (0.38 mm) thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

D. Write-on Tags:
   1. Polyester Tags: 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment.
   2. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer. Writing on tag must be clearly legible.

2.7 SIGNS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-Bid approved equal:
   1. Brady Corporation.
   2. Carlton Industries, LP.
   3. Champion America.
   4. Emedco.
   5. Marking Services, Inc.

B. Baked-Enamel Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches (180 by 250 mm).

C. Metal-Backed Butyrate Signs:
1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch (1-mm) galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches (250 by 360 mm).

D. Laminated Acrylic or Melamine Plastic Signs:
1. Engraved legend.
2. Thickness:
   a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
   b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
   c. Engraved legend with black letters on white face for instructional signs, white letters on a dark gray or black background for identification signs.
   d. Self-adhesive.
   e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-Bid approved equal:
1. Brady Corporation.
2. Carlton Industries, LP.
3. Champion America.
4. Emedco.
5. Marking Services, Inc.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.

4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
1. Secure tight to surface of conductor, cable, or raceway.

H. System Identification for Raceways and Cables over 600 V: Per utility service provider requirements.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer; including the automatic transfer switch, permanent generator, portable generator docking station, and UPS equipment.

K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

L. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

M. Vinyl Wraparound Labels:
1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

N. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

O. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

P. Self-Adhesive Labels:
1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

Q. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

R. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

S. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

T. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

U. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

V. Underground Line Warning Tape:
1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.
2. Install underground-line warning tape for cables in raceways.

W. Metal Tags:
1. Place in a location with high visibility and accessibility.
2. Secure using General purpose cable ties except where Code requires plenum rated cable ties.

X. Nonmetallic Preprinted Tags:
1. Place in a location with high visibility and accessibility.
2. Secure using General purpose cable ties except where Code requires plenum rated cable ties.

Y. Write-on Tags:
1. Place in a location with high visibility and accessibility.
2. Secure using General purpose cable ties except where Code requires plenum rated cable ties.

Z. Baked-Enamel Signs:
1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

AA. Metal-Backed Butyrate Signs:
1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.

BB. Laminated Acrylic or Melamine Plastic Signs:
1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.

CC. Cable Ties: General purpose, for attaching tags, except as listed below:
1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

DD. Cable ties are not to be used to secure conduits or cabling of the electrical or low voltage systems.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120V to Ground: Identify with self-adhesive raceway labels.
   1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

D. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
   1. "EMERGENCY POWER."
   2. “701 STANDBY POWER."
   3. "POWER."
   4. "UPS."

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive wrap-around labels, snap-around color-coding bands or self-adhesive vinyl tape] to identify the phases.
   1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.

G. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.

H. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit.

I. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

J. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

K. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels, Baked-enamel warning signs or Metal-backed, butyrate warning signs.
   1. Apply to exterior of door, cover, or other access.
   2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
      a. Power-transfer switches.
      b. Controls with external control power connections.
      c. Dispatch Room Consoles.
      d. Mechanical equipment served by multiple circuit connections.

M. Arc Flash Warning Labeling: Self-adhesive labels.

N. Operating Instruction Signs: [Self-adhesive labels] [Baked-enamel warning signs] [Metal-backed, butyrate warning signs] [Laminated acrylic or melamine plastic signs].

O. Emergency Operating Instruction Signs: Self-adhesive labels, Baked-enamel warning signs, Metal-backed, butyrate warning signs or Laminated acrylic or melamine plastic signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at:
   1. Equipment used for power transfer.
   2. Portable generator docking station.
   3. Permanent generator.
   4. UPS equipment.

P. Equipment Identification Labels:
   1. Indoor Equipment: Baked-enamel signs or Laminated acrylic or melamine plastic signs.
   2. Outdoor Equipment: Laminated acrylic or melamine sign.
   3. Equipment to Be Labeled:
      a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
      b. Distribution boards. Distribution board identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label. Each breaker shall also be labeled with equipment served, SPARE, or SPACE as applicable.
      c. Enclosures and electrical cabinets.
      d. Access doors and panels for concealed electrical items.
      e. Current Transformer enclosure.
      f. Emergency system boxes and enclosures.
      g. Enclosed switches.
      h. Enclosed circuit breakers.
      i. Enclosed controllers.
      j. Variable-speed controllers.
      k. Push-button stations.

l. Power-transfer equipment.
m. Contactors.
n. Remote-controlled switches and control devices.
o. Battery-inverter units.
p. Lighting control system relays, power packs, etc.
q. Lighting control system wall stations where called out on drawings.
r. Luminaire remote transformers, drivers, etc.
s. Monitoring and control equipment.

END OF SECTION 260553

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. Indoor occupancy and vacancy sensors.
2. Daylight Harvesting Dimming Controls
3. Digital timer light switches.
4. Lighting contactors.
5. Emergency shunt relays.
6. Lighting Control Panel.

B. Related Requirements:
1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
1. Show installation details for the following:
a. Occupancy sensors.
b. Vacancy sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Faulty operation of lighting control software.
b. Faulty operation of lighting control devices.
2. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 PRODUCTS

2.1 INDOOR OCCUPANCY AND VACANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-approved equal:
   1. Acuity Lighting.
   2. Eaton Lighting.
   3. Leviton Mfg. Company, Inc.
   4. Lutron.
   5. Sensorworx.
   6. Wattstopper.

B. General Requirements for Sensors:
   1. See lighting plans for mountings and types (low voltage, line voltage).
   2. Dual technology.
   3. Hardwired connection.
   4. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Dual-Technology Type: Detect occupants in coverage area using PIR and ultrasonic or microphonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
   1. Sensitivity Adjustment: Separate for each sensing technology.
   2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
   3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
   4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet (110 square meters) when mounted 48 inches (1200 mm) above finished floor.

2.2 DAYLIGHT-HARVESTING DIMMING CONTROLS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-approved equal:
   1. Acuity Lighting.
   2. Eaton Lighting.
   3. Leviton Mfg. Company, Inc.
   4. Lutron.
   5. Sensorworx.
   6. Wattstopper.

B. General Requirements for Sensors:
   1. See lighting plans for mountings.
   2. Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed. Lights shall dim to off if adequate daylight is present in the space.
   3. Hardwired connection.
   4. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   5. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc (120 to 640 lux).

2.3 TIMER LIGHT SWITCH

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-approved equal:
   1. Acuity Lighting.
   2. Eaton Lighting.
   3. Intermatic.
   4. Leviton Mfg. Company, Inc.
   5. Lutron.
   6. Sensorworx.
   7. Wattstopper.

B. Description: Combination timer and conventional switch lighting control unit. Switchbox-mounted with selectable time interval in 10 minute increments.
   1. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 amps at 277-V ac for LED, and 1/4 horsepower at 120-V ac.
   2. Integral relay for connection to BAS.
   3. Voltage: Match the circuit voltage.
   4. Color: Per Architect
   5. Faceplate: Color matched to switch.

2.4 EMERGENCY SHUNT RELAY

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-approved equal:
   1. Acuity Lighting.
   2. Current Lighting.
   3. Eaton Lighting.
   4. Leviton Mfg. Company, Inc.
   5. Lutron.
   6. Sensorworx.
   7. Wattstopper.

B. Description: Complying with UL 924.

2.5 LIGHTING CONTROL PANEL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-approved equal:
   1. Acuity Lighting.
   2. Cooper Lighting Controls.
   3. Lutron.
   4. Wattstopper

B. Lighting control panel shall be UL 924 Listed as required for control of emergency lighting circuits.

C. The lighting control panel shall be able to be barriered into multiple sections; see lighting control panel schedule in the design drawings.

D. See lighting plans for additional information and requirements.

2.6 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No.18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

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

3.2 SENSOR INSTALLATION

A. Comply with NECA 1.

B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures,

HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3 CONTACTOR INSTALLATION

A. Comply with NECA 1.

B. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.4 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).

C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
   1. Identify controlled circuits in lighting contactors.
   2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor
   3. Devices to be labeled include but are not limited to:
      a. Relay devices.
      b. Power supplies/ packs.
      c. Remote low voltage transformers.
      d. Remote drivers.
      e. Emergency shunt relays.
      f. Lighting control panels.

B. Label time switches and contactors with a unique designation.

3.6 START-UP AND TESTING

A. The Electrical Contractor shall engage a factory-authorized service representative for the lighting control system(s) and devices to perform functional testing and to program and start-up all lighting control systems and devices (networked and stand-alone).
   1. Refer to Design Drawings for programming requirements for the lighting control systems and devices.

B. The Electrical Contractor shall engage a factory-authorized service representative for the lighting control system(s) and devices to perform the following tests and inspections:
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Confirm correct communications wiring, initiate communications between panels, and program the lighting control system according to approved configuration schedules, time-of-day schedules, and input override assignments.
   3. Operational Tests:
      a. After installing lighting control devices and after electrical circuitry has been energized, start units to confirm proper unit operation.
      b. Set and operate controls to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.
      c. Include testing of dimming control equipment under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   5. Emergency Power Transfer: Test listed functions.

C. Lighting control devices will be considered defective if they do not pass tests and inspections. Replace all defective lighting control devices and retest.

D. Prepare test and inspection reports.

3.7 COMMISSIONING

A. After the factory-authorized service representative has completed start-up for all of the lighting control devices and systems, the Contractor shall arrange for the factory-authorized service representative to test the system with the Commissioning Agent.

B. The Contractor shall provide completed start-up forms and checklists to the Engineer and Commissioning Agent for all lighting and receptacle control systems and equipment.

C. The Contractor shall coordinate with the Owner, Architect and General Contractor; tests should be performed in the presence of the Owner, Commissioning Agent and Architect unless given specific permission otherwise in writing.

D. The factory-authorized service representative shall coordinate the commissioning of the lighting and receptacle controls with the Commissioning Agent per the Commissioning Plan. This shall include functional testing of:
   1. All daylighting controls.
   2. All occupancy and vacancy sensor.
   3. All manual controls.
   4. The lighting control panel scheduled dimming of corridor luminaires at night as indicated in the design documents, including manual override controls.
   5. All exterior lighting controls; dusk to dawn and dusk to curfew fixtures.
   6. Receptacle controls.

E. It is the responsibility of the Contractor and factory-authorized service representative to re-adjust or replace all equipment and devices that are not operating within the require parameters.

F. The Commissioning Agent will generate a Commissioning report summarizing the Commissioning process. The Contractor shall assist and provide documentation as required to complete this report.

3.8 ADJUSTING

A. Light Level Setting: The Contractor and factory-authorized service representative shall schedule with the Architect and Engineer a time to review and adjust the settings of initial luminaire output levels of the Maintenance Bays.

B. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to one visit to Project during other-than-normal occupancy hours for this purpose.
   1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
   2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

3.9 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
   1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices and the lighting and receptacle control systems.

B. The factory-authorized service representative shall provide at least 3 hours of training for the Owner's maintenance personnel.

END OF SECTION 260923

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. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Load Centers.
4. Factory-installed surge protection devices (SPD).
5. Termination Cabinet.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. GFEP: Ground-fault equipment protection.

C. HID: High-intensity discharge.

D. MCCB: Molded-case circuit breaker.

E. Panelboard: Except where otherwise indicated, the general term “Panelboard” shall refer to lighting and appliance branch-circuit panelboards, distribution panelboards and load centers.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of switchboard and panelboard.

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.

2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each switchboard, panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.

2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.

3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.

4. Detail bus configuration, current, and voltage ratings.

5. Short-circuit current rating of switchboards, panelboards and overcurrent protective devices.

6. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.

7. Detail utility company's metering provisions with indication of approval by utility company.

8. Include evidence of NRTL listing for series rating of installed devices.

9. Include evidence of NRTL listing for SPD as installed in panelboards.

10. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

11. Include wiring diagrams for power, signal, and control wiring.

12. Key interlock scheme drawing and sequence of operations.

13. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

C. DELEGATED DESIGN SUBMITTALS

1. For available fault current / short circuit calculations, overcurrent protection devices coordination study, and arc-flash hazard analysis.

2. For arc-flash labels.

1.5 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards.

B. Seismic Qualification Data: Certificates, for switchboards, panelboards, overcurrent protective devices, 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.

C. Field Testing 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.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards, panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for switchboards and all installed components.

2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

3. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

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. Keys: Two spares for each type of panelboard cabinet lock.

2. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type but no fewer than two of each size and type.

3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

B. Manufacturer Qualifications: ISO 9001 or 9002 certified.

C. Testing Agency Qualifications: Accredited by NETA.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Remove loose packing and flammable materials from inside switchboards and panelboards; install temporary electric heating (250 W per switchboard section or panelboard) to prevent condensation.

C. Handle and prepare switchboards for installation according to NECA 400**.**

D. Handle and prepare panelboards for installation according to NECA 407.

1.10 FIELD CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards or panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 23 deg F (minus 5 deg C) to plus 104 deg F (plus 40 deg C).

b. Altitude: Not exceeding 6600 feet (2000 m).

1.11 COORDINATION

A. Coordinate layout and installation of switchboards, panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.12 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period:

1. Warranty Period: Three years from date of Substantial Completion.

B. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

C. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SWITCHBOARD AND PANELBOARD COMMON REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. General Electric by ABB.

2. Eaton Corporation; Cutler-Hammer Products.

3. Siemens Energy & Automation, Inc.

4. Square D.

B. Source Limitations: Obtain switchboards, panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards and panelboards including clearances between equipment and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. 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.

E. Comply with NFPA 70.

F. Nominal System Voltage: See single-line diagrams.

G. Equipment ratings: See single-line diagrams.

2.2 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined as required by Code, AHJ and project Structural Engineer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.

a. 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."

B. Comply with NEMA PB 1.

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. Enclosures: Enclosures: Flush and Surface-mounted as noted on drawings, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

2. Height: 84 inches (2.13 m) maximum.

3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.

4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

5. Finishes:

a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

b. Back Boxes: Galvanized steel.

E. Incoming Mains:

1. Location: Per Contractor.

2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

F. Phase, Neutral, and Ground Buses:

1. Material: Tin-plated aluminum.

a. Plating shall run entire length of bus.

b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.

3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.

6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

G. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. NRTL Label: Where indicated on the single-line diagram as service entrance rated, equipment shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices.

I. Short-Circuit Current Rating for Normal Power equipment: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.

1. Panelboards rated 240 V or less shall have short-circuit ratings as required by the Contractor's Short Circuit Study, but not less than 10,000 A rms symmetrical.

2. Panelboards rated above 240 V and less than 600 V shall have short-circuit ratings as required by the Contractor's Short Circuit Study, but not less than 14,000 A rms symmetrical.

J. Short-Circuit Current Rating for Normal Power equipment: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as required by the Contractor's Short Circuit Study, but not less than 10,000 A rms symmetrical.

2. Switchboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as required by the Contractor's Short Circuit Study or 14,000 A rms symmetrical, whichever is greater.

K. Short-Circuit Current Rating for 700 and 701 System (Emergency and Code Required Standby) Power equipment: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as required by the Contractor's Short Circuit Study, but not less than 10,000 A rms symmetrical.

2. Switchboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as required by the Contractor's Short Circuit Study or 14,000 A rms symmetrical, whichever is greater.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards, Panelboards and load centers shall withstand the effects of earthquake motions determined according to local AHJ requirements and the Project Structural Engineer.

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 remain operational."

2.4 POWER DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1, distribution type.

B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

C. Mains: Circuit breaker or Lugs only as indicated on drawings.

D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers or Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers or Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

B. Mains: Circuit breaker or Lugs only as indicated on drawings.

C. Branch Overcurrent Protective Devices: Plug-in or Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.6 LOAD CENTERS

A. Load Centers: Comply with UL 67.

B. Mains: Circuit breaker or Lugs only as indicated on drawings.

C. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Concealed hinges secured with flush latch.

E. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.7 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.

b. Instantaneous magnetic trip element for short circuits.

c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3. Electronic Trip Circuit Breakers:

a. RMS sensing.

b. Field-replaceable rating plug or electronic trip.

c. Digital display of settings, trip targets, and indicated metering displays.

d. Multi-button keypad to access programmable functions and monitored data.

e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.

f. Integral test jack for connection to portable test set or laptop computer.

g. Field-Adjustable Settings:

1) Instantaneous trip.

2) Long- and short-time pickup levels.

3) Long and short time adjustments.

4) Ground-fault pickup level, time delay, and I squared T response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).

6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).

7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.

8. Panelboard Subfeed Circuit Breakers: Vertically mounted.

9. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.

b. Breaker handle indicates tripped status.

c. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.

d. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.

e. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

f. Multipole units enclosed in a single housing with a single handle or factory assembled to operate as a single unit.

g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

h. Shunt Trip: 120-V trip coil energized from separate circuit.

B. Insulated-Case Circuit Breaker (ICCB): 80 percent rated, sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.

1. Two-step, stored-energy closing.

2. Standard-function, microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:

a. Instantaneous trip.

b. Time adjustments for long- and short-time pickup.

c. Ground-fault pickup level, time delay, and I squared t response.

3. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

4. Remote trip indication and control.

C. Fused Switch (only where shown on Contract Drawings set): NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

2.8 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.9 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Mounting Accessories: For anchors, mounting channels, bolts, washers, and other mounting accessories, comply with requirements in Section 260500, “Common Work Results for Electrical,” or manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering gear to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store switchboards and panelboards according to NECA 400 and NECA 407.

1. Lift or move with spreader bars and manufacturer-supplied lifting straps following manufacturer's instructions.

2. Use rollers, slings, or other manufacturer-approved methods if lifting straps are not furnished with switchboard.

C. Protect from moisture, dust, dirt, and debris during storage and installation.

D. Examine switchboards and panelboards before installation. Reject switchboards and panelboards that are damaged, rusted, or have been subjected to water saturation.

E. Examine elements and surfaces to receive switchboards and panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Coordinate layout and installation of switchboards and panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install switchboards and accessories according to NECA 400.

D. Install panelboards and accessories according to NECA 407.

E. Install termination cabinet and accessories per SCL Requirements and Manufacturer's Instructions.

F. Equipment Mounting - Switchboard: Where shown on design drawings, install switchboards on concrete base, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete" and/ or Section 033053 "Miscellaneous Cast-in-Place Concrete."

1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches (50-mm) above concrete base after switchboard is anchored in place.

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.

3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

5. Install anchor bolts to elevations required for proper attachment to switchboards.

6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.

G. Equipment Mounting - Panelboards:

1. Attach panelboard to the vertical finished or structural surface behind the panelboard.

2. Comply with requirements for seismic control devices as required by the local AHJ and Project Structural Engineer.

H. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from equipment.

I. Comply with mounting and anchoring requirements as required by the local AHJ and Project Structural Engineer.

J. Mount such that the top-most circuit breaker is not higher than 79-inches above finished floor as required by Code.

K. Mount panelboard cabinet plumb and rigid without distortion of box.

L. Mount surface-mounted panelboards to steel slotted supports1 1/4 inch (32 mm) in depth. Orient steel slotted supports vertically.

M. Install overcurrent protective devices, controllers and instrumentation not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

N. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

O. Install filler plates in unused spaces.

P. Install filler plates in unused spaces of panel-mounted sections.

3.3 CONNECTIONS

A. As required by Code, bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.

B. Support and secure conductors within the switchboard according to NFPA 70.

C. Extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

3.4 IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards or panelboards with one or more service disconnecting and overcurrent protective devices.

B. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

C. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Create a directory to indicate installed Panelboard circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections for Panelboards and Switchboards:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Do not perform optional tests. Certify compliance with test parameters.

2. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

3. Test ground-fault protection of equipment for service equipment per NFPA 70.

4. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Switchboards and Panelboards will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as indicated.

3.7 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain panelboards, switchboards, termination cabinet, overcurrent protective devices, instrumentation, and accessories.

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. Standard-grade receptacles, 125 V, 20 A.
2. GFCI receptacles, 125 V, 20 A.
3. Tamper-resistant standard-grade receptacles, 125 V, 15 A and 20A.
4. Tamper-resistant GFCI receptacles, 125 V, 15 A and 20A.
5. USB Charging Receptacles, 125 V, 20 A.
6. Twist-locking receptacles.
7. Pendant cord-connector devices.
8. Toggle switches, 120/277 V, 20 A.
9. Decorator-style devices, 125 V, 15 A and 20A.
10. Occupancy sensors.
11. Wall plates.
12. Floor service fittings.

1.3 DEFINITIONS

A. AFCI: Arc-fault circuit interrupter.

B. BAS: Building automation system.

C. EMI: Electromagnetic interference.

D. GFCI: Ground-fault circuit interrupter.

E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

F. RFI: Radio-frequency interference.

G. SPD: Surge protective device.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, for the following Sections provide products from one of the following:
   1. Cooper Wiring Devices: Division of Cooper Industries, Inc.
   2. Hubbell Incorporated.
   3. Legrand North America, LLC.
   4. Leviton Mfg. Company, Inc.
   5. Pass & Seymour; Legrand North America, LLC.

B. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Comply with NFPA 70.

D. RoHS compliant.

E. Comply with NEMA WD 1.

F. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with requirements in this Section.

G. Devices for Owner-Furnished Equipment:
   1. Receptacles: Match plug configurations.
   2. Cord and Plug Sets: Match equipment requirements.

H. Device Color:
   1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
   2. Wiring Devices Connected to UPS System: Gray or as selected by Architect.

I. Wall Plate Color: For plastic covers, as selected by Architect.

J. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL PURPOSE RECEPTACLES, INTERIOR LOCATIONS:

A. In MEP equipment rooms and other areas of multifamily buildings not accessible to residents, provide 125V, 20A receptacles unless otherwise required by Code, equipment to be connected, or the Contract Documents. Provide GFCI type receptacles or GFCI type breakers where GFCI protection is required; see Contract Drawings.

B. In all other areas, provide 125V, 20A, receptacles unless otherwise required by Code, equipment to be connected, or the Contract Documents. Provide GFCI type receptacles or GFCI type breakers where GFCI protection is required; see Contract Drawings.

C. See Contract Drawings for requirements and locations for controlled receptacles.

D. Provide specialty type receptacles as required for appliances/ equipment and/ or as indicated on the drawings.

2.3 GENERAL PURPOSE RECEPTACLES, EXTERIOR LOCATIONS:

A. For all exterior areas provide 125V, 20A, Tamper-Resistant, weather resistant, GFCI-type receptacles in weatherproof while in use enclosures unless otherwise required by Code, equipment to be connected, or the Contract Documents.

B. Provide specialty type receptacles as required for appliances/ equipment and/ or as indicated on the drawings.

2.4 STANDARD-GRADE RECEPTACLES, 125 V, 15 A AND 20 A

A. Duplex Receptacles, 125 V, 20 A
1. Description: Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498.

B. Tamper-Resistant Duplex Receptacles, 125 V, 15 A and 20 A
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-15R or 5-20R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

2.5 GFCI RECEPTACLES, 125 V, 15A AND 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-15R or 5-20R.
3. Type: Feed through.
4. Standards: Comply with UL 498, UL 943 Class A.

B. Weather-Resistant, GFCI Duplex Receptacles, 125 V, 15A and 20 A
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R or 5-20R.
3. Type: Feed through.
4. Standards: Comply with UL 498 and UL 943 Class A.

5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

C. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 15 A and 20A

1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-15R or 5-20R.
3. Type: Feed through as allowed by Code and project requirements.
4. Standards: Comply with UL 498, UL 943 Class A.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

D. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 15 A and 20A

1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R or 5-20R.
3. Type: Feed through.
4. Standards: Comply with UL 498 and UL 943 Class A.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.6 USB RECEPTACLES

A. USB Charging Receptacles

1. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
2. USB Receptacles: Dual, USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
3. Standards: Comply with UL 1310 and USB 3.0 devices.
4. Provide receptacles listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" where noted on drawings.

2.7 TWIST-LOCKING RECEPTACLES

A. Configuration: NEMA WD 6, See Power Plans for Configuration.

B. Standards: Comply with UL 498.

2.8 PENDANT CORD-CONNECTOR DEVICES

A. Description: Matching, locking-type plug and receptacle body connector, heavy-duty grade.

B. Configuration: NEMA WD 6, Configurations L5-20P and L5-20R.

C. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.

D. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

E. Standards: Comply with FS W-C-596.

2.9 CORD AND PLUG SETS

A. Match voltage and current ratings and number of conductors to requirements of equipment being connected.

B. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.

C. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.10 TOGGLE SWITCHES, 120/277 V, 20 A

A. Single-Pole Switches, 120/277 V, 20 A
1. Standards: Comply with UL 20.

B. Two-Pole Switches, 120/277 V, 20
1. Comply with UL 20.

C. Three-Way Switches, 120/277 V, 20 A
1. Comply with UL 20.

D. Pilot-Light, Single-Pole Switches: 120/277 V, 20 A
1. Description: Illuminated when switch is off.
2. Standards: Comply with UL 20.

E. Lighted Single-Pole Switches, 120/277 V, 20 A
1. Description: Handle illuminated when switch is off.
2. Standards: Comply with NEMA WD 1, UL 20.

F. Key-Operated, Single-Pole Switches, 120/277 V, 20 A
1. Description: Factory-supplied key in lieu of switch handle.
2. Standards: Comply with UL 20.

G. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches, 120/277 V, 20 A
1. Description: For use with mechanically held lighting contactors.
2. Standards: Comply with NEMA WD 1, UL 20.

H. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches, 120/277 V, 20 A
1. Description: For use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

2. Standards: Comply with NEMA WD 1, UL 20.

2.11 OCCUPANCY SENSORS

A. Wall Switch Sensor Light Switch, Dual Technology
   1. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (ultrasonic and passive infrared) technology.
   2. Standards: Comply with UL 20.
   3. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
   4. Adjustable time delay of 15 or 30 minutes as indicated on drawings.
   5. Able to be set to Automatic or Manual-On mode as indicated on drawings.
   6. Connections: Hard wired.

2.12 TIMER LIGHT SWITCH

A. Digital Timer Light Switch
   1. Description: Switchbox-mounted, combination digital timer and conventional switch lighting-control unit, with backlit digital display, with selectable time interval in 10-minute increments.
   2. Standards: Comply with UL 20.
   3. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
   4. Integral relay for connection to BAS.

2.13 WALL PLATES

A. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. Single and combination types shall match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.
   2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
   3. Material for Unfinished Spaces: Galvanized steel.
   4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.14 PREFABRICATED MULTIOUTLET ASSEMBLIES

A. Description: Two-piece surface metal raceway, with factory-wired multioutlet harness.

B. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish.

D. Multioutlet Harness:

1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498.
2. Receptacle Spacing: 6 inches (150 mm).
3. Wiring: No. 12 AWG solid, Type THHN copper, single circuit.

PART 3 EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.
5. Coordinate wall-mounted occupancy sensor switches with door swings; do not locate such that they will be blocked by open doors.

C. Conductors:
1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall comply with NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
   a. Cut back and pigtail, or replace all damaged conductors.
   b. Straighten conductors that remain and remove corrosion and foreign matter.
   c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
1. device, listing conditions in the written instructions.

G. Dimmers:
1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan-speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device, listing conditions in the written instructions

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multi-gang wall plates.

I. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through GFCI receptacles for all dedicated maintenance bay devices; all receptacles requiring GFCI protection are to be GFCI-type (i.e. protection of downstream receptacles via feed through of upstream GFCI devices is not allowed).

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. In the Maintenance Bays, identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Perform the following tests and inspections:

C. Tests for 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 unacceptable.
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. 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.

D. Wiring device will be considered defective if it does not pass tests and inspections. Contractor to replace all defective wiring devices and retest.

3.5 RECEPTACLE CONTROL SYSTEM START UP AND TESTING

A. See Specification Section 26 09 23, Lighting Control Devices for requirements.

3.6 COMMISSIONING OF RECEPTACLE CONTROLS

A. See Specification Section 26 09 23, Lighting Control Devices for requirements.

END OF SECTION 262726

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Fusible switches.
2. Cartridge Fuses.
3. Nonfusible switches.
4. Molded-case circuit breakers (MCCBs).
5. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, 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 a nationally recognized testing laboratory (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.

B. Shop Drawings: For enclosed switches and circuit breakers.
1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Data: 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.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
      a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
   2. Altitude: Not exceeding 6600 feet (2010 m).

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to Code.
   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."

2.2 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, 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 an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.3 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Six Pole, Single Throw, 240-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Type HD, Heavy Duty, Double Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

F. Accessories: Provide accessories as required for specific installation/usage.

2.4 CARTRIDGE FUSES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.

B. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.5 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Three Pole, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Three Pole, 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.

D. 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.

E. Type HD, Heavy Duty, Three Pole, 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.

F. Accessories: Provide accessories as required for specific installation/usage.

2.6 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series

Rated System. _____ Amps Available. Identical Replacement Component Required."

D. MCCBs shall be equipped with a device for locking in the isolated position.

E. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.

F. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

G. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

H. 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 I-squared t response.

I. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

J. 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.

K. Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

L. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

M. Features and Accessories: Provide features/accessories as required for specific installation/usage. Including but not limited to:
   1. Standard frame sizes, trip ratings, and number of poles.
   2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
   3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
   4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
   5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

6. Electrical Operator: Provide remote control for on, off, and reset operations.

2.7 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, 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. Wet or Damp, Indoor Locations: NEMA 250, Type 4.
   3. Exterior Locations: NEMA 250, Type 3R.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1) or gray baked enamel paint, electrodeposited on cleaned, phosphatized galvannealed steel (NEMA 250 Types 3R, 12)

C. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

D. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

E. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

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.
   1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 PREPARATION

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than fifteen working days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Owner's written permission.
4. Comply with NFPA 70E.

3.3 INSTALLATION

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.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

3.4 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections for Switches:
   1. Visual and Mechanical Inspection:
      a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
      b. Inspect physical and mechanical condition.
      c. Inspect anchorage, alignment, grounding, and clearances.
      d. Verify that the unit is clean.
      e. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
      f. Verify that fuse sizes and types match the Specifications and Drawings, the Electrical Systems Studies, and/ or the requirements of the installation instructions of the equipment being served.

g. Verify that each fuse has adequate mechanical support and contact integrity.
h. Verify correct phase barrier installation.
i. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

C. Tests and Inspections for Molded Case Circuit Breakers:
1. Visual and Mechanical Inspection:
a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.
e. Verify that breaker trip ratings and types match the Specifications and Drawings, the Electrical Systems Studies, and/ or the requirements of the installation instructions of the equipment being served.
f. Operate the circuit breaker to ensure smooth operation.
g. Inspect operating mechanism, contacts, and chutes in unsealed units.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges.

C. Adjust relay and protective device settings according to recommended settings provided by the coordination study (see Specification Section 26 05 73). Field adjustments shall be completed by the engineering service division of equipment manufacturer under the "Startup and Acceptance Testing" contract portion.

END OF SECTION 262816

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. Interior and exterior luminaires.
   2. Exit signs.
   3. Emergency lighting units.
   4. Emergency lighting inverters.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Arrange in order of luminaire designation.
   2. Include data on features, accessories, and finishes.
   3. Include physical description and dimensions of luminaires.
   4. Include emergency lighting units, including batteries and chargers.
   5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
   6. For each pole, accessory:
      a. Include data on construction details, profiles, EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
      b. Include finishes for lighting poles and luminaire-supporting devices.
      c. Anchor bolts.
      d. Manufactured pole foundations.
   7. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for

lamps and accessories identical to those indicated for the luminaire as applied in this Project IES LM-79 and IES LM-80.

a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all luminaires and lamp types used on Project; use ANSI and manufacturers' codes.
2. Copies of all Manufacturers’ Warranties.

1.6 QUALITY ASSURANCE

A. Provide luminaires from a single manufacturer for each luminaire type.

B. Source Limitations: For poles, obtain each color, grade, finish, type, and variety of pole from single source with resources to provide products of consistent quality in appearance and physical properties.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

B. Store poles on decay-resistant skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.

D. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4 inch (6 mm) deep. Do not apply tools to section of pole to be installed below finished grade.

E. Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle poles with web fabric straps.

1.8 WARRANTIES

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires and poles that fail in materials or workmanship within specified warranty period.

B. LUMINAIRES:
1. Warranty Period: Five year(s) from date of Substantial Completion.
2. Warranty Period for Corrosion Resistance: Five years from date of Substantial Completion.
3. Warranty Period for Color Retention: Five years from date of Substantial Completion

C. EMERGENCY LIGHTING INVERTERS
1. Provide 3-year warranty on system electronics and 1 year full, 7-year prorata warranty on batteries, minimum.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance:
1. Luminaires shall withstand the effects of earthquake motions determined according to the requirements of the local AHJ and the Project Structural Engineer.
2. Foundation and pole shall withstand the effects of earthquake motions determined according to ASCE/SEI 7**,** the requirements of the local AHJ and the Project Structural Engineer.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Structural Characteristics: Comply with AASHTO LTS-6-M.

D. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied according to AASHTO LTS-6-M.

E. Live, Ice and Wind Loads: Per the requirements of Code, the local AHJ and the project Structural Engineer.

2.2 LUMINAIRE REQUIREMENTS

A. 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.

B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp characteristics:
      a. "USE ONLY" and include specific lamp type.
      b. Lamp diameter, shape, size, wattage, and coating.
      c. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.

D. See Luminaire Schedule in Contract Drawing Set for Luminaire Requirements for each Luminaire Type, Basis of Design manufacturers, Approved Alternate Manufacturers, etc.

2.3 EMERGENCY LIGHTING INVERTERS:

A. Manufacturers: Contingent upon compliance with project requirements, provide emergency lighting inverters from one of the below listed manufacturers. Please note, some of these manufacturers will need to provide extended warranties (over their standard) to meet project requirements; see Warranties section above.
   1. Chloride by Signify.
   2. Dual-Lite.
   3. Iota Emergency Lighting, Acuity Brands.
   4. Perfect Power Systems.
   5. Myers Emergency Power Systems.
   6. Sure-Lites, Cooper Lighting Solutions.

B. Provide emergency lighting inverters sized as required to serve emergency luminaires indicated on drawings without integral battery packs. The project is to be served by multiple small emergency lighting inverters, not one large central inverter.

C. UL 924 listed.

D. UL 924 self-testing and self-diagnostics.

E. Emergency lighting inverters are to be compatible with LED luminaires.

F. Emergency lighting inverters shall provide 90-minute run time.

G. Input voltage shall be field selectable at 120VAC or 277VAC.

H. Output voltage distortion shall be less than 10% for resistive loads.

I. Emergency lighting inverters shall be compatible with generators (10X inverter size).

J. Emergency lighting inverters shall have maintenance free VRLA batteries and a microprocessor-controlled, 3-stage battery charger.

K. Alarms shall include monthly test fault, yearly test fault, charger fault, output voltage low, output voltage high, overload fault, low voltage disconnect, heatsink over temp and input fuse failure.

L. Emergency lighting inverters shall have AIC rating as needed for available fault current as per the Contractor's Short Circuit/ Fault Current calculations.

M. Inverter operating temperature: 32 degrees F to 104 degrees F (0 degrees C to 40 degrees C).

N. Battery operating temperature: 68 degrees F to 86 degrees F (20 degrees C to 30 degrees C) per UL 924 specifications.

2.4 POLE REQUIREMENTS

A. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

B. Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size indicated, and accessible through handhole.

C. Fasteners: Galvanized steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.
1. Materials: Compatible with poles and standards as well as to substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

D. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches (65 by 130 mm), with cover secured by stainless-steel captive screws

2.5 MATERIALS

A. Metal Parts:
1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Steel:
1. ASTM A36/A36M for carbon structural steel.
2. ASTM A568/A568M for sheet steel.

C. Stainless Steel:
1. Manufacturer's standard grade.
2. Manufacturer's standard type, ASTM A240/240M.

D. Galvanized Steel: ASTM A653/A653M.

E. Aluminum: ASTM B209.

2.6 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.7 LUMINAIRE SUPPORT

A. Comply with requirements in Section 260500 for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm) or as required by Structural Engineer and local AHJ, whichever is larger.

D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

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

3.2 TEMPORARY LIGHTING

A. If approved by the Architect in writing, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

D. Flush-Mounted Luminaires:
1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

E. Wall-Mounted Luminaires:
1. Attached to structural members in walls or as per Manufacturer's Instructions and Structural Engineer's requirements.
2. Do not attach luminaires directly to gypsum board.

F. Suspended Luminaires:
1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

G. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 POLE AND BOLLARD FOUNDATIONS

A. The Electrical Contractor is to hire a Structural Engineer currently registered in the State of Washington to engineer foundations for light poles and bollards and support structures for power conductors, communications cable tray, communications racks, etc. See Project Drawing and other Division 26 and 27 Specification Sections set for additional information and requirements.

B. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Structural steel complying with ASTM A36/A36M and hot-dip galvanized according to ASTM A123/A123M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

C. Pre-Cast Foundations: Factory fabricated, with structural steel complying with ASTM A36/A36M and hot-dip galvanized according to ASTM A123/A123M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

D. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A36/A36M and hot-dip galvanized according to ASTM A123/A123M; and with top-plate and mounting bolts to match

pole-base flange and strength required to support pole, luminaire, and accessories.

1. Baseplate: Stamped with manufacturer's name, date of production, and cable entry.

E. Direct-Buried Foundations: Install to depth required by Structural Engineer. Add backfill as required by Structural Engineer**,** tamping each layer before adding the next. To ensure a plumb installation, continuously check pole orientation with plumb bob while tamping.

F. Anchor Bolts: Install plumb using manufacturer-supplied template, uniformly spaced.

3.5 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on drawing or required by the Utilities, Code or the AHJ.

1. Fire Hydrants and Water Piping: 60 inches (1520 mm)
2. Water, Gas, Electric, Communications, and Sewer Lines: 10 feet (3 m)
3. Trees: 15 feet (5 m) from tree trunk

C. Concrete Pole and Bollard Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Foundation-Mounted Poles and Bollards: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
3. Install base covers unless otherwise indicated.
4. Use a short piece of 1/2 -inch (13-mm) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole

E. Poles and Pole Foundations Set in Concrete-Paved Areas: Install poles with a minimum 6-inch- (150-mm-) wide, unpaved gap between the pole or pole foundation and the edge of the adjacent concrete slab. Fill unpaved ring with pea gravel. Insert material to a level 1 inch (25 mm) below top of concrete slab.

F. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.6 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.

B. Steel Conduits: Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.7 GROUNDING

A. Ground Metal Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
   1. Install grounding electrode for each pole.
   2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
   3. Bond metal poles and bollards to grounding electrode system. See Project Drawing Set.

B. Ground Nonmetallic Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
   1. Install grounding electrode for each pole.
   2. Install grounding conductor and conductor protector.
   3. Ground metallic components of pole accessories and foundation.

3.8 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
   2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
   3. Inspect poles for nicks, mars, dents, scratches, and other damage.

B. Luminaires will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to one visit to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
   1. During adjustment visits, inspect all luminaires. Replace luminaires that are defective. Adjust luminaires that are no longer level.

2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

END OF SECTION 265119

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 26.

1.2 SUMMARY

A. **This is a design/build specification**. Contract Documents are meant to provide information (scope, performance requirements, preliminary quantities and locations, etc) for Bidding by Design-Build Contractors only. All final quantities and locations of equipment and devices shall be coordinated with the Fire Marshal/ Local AHJ (as applicable), Architect and Owner prior to the start of construction.

B. Design Intent: The project includes Electrical, Fire Alarm and Low Voltage systems for the Shop Addition to the Monroe Fire Station #31. The existing fire station and administration building will have a new vehicle maintenance bay added on to the existing apparatus bay.
1. All Low Voltage systems are existing and to be expanded upon in order to serve the new Shop Addition area of the project.
2. The bidding Low Voltage subcontractors are to visit to the site and assess the existing system conditions in order to provide an accurate bid which accounts for all necessary components and labor to expand the existing systems out to the new Shop Addition.

C. All Fire Alarm and Low Voltage Systems are Design-Build; Contract Documents (drawings and specifications) are meant to provide information (scope, performance requirements, preliminary quantities and locations, etc) for Bidding by Design-Build Contractors only. All final quantities and locations of equipment and devices shall be coordinated with the Fire Marshal/ Local AHJ (as applicable), Architect and Owner prior to the start of construction.

D. The Design-Build Contractors shall design, submit for plan review, permit, provide and install complete and fully operational and coordinated systems that meet all requirements of the Owner, local AHJ and as per the Project Contract Documents.
1. All voice and data cabling design shall be performed by an RCDD or by a designer with five or more years of experience with telecommunications cabling design. Contractor to provide proof of designer qualifications.

E. Low Voltage Systems to be provided for the Project include:
1. Fire Alarm System.
2. Telecom Systems.
3. Wireless Network.
4. Access Control System.

F. The Contractor shall provide all labor, materials, equipment and devices, supports, etc necessary for satisfactory installation of fire alarm and low voltage work ready to operate in strict accordance with Code requirements and these specifications and drawings including but not limited to all switches, routers, CCTV cameras and NVR server, racks, patch panels, patch cables, 110 blocks, terminations, etc. The Contractor shall also provide permanent labeling at both ends of all low voltage cabling, color coded for each system, which shall match the numbering scheme of the Low Voltage system As-Built drawings for all terminations.

1. The Contractor shall test all terminations to ensure they are in good working order. Any and all faulty cables and/ or terminations shall be replaced at no cost to the Owner.

G. All final quantities and locations of equipment and devices shall be coordinated with the Fire Marshal/ Local AHJ (as applicable), Architect and Owner prior to the start of construction.

H. The Contractors shall provide all labor, materials, equipment and devices, supports, etc necessary for satisfactory installation of fire alarm and low voltage work ready to operate in strict accordance with Code requirements and these specifications and drawings.

I. Related Sections: All Division 01, 26, 27 and 28 Specification Sections included in the Contract Documents.

J. Commissioning Activities and Submittals: The Project shall be commissioned per Energy Code. The Contractor shall coordinate with the General Contractor, Architect and Commissioning Agent and provide support for the complete commissioning process as required. See Divisions 01, 26, 27 and 28 for additional information.

1.3 COORDINATION MEETINGS

A. The Design-Build Low Voltage Contractor shall coordinate with the Electrical and General Contractor to arrange for two coordination meetings/ conference calls for the low voltage systems for the project. The attendees shall include the Low Voltage Contractor, the Electrical Contractor, the General Contractor, the Owner/ Owner's Rep, the Owner's IT Department, the Architect and the Electrical Engineer.

B. The first meeting/ conference call shall occur within four (4) weeks of the Contractor receiving notice to proceed on the project and before the Low Voltage Contractor has issued their first set of shop drawings for the Low Voltage systems for the project. The intent of this meeting is for the Low Voltage Contractor to discuss design intent with the Owner and confirm the requirements for all systems.

C. The second meeting/ conference call shall occur within two (2) weeks of the Low Voltage Contractor issuing their first set of shop drawings for the Low Voltage systems for the project. The intent of this meeting is for the Low Voltage Contractor to discuss specific equipment and device locations with the Owner and Architect.
1. The Design-Build Low Voltage Contractor shall issue their first round of shop drawing and schedule the second coordination meeting/ conference call before any low voltage systems, devices, equipment, etc have been roughed in.
2. The second meeting /conference call shall be scheduled to allow for enough time for the Design-Build Low Voltage Contractor to issue a second set of shop drawings for Owner and Engineer review and comment before rough-in for these systems needs to begin.
3. Any equipment, devices, etc for any low voltage systems roughed-in before the second meeting/ conference call shall be relocated as needed at the Contractor's expense.

1.4 SYSTEMS REQUIREMENTS

A. The Fire Alarm and Low Voltage Contractors shall provide all racks, parts, pieces, cabling, equipment, devices, supports, etc required for complete and fully operational low voltage and fire alarm systems per Code, AHJ, and Owner requirements.

B. FIRE ALARM SYSTEM

1. See Specification Section 28 46 00.

C. TELECOM AND CATV SERVICES:
1. The Telecom and CATV services are existing to remain. Confirm all provider details with owner prior to bid.

D. TELECOM AND CATV SYSTEMS:
1. See the Bid Set Electrical drawings for additional information and requirements including preliminary device quantities and locations for bidding purposes.
2. The Contractor shall design, provide and install complete and fully operational expansions of the existing Telecom and CATV systems for the new Shop Addition areas of the project. Coordinate exact requirements, locations and device types with the Owner.
3. System Risers:
   a. Low Voltage Contractor shall provide riser cabling for all other low voltage systems/ providers and for the Owner's network. Confirm requirements with individual utility service providers and the Owner.
4. Telecom equipment and cabling shall meet TIA performance criteria for Category 6. All cabling is to be terminated with Category 6 jacks.
5. The Design-Build Contractor shall coordinate with the Owner to confirm telecom system requirements prior to the start of design.
6. The CATV system shall consist of cable television service and a coaxial cable distribution system.
   a. Headend equipment shall consist of receiving equipment and associated signal distribution amplification and equalization.
   b. Distribution of cable television service signals, which includes coordinating with Owner's selected service provider for installation of cable to the service point ready for connection into the distribution system. Obtain signal levels and noise and distortion characteristics from service provider as the point of departure for system layout and final equipment selection.
   c. Cable distribution system consisting of coaxial cables, user interfaces, signal taps and splitters, RF amplifiers, signal equalizers, power supplies, and required hardware, complying with CEA-310-E and CEA-2032 and resulting in performance parameters specified in this Section. System shall be capable of distributing television channels according to CEA-542-B.
7. In addition to devices noted on the Bid Set drawings, the Design-Build Contractor shall also provide:
   a. Any other devices required by Code, AHJ or Fire Marshal.

E. WIRELESS NETWORKS
1. The Contractor shall provide wireless access points and all other equipment required to provide a secured wireless network at the new Shop Addition area of the project.

F. ACCESS CONTROL SYSTEM
1. The Contractor shall design, provide and install a complete and fully operational expansion of the existing access control system for the project.
   a. Per the owner, there are two access controls systems currently deployed within the existing building:
      1) RS2 Technologies Access it! Universal.Net
      2) Stanley Wi-Q
2. Expansion System and devices shall be compatible with the Owner's existing system. Current access control is via key-pads, with access codes, at the exterior doors.

3. The new devices shall be interconnected to provide notifications on the existing system as required by the existing programming and system functionality.
4. The system shall be designed to support all locations indicated in the Low Voltage preliminary plans plus an additional 25% future capacity.
5. Doors out of the stairwells shall be locked under normal conditions (once in the stairwell, a person must continue down and out at the egress level). These doors shall unlock upon signal from the fire alarm system per Code and AHJ requirements.

1.5 CODES AND STANDARDS:

A. All work shall meet or exceed the requirements of the current versions of all applicable Federal, State, and Local Codes and Standards including but not limited to:
1. National Electrical Code (NEC) with Local Amendments.
2. Washington State Energy Code with Local Amendments.
3. International Fire Code (IFC) with Local Amendments.
4. International Building Code (IBC) with Local Amendments.
5. International Mechanical Code (IMC) with Local Amendments.
6. Uniform Plumbing Code (UPC) with Local Amendments.
7. The Americans with Disabilities Act (ADA).
8. Illuminating Engineering Society of North America (IESNA) Standards and Recommended Practices.
9. National Fire Protection Association (NFPA) Standards and Recommended Practices.
10. Applicable Standards of the following organizations (see subsequent Division 26, 27 and 28 sections for additional information):
    a. American National Standards Institute (ANSI).
    b. American Society for Testing Materials (ASTM).
    c. Building Industry Consulting Services International (BICSI)
    d. Institute of Electrical and Electronics Engineers (IEEE)
    e. National Electrical Manufacturer's Association (NEMA)
    f. Underwriter's Laboratories (UL) standards.
11. Utility Service Provider Requirements.

1.6 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to International Building Code with local amendments, Fire Marshal, and UL for fire resistance ratings and surface burning characteristics.

1.7 PRODUCT SUBSTITUTIONS

A. Manufacturers and models of equipment and material indicated in Divisions 27 and 28 Specifications and on drawings are those upon which the fire alarm and low voltage systems designs are to be based; other manufacturers with products considered equal in general quality may also be listed without specific model designation. Manufacturers not listed shall be submitted for approval prior to submission of Bid by the Contractor, see Division 01.

B. Any equipment other than the basis of design is considered a substitution; this includes equipment from any alternate manufacturers listed without specific model designation in the Contract Specifications and / or Drawings.

C. Pre-Bid 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.

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. Approval of proposed substitution does not grant the Contractor approval for deviation from the contract requirements.

F. Unless indicated otherwise, “or approved equal” may be assumed for all products in Divisions 26, 27 and 28.

1.8 DESIGN DRAWINGS

A. All drawings, specifications and calculations prepared by the Fire Alarm Design-Build Contractor shall be stamped by an Engineer currently registered in the State of Washington.

B. The Design-Build Contractor shall submit drawings and diagrams for review and for job coordination:
   1. Permit / Construction Drawings for review. These drawings shall be submitted at two milestones as selected by the Architect in electronic PDF format.
      a. The Contractors’ drawings shall match the layout of the Architectural drawings.
      b. Fire Alarm systems shall be provided in a separate set of drawings by the Fire Alarm Contractor.
      c. The Drawing Sets shall include at a minimum:
         1) Symbols, Legend and drawing list sheets.
         2) Low Voltage Systems (Telecom, CATV, access control, etc) floor plan drawings.
         3) Low Voltage Systems riser diagrams.
         4) Fire Alarm System sheets and calculations approved by the local Fire Marshal/ AHJ.

1.9 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” of Divisions 26, 27 and 28 Specification Sections and all additional products noted on drawings or required for completion of sequence of operations (three submittal packages total; one for all of Division 26, one for Fire Alarm, and one for all other Low Voltage systems).

B. Provide the Submittals so as not to delay the construction schedule; allow at least two weeks for review of each submittal and re-submittal.

C. Electronic: Submittals shall be complete in one PDF file for each Division with bookmarks for each Specification Section and Principal Category. Multi-file submittals will be returned without review.
   1. First Page: Name of Project, Owner, Location & Contracting Company.
   2. Index Page: List of specification sections and principal categories with contents by Tag or item.
   3. Bookmarks: Electronic bookmark of each specification section and principal category corresponding to listing in index.

D. 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.

E. Equipment vendor cover page with contact information shall precede submittal by that vendor.

F. 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.
5. Construction Materials.
6. Ratings (i.e. UL, ASTM, NEMA, etc).
7. Electrical characteristics (Voltage, Phase, Wattage, Breakers, etc).
8. Engineering technical data.
9. Sound level data.
10. Vibration Isolation.
11. Controls and wiring diagrams.
12. Accessories.

G. If requested in subsequent Specification Sections or by Architect or Engineer, submit Manufacturer's Installation Instructions on any equipment, procedures, or certifications so requested.

H. Do no ordering, fabrication or manufacturing of products until return of approved submittals.

I. The Contractor agrees to pay for the Engineer’s review cost of the Division 27 and 28 Submittals beyond one resubmittal where resubmittals are required due to deficiencies in the Contractor’s Submitted material.

1.10 SHOP DRAWINGS

A. The Contractor shall submit drawings and/or diagrams for review and for job coordination:
1. Slab plans marked up with all penetrations required for electrical, fire alarm and low voltage systems. Sizes of penetrations shall be indicated on the plans and penetration locations shall be dimensioned from major building lines. The Contractor shall submit these slab plans to the Architect for review.
2. For all special or custom-built items or equipment.
3. 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.
    a. By submission of revised design shop drawings, the Contractor acknowledges that coordination has been done with all other trades to ensure that all equipment fits and remains accessible with all Code required clearances and that no conflicts exist.

B. The Architect’s review of shop drawings shall not relieve the Contractor of the 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.

1.11 PLAN REVIEW AND PERMITS

A. In addition to the distribution requirements specified in other Specification Sections, the Design-Build Contractors shall make all required submissions to the Authorities Having

Jurisdiction (AHJ) for Plan Review, Permits and approval for applicable low voltage systems (Fire Alarm, Two-Way Communication, etc). The Contractors shall pay all fees related to said submissions. The Contractors shall revise their design and resubmit as needed to obtain AHJ approval. All additional and / or revisions to the Contractor's designs required to obtain AHJ approval shall be carried out by the Contractor at no additional cost to the Owner – this includes the fees associated with any resubmissions. The Contractors shall submit all comments received from the AHJ to the Architect and Engineer.

B. The Contractor shall not commence work until a permit (or "get started" permit where allowed by the AHJ) is obtained. Contractor is solely responsible for ensuring that the permit application and any revisions are submitted in a timely manner so as not to impact project schedule.

1.12 QUALITY ASSURANCE

A. The Contractors shall perform all work per current versions of all applicable Codes and Standards with state and local amendments – see "Codes and Standards" paragraph above.

B. All equipment and devices shall be UL-Listed and Labeled and shall be acceptable to the Authority Having Jurisdiction as suitable for the use and location for which they are intended.

C. Provide all like items (telecom outlets, patch panels, faceplates, etc) from one manufacturer.

1.13 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in Divisions 27 and 28 Specification Sections with a minimum of three years' experience.

B. Installer: Company specializing in performing Work included in Divisions 27 and 28 on projects of similar type and scale with a minimum of three years' experience.

1.14 DELIVERY, STORAGE AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. The Contractor shall keep all equipment, devices, conduit, etc in a dry, secured, protected area. The location shall be coordinated with the Architect and General Contractor prior to the start of Construction. See Division 01 for additional delivery, storage and handling requirements.

C. Where original packaging is insufficient, provide additional protection. Maintain protection in place until installation.

D. Inspect all products and materials for damage prior to installation.

E. Protect conduit from all entry of foreign materials by providing temporary end caps or closures on conduit and fittings.

F. Protect materials and finishes during handling and installation to prevent damage.

G. Comply with manufacturer's installation instruction for rigging, unloading and transporting equipment.

1.15 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. Coordinate with General Contractor to have ventilation provided in areas to receive solvent cured materials.

C. Do not install underground conduit when bedding is wet or frozen.

1.16 FIELD MEASUREMENTS

A. Verify field measurements prior to ordering racks and other equipment.

B. Verify by field measurements that equipment and rack 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 and documenting exact locations of existing systems.

1.17 COORDINATION

A. The Contractor shall visit the site and become familiar with existing conditions affecting work. The Contractor shall include in their Bid the costs for all work and / or materials required to comply with the requirements of the Contract Documents based on the actual existing conditions. Failure to visit the Site and verify actual existing conditions does not relieve the Contractor of these requirements; no change orders will be paid due to lack of verification of existing conditions whether they are specifically noted in the Contract Documents or not.

B. The Contractor shall verify the locations of any overhead or buried utilities on or near the Project 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. 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.

E. Where the drawings or specifications call out for the contractor to field verify and / or coordinate locations and requirements this verification / coordination is to be completed prior to any equipment, devices, supports, conduits, etc are installed / roughed-in. Any equipment, devices, supports, conduits, etc installed at locations unacceptable to the design team (either for aesthetics or functionality) due to the contractor failing to field verify / coordinate shall be relocated at the contractor's expense.

F. Electrical and Low Voltage Systems 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 as necessary to fit actual conditions.

G. 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.

H. 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 Electrical, HVAC, plumbing, and sprinkler contractors shall provide whatever materials, offsets, labor etc. is required to resolve the conflict.

I. Advise the Architect of any modifications required to suit the equipment furnished. Costs for modifications due to equipment substitution will be borne by the contractor.

J. 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.

K. 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.

L. Coordinate trenching, excavating, bedding, backfilling of buried systems with requirements of this specification.

M. Coordinate wall openings, rough-in locations, concrete housekeeping pads, and conduit rough-in locations to accommodate Work of Divisions 26, 27 and 28.

N. The Contractor shall coordinate with the Architectural plans and Project structure when locating equipment and devices and routing conduit and cabling.

O. The Contractor shall coordinate with the General Contractor and provide slab plans marked up with all penetrations required for electrical, fire alarm and low voltage systems. Sizes of penetrations shall be indicated on the plans and penetration locations shall be dimensioned from major building lines. The Contractor shall submit these slab plans to the Architect for review.

P. The Contractor shall coordinate conduit and cabling routing and equipment and device locations with all other trades to ensure all Code required clearances are maintained and equipment and devices remain accessible after the work of all trades is complete.

Q. The Contractor shall consult the approved shop drawings of all other trades and crafts to ensure coordination with final locations of cabinetry, counters, appliances, equipment, structural members, etc. Conflicts are to be resolved with the Architect and General Contractor prior to rough-in. The Contractor shall not be paid for relocation work (including cutting, patching, and finishing) required due to a lack of coordination prior to installation.

R. See the Architectural drawings for the exact locations of low voltage devices. The Contractor shall make minor changes (less then 6-feet in any direction) in the location of conduit, boxes, devices, etc from the locations shown in the drawings without extra charge to the Owner where required by coordination or if directed by the Architect or Owner.

S. Prior to the start of Construction, coordinate locations and connection requirements for all line voltage power connections with the Electrical Contractor and Engineer.

1.18 PROJECT CLOSEOUT

A. Completion, submission and approval of the following is required for final project closeout:
   1. Walk through the Project with the Owner and Architect to make note of deficiencies.
   2. Execution of Owner's, Architect's and Engineer's final observation reports (punchlist).
   3. Operating and Maintenance Instructions.
   4. Operating and Maintenance Manual.
   5. Equipment Cleaning.
   6. Record Drawings.
   7. Testing.
   8. Commissioning and Commissioning Report.
   9. Warranty.

B. See other Divisions 01, 27 and 28 Specification Sections for additional requirements.

1.19 OPERATING AND MAINTENANCE INSTRUCTIONAL TRAINING

A. General: In addition to requirements of Division 01, following initial operation of Electrical systems and prior to acceptance by the Architect, perform the following services:
   1. 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.
   2. 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 and device calibration; systems set up, adjustments and programming; and safeties and alarms.
   3. 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.
   4. During demonstrations and instructions include and reference information from maintenance manuals and contract drawings.
      a. Provide documentation of all instruction which includes:
         1) Date and time of instruction.
         2) Name, affiliation and qualifications of the instructor.
         3) Name and affiliation of the attendees.
         4) Topics, systems, and equipment covered.
         5) Length of instruction.
   5. Minimum duration of instruction periods:

a.	Telecom and CATV Systems	1 hour
b.	Access Control System	1 hours
c.	Fire Alarm Systems	See Section 28 46 00

1.20 OPERATING AND MAINTENANCE MANUALS

A. Contents: Furnish, in accord with Division 01, one PDF and one bound copy of operating and maintenance manuals to include the following:
   1. The Job name and address.

2. Names, addresses and telephone numbers of the Contractor, sub- contractors and local companies responsible for maintenance of each system or piece of equipment.
3. Manufacturers, suppliers, contractor names, addresses and phone numbers.
4. Written guarantees.
5. Warranty service contractors' names, address and phone numbers (if different from above).
6. Copies of approved brochures and Shop Drawings as applicable for all submittal items.
7. Manufacturer’s printed operating procedures to include start-up and routine and normal operating instructions; and control, shutdown, and emergency instructions.
8. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; and adjusting instructions.
9. Part numbers of all replaceable items.
10. Operation sequences.
11. Record drawings corrected and completed.
12. Completed equipment start-up forms and checklists.
13. Final copy of testing reports.

B. Operation and Maintenance Data:
1. Include spare parts lists for all equipment as applicable.
2. Submit installation instructions, adjustment instructions, and spare parts lists 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.

C. Binders:
1. Furnish typewritten or printed index and tabbed dividers between principal categories.
2. Bind each manual in a hard-backed loose-leaf binder.
3. Imprint on Cover:
   a. Name of Project.
   b. Owner.
   c. Location of project.
   d. Architect.
   e. Contractor.
   f. Year of Completion.
4. Imprint on backing:
   a. Name of Project.
   b. Year of completion.

D. PDFs:
1. Provide PDF with bookmarks for each Specification Section and / or Principal Category.
   a. First Page: Name of Project, Owner, Location & Contracting Company.
   b. Index Page: List of specification sections with contents by Tag or item.
   c. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

E. Submittal:
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.

1.21 RECORD DRAWINGS

A. Prepare record documents in accordance with the requirements of Division 01 Specification Section "Contract Closeout."

B. Label each drawing as "Record Drawing" with Low Voltage Contractors' name and date.

C. During construction, maintain an accurate record set of the drawings of the installation on project site at all times; keep this set in a safe location, protected from the environment.

D. Submit one digital file with all drawings in PDF format.

E. Make all notes and revisions on PDF set in red.

F. In addition to the requirements specified in Division 01 and in other Division 26, 27 and 28 Specification Sections, indicate installed conditions (locations, sizes, burial depths, arrangements, etc) for:
   1. Major raceway systems – Interior and Exterior – dimensions from prominent building lines.
   2. Utility service conduit (power and telecom) and connections, dimensions from prominent building lines.
   3. Locations of all conduits provided for future use with intended future use identified.
   4. Equipment locations (exposed and concealed) shown to scale and dimensioned from prominent building lines.
   5. Final numbering for all low voltage terminations.
   6. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.22 TESTING

A. All cabling shall be tested by a certified installer.

B. Provide completed start-up forms and checklists.
   1. Contractor to test all horizontal UTP cables per TIA 568.B.2 for CAT6 performance requirements.

C. Perform testing of fire alarm systems as described in Division 26, 27 and 28 Specification Sections and as required by applicable codes and ordinances.

D. Written verification of testing to be signed by Owner's Representative.

1.23 WARRANTY 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. The Contractor shall, without cost to the Owner, correct all defects and failures discovered within one year from date of final acceptance for all electrical, fire alarm systems, except when in the opinion of the Architect a failure is due to neglect or carelessness of the Owner.
   1. See individual Specification Sections for additional requirements.
   2. Telecom terminations and cabling shall be provided with a 15 year warranty.

C. 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.

D. The Contractor shall make all necessary control adjustments during first year of operation.

E. The presence of any inspector or observer at any point during construction does not relieve the Contractor from responsibility for defects discovered after completion of the work.

F. Refer to Division 01, 26, 27 and 28 Specification Sections for additional Warranty requirements.

PART 2 PRODUCTS

2.1 CABLE TRAYS

A. Subject to compliance with requirements, provide equipment, devices and cabling by one of the following manufacturers or a pre-approved equal:
1. Cable Management Solutions, Inc.
2. Cablofil Inc.
3. Cooper B-Line, Inc.
4. Cope; Atkore International.
5. GS Metals Corp.
6. Monosystems, Inc.
7. MP Husky Cable Tray and Cable Bus.
8. Wiring Device-Kellens; Hubbell Incorporated

B. Comply with TIA/EIA-569-A.

C. Sizes and Configurations: See the Drawings for preliminary requirements for types, materials, sizes, and configurations. Confirm final sizes and configurations with the Low Voltage Design-Build Contractor.

D. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.
1. Source Limitations: Obtain cable trays and components from single manufacturer.

E. Description:
1. Width: as indicated on Drawings.
2. Minimum Usable Load Depth: 6 inches (150 mm).
3. Straight Section Lengths: 10 feet (3.0 m) or 12 feet (3.7 m), except where shorter lengths are required to facilitate tray assembly.
4. Rung Spacing: 6 inches (150 mm) o.c.
5. Radius-Fitting Rung Spacing: 9 inches (225 mm) at center of tray's width.
6. Support Point: Splice fittings shall be hanger support point.
7. Support Spacing: Support each section at midpoint. Support wall-mounted sections a maximum of one-sixth of the section length from each end.
8. Unbalanced Loads: Maintain cable tray rungs within six degrees of horizontal under all loading conditions.
9. Splicing Assemblies: Bolted type using serrated flange locknuts.
10. Splicing Assembly Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
11. Splices and Connectors: Protect cables from edges of center rail and do not intrude into cable fill area.

12. Materials: Aluminum alloy 6063-T6 according to ANSI H35.1/H 35.1M for extruded components, and Alloy 5052-H32 or Alloy 6061-T6 according to ANSI H35.1/H 35.1M for fabricated parts.
13. Hardware: Chromium-zinc-plated steel, ASTM F1136.

F. CABLE TRAY GROUNDING
1. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems" and the design drawings.
2. Cable trays shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.
3. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.
4. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

2.2 UTP CABLE

A. Subject to compliance with requirements, provide equipment, devices and cabling by one of the following manufacturers or a pre-approved equal:
1. Belden CDT, Inc, Electronics Division.
2. Berk-Tek.
3. CommScope, Inc.
4. KRONE, Inc.
5. Superior Essec, Inc.

B. Description: 100-ohm, 100 pair UTP formed into 25-pair binder groups covered with thermoplastic jacket.
1. Comply with TIA/ EIA-568-B.2, Category 6.

2.3 TELECOM/ CATV EQUIPMENT:

A. Subject to compliance with requirements, provide equipment, devices and cabling by one of the following manufacturers:
1. Belden, Inc.
2. Cooper B-Line.
3. Hubbell Premise Wiring.
4. Legrand.
5. Leviton Commercial Networks Division.
6. Motorola, Inc.; Connected Home Solutions.
7. Ortronics, Inc.
8. Tyco Electronic Corporation.

B. The telecom equipment, devices and cabling shall meet TIA performance criteria for Category 6. All cabling shall be terminated with Category 6 RJ45 jacks.

2.4 ACCESS CONTROL SYSTEM

A. See Paragraph 1.4-F above.

2.5 HANGERS AND SUPPORTS

A. See Specification Section 26 00 01.

2.6 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

A. See Specification Section 26 05 19.

2.7 GROUNDING AND BONDING

A. See Specification Section 26 05 26.

2.8 RACEWAY AND BOXES

A. See Specification Section 26 05 33.

2.9 IDENTIFICATION FOR LOW VOLTAGE SYSTEMS

A. See Specification Section 26 05 53.

PART 3 EXECUTION

3.1 DOCUMENTATION

A. Additional plan submittals to reviewing authority: If additional drawing submittals are required at any time during construction the Contractor shall submit drawings, review with authority, and pick up subsequent approved drawings. The Contractor will revise and/or prepare drawings for submittal.

3.2 MOCK-UPS

A. The Contractor shall completely mock-up the Shop Addition area by marking the intended locations of all equipment and devices.

B. Before starting installation of equipment and devices, the Electrical Contractor shall walk through all mocked-up areas with the Owner, Architect, and General Contractor to receive approval for all locations.

C. The Electrical Contractor shall relocate equipment and devices in the mock-ups per the Owner and Architect’s instructions.

D. The Electrical Contractor shall relocate any equipment and devices installed prior to the approval of the mocked-up areas by the Architect and Owner at the Electrical Contractor’s expense.

3.3 INSTALLATION

A. The Contractor shall conceal all conduit, cabling and boxes in finished areas unless indicated otherwise or granted specific permission by the Architect. Install all conduit and cabling perpendicular or parallel with building lines wherever possible.

B. In open ceiling areas, all cabling shall be installed in conduit. Conduit shall be painted; color as selected by the Architect.

C. Coordinate the locations of equipment and outlets with all other trades.

3.4 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 (including the electric and telecom utility providers for utility service infrastructure work).

B. Should any work be enclosed or covered up before such inspection and testing, the Contractor shall at his own expense uncover said 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 including paying other trades to repair work under their scope that was disturbed.

3.5 FIELD QUALITY CONTROL

A. Conducts tests of equipment, devices, and systems as required by NFPA, BICSI, local Codes and the local AHJ.
   1. Provide a Service Technician with all tools, instruments, etc required to complete required tests.
   2. Coordinate with the Owner, Architect and General Contractor; tests should be performed in the presence of the Owner and Architect unless given specific permission otherwise.

B. Refer to individual Division 26, 27 and 28 Specification Sections for additional requirements.

3.6 CLEANING

A. Clean adjacent surfaces of fire stopping materials.

B. Clean interior and exterior of all equipment. Equipment shall be free of dirt, construction debris, corrosion, etc.

C. Adequate provisions shall be made during construction to eliminate dirt, debris or other material from entering and collecting inside of conduit and equipment. Any collection of material shall be thoroughly cleaned before owner occupancy.

D. Clean exterior of all exposed conduit.

E. Use ESDS Compliant Products: Materials intended for use inside the building envelope, including those used for patching, painting, touch-up, and cleaning, must contain acceptable levels of VOC’s and contain no added urea-formaldehyde.

3.7 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 low voltage systems 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 low voltage systems installations.

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.

3.8 SALVAGE

A. Remove excess conduit and conductors. Remove scrap 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.

3.9 MANUFACTURERS' FIELD SERVICES

A. Refer to individual Division 26, 27 and 28 Specification Sections for requirements.

3.10 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

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 Divisions 26, 27 and 28.

1.2 SUMMARY

A. **This is a design/build specification**. Contract Documents are meant to provide information (scope, performance requirements, preliminary quantities and locations, etc) for Bidding by Design-Build Contractors only. All final quantities and locations of equipment and devices shall be coordinated with the Fire Marshal/ Local AHJ (as applicable), Architect and Owner prior to the start of construction.

B. Design Intent: The project includes Electrical, Fire Alarm and Low Voltage systems for the Shop Addition to the Monroe Fire Station #31. The existing fire station and administration building will have a new vehicle maintenance bay added on to the existing apparatus bay. The building has an existing Fire Alarm System that is to be expanded into the new Shop Addition space.

1. The existing Fire Alarm system manufacturer is Notifier brand equipment.

C. All Fire Alarm and Low Voltage Systems are Design-Build; Contract Documents (drawings and specifications) are meant to provide information (scope, performance requirements, preliminary quantities and locations, etc) for Bidding by Design-Build Contractors only.

D. The Fire Alarm and Low Voltage Design-Build Contractor(s) shall be subcontractor(s) to the Electrical Contractor. The Design-Build Contractors shall design, provide and install complete and fully operational and coordinated systems that meet all requirements of the Owner, local AHJ and as per the Project Contract Documents.

E. Low Voltage Systems to be provided for the Project include:
1. Fire Alarm System.
2. Telecom Systems.
3. Wireless Network.
4. CCTV System.
5. Building Entry/ Intercom System.
6. Access Control System.

F. The Contractor shall provide all labor, materials, equipment and devices, supports, etc necessary for satisfactory installation of fire alarm and low voltage

work ready to operate in strict accordance with Code requirements and these specifications and drawings including but not limited to all switches, routers, CCTV cameras and NVR server, racks, patch panels, patch cables, 110 blocks, terminations, etc. The Contractor shall also provide permanent labeling at both ends of all low voltage cabling, color coded for each system, which shall match the numbering scheme of the Low Voltage system As-Built drawings for all terminations.

1. The Contractor shall test all terminations to ensure they are in good working order. Any and all faulty cables and/ or terminations shall be replaced at no cost to the Owner.

G. All final quantities and locations of equipment and devices shall be coordinated with the Fire Marshal/ Local AHJ (as applicable), Architect and Owner prior to the start of construction.

H. Related Sections: All Division 01, 26, 27 and 28 Specification Sections included in the Contract Documents.

I. Commissioning Activities and Submittals: The Project shall be commissioned per Energy Code. The Contractor shall coordinate with the General Contractor, Architect and Commissioning Agent and provide support for the complete commissioning process as required. See Divisions 01, 26, 27 and 28 for additional information.

1.3 SYSTEMS REQUIREMENTS

A. FIRE ALARM SYSTEM

1. The building has an existing Fire Alarm system. The design-build fire alarm subcontractor is to be provide an expansion of the existing system in order to provide coverage in the new Shop Addition space meeting all Code and Fire Marshal requirements. The fire alarm subcontractor is responsible for designing, providing and installing the system components.

2. System-based, addressable smoke detectors and carbon monoxide alarms are to be provided in the Shop Addition per the requirements of Code and the Fire Marshal.

3. System-based, horn/ strobe devices are to be provided in the Shop Addition per the requirements of Code and the Fire Marshal.

1.4 CODES AND STANDARDS:

A. All work shall meet or exceed the requirements of the current versions of all applicable Federal, State, and Local Codes and Standards including but not limited to:

1. National Electrical Code (NEC) with Local Amendments.
2. Washington State Energy Code with Local Amendments.
3. International Fire Code (IFC) with Local Amendments.
4. International Building Code (IBC) with Local Amendments.
5. International Mechanical Code (IMC) with Local Amendments.
6. Uniform Plumbing Code (UPC) with Local Amendments.
7. The Americans with Disabilities Act (ADA).
8. Illuminating Engineering Society of North America (IESNA) Standards and Recommended Practices.
9. National Fire Protection Association (NFPA) Standards and Recommended Practices.
10. Applicable Standards of the following organizations (see subsequent Division 26, 27 and 28 sections for additional information):
    a. American National Standards Institute (ANSI).
    b. American Society for Testing Materials (ASTM).
    c. Building Industry Consulting Services International (BICSI)
    d. Institute of Electrical and Electronics Engineers (IEEE)
    e. National Electrical Manufacturer's Association (NEMA)
    f. U.S. Department of Housing and Urban Development (HUD)
    g. Underwriter's Laboratories (UL) standards.
11. Utility Service Provider Requirements.

1.5 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to International Building Code with local amendments, Fire Marshal, and UL for fire resistance ratings and surface burning characteristics.

1.6 PRODUCT SUBSTITUTIONS

A. Manufacturers and models of equipment and material indicated in Divisions 27 and 28 Specifications and on drawings are those upon which the fire alarm and low voltage systems designs are to be based; other manufacturers with products considered equal in general quality may also be listed without specific model designation. Manufacturers not listed shall be submitted for approval prior to submission of Bid by the Contractor, see Division 01.

B. Any equipment other than the basis of design is considered a substitution; this includes equipment from any alternate manufacturers listed without specific model designation in the Contract Specifications and / or Drawings.

C. Pre-Bid 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.

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. Approval of proposed substitution does not grant the Contractor approval for deviation from the contract requirements.

F. Unless indicated otherwise, “or approved equal” may be assumed for all products in Divisions 26, 27 and 28.

1.7 DESIGN DRAWINGS

A. All drawings, specifications and calculations prepared by the Fire Alarm Design-Build Contractor shall be stamped by an Engineer currently registered in the State of Washington.

B. The Design-Build Contractors shall submit drawings and diagrams for review and for job coordination:

1. Permit / Construction Drawings for review. These drawings shall be submitted at two milestones as selected by the Architect in electronic PDF format.

a. The Contractors’ drawings shall match the layout of the Architectural drawings.

b. The Drawing Sets shall include at a minimum:

1) Symbols, Legend and drawing list sheets.

2) Equipment Schedules.

3) Fire Alarm System sheets and calculations approved by the local Fire Marshal/ AHJ.

1.8 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” this specification and all additional products noted on drawings or required for completion of sequence of operations.

B. Provide the Submittals so as not to delay the construction schedule; allow at least two weeks for review of each submittal and re-submittal.

C. Electronic: Submittals shall be complete in one PDF file with bookmarks for each Specification Section. Multi-file 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.

D. 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.

E. Equipment vendor cover page with contact information shall precede submittal by that vendor.

F. 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.
5. Construction Materials.
6. Ratings (i.e. UL, ASTM, NEMA, etc).
7. Engineering technical data.
8. Electrical characteristics (Voltage, Phase, Wattage, Breakers, etc).
9. Controls and wiring diagrams.
10. Accessories.

G. If requested in subsequent Specification Sections or by Architect or Engineer, submit Manufacturer's Installation Instructions on any equipment, procedures, or certifications so requested.

H. Do no ordering, fabrication or manufacturing of products until return of approved submittals.

I. The Contractor agrees to pay for the Engineer's review cost of the Fire Alarm Systems Submittals beyond one resubmittal where resubmittals are required due to deficiencies in the Contractor's Submitted material.

1.9 SHOP DRAWINGS

A. The Contractor shall prepare Shop Drawings stamped and signed by a Certified Designer. Drawings shall be developed in accordance with Code 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 the manufacturer's name and catalog number of each piece of equipment used. Also included shall be:

1. Symbols and legend sheet.
2. Schedules sheets.
3. Floor Plans showing device locations per Code and Fire Marshal requirements.
4. Wiring diagrams.
5. All calculations required for approval by the Fire Marshal and local AHJ.

E. The Contractor shall also coordinate with the General Contractor and provide slab plans marked up with all penetrations required for fire alarm and area of refuge systems. Sizes of penetrations shall be indicated on the plans and penetration locations shall be dimensioned from major building lines. The Contractor shall submit these slab plans to the Architect for review.

F. The Architect's and Engineer'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.

1.10 PLAN REVIEW AND PERMITS

A. In addition to the distribution requirements specified in other Specification Sections, the Fire Alarm Design-Build Contractor shall make all required submissions to the Authorities Having Jurisdiction (AHJ) for Plan Review, Permits and approval. The Fire Alarm Contractor shall pay all fees related to said submissions. The Fire Alarm Contractor shall revise their design and resubmit as needed to obtain AHJ approval. All additional and / or revisions to the Fire Alarm Contractor's designs required to obtain AHJ approval shall be carried out by the Fire Alarm Contractor at no additional cost to the Owner – this includes the fees associated with any resubmissions. The Fire Alarm contractor shall submit all comments received from the AHJ to the Architect and Engineer.

B. The Contractor shall not commence work until a permit (or "get started" permit where allowed by the AHJ) is obtained. Contractor is solely responsible for ensuring that the permit application and any revisions are submitted in a timely manner so as not to impact project schedule.

1.11 QUALITY ASSURANCE

A. Perform all work per current versions of all applicable Code and Standards with state and local amendments – see "Codes and Standards" paragraph above.

B. All equipment and devices shall be UL-Listed and Labeled and shall be acceptable to the Authority Having Jurisdiction as suitable for the use and location for which they are intended.

C. Provide all system components from one manufacturer unless Architect provides written permission to do otherwise.

1.12 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in Specification Sections 28 46 00 and 28 46 21 with a minimum of five years' experience.

B. Installer: Company specializing in performing Work on projects of similar type and scale with a minimum of three years' experience.

1.13 SCHEDULING

A. Coordinate with and provide assistance in final adjustment and testing of life safety systems with the General Contractor and Fire Authority.

1.14 DELIVERY, STORAGE AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. The Contractor shall keep all equipment, devices, conduit, etc in a dry, protected area. The location shall be coordinated with the Architect and General Contractor prior to the start of Construction. See Division 01 for additional delivery, storage and handling requirements.

C. Where original packaging is insufficient, provide additional protection. Maintain protection in place until installation.

D. Inspect all products and materials for damage prior to installation.

E. Protect conduit from all entry of foreign materials by providing temporary end caps or closures on conduit and fittings.

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.

1.15 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. Coordinate with General Contractor to have ventilation provided in areas to receive solvent cured materials.

C. Do not install underground conduit when bedding is wet or frozen.

1.16 FIELD MEASUREMENTS

A. Verify field measurements prior to ordering gear.

B. Verify by field measurements that equipment 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 and documenting exact locations of existing systems.

1.17 COORDINATION

A. The Contractor shall visit the site and become familiar with existing conditions affecting work. The Contractor shall include in their Bid the costs for all work and / or materials required to comply with the requirements of the Contract Documents based on the actual existing conditions. Failure to visit the Site and

verify actual existing conditions does not relieve the Contractor of these requirements; no change orders will be paid due to lack of verification of existing conditions whether they are specifically noted in the Contract Documents or not.

B. The Contractor shall verify the locations of any overhead or buried utilities on or near the Project 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. 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.

E. Where the drawings or specifications call out for the contractor to field verify and / or coordinate locations and requirements this verification / coordination is to be completed prior to any equipment, devices, supports, conduits, etc are installed / roughed-in. Any equipment, devices, supports, conduits, etc installed at locations unacceptable to the design team (either for aesthetics or functionality) due to the contractor failing to field verify / coordinate shall be relocated at the contractor's expense.

F. Electrical and Low Voltage Systems 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 as necessary to fit actual conditions.

G. 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.

H. 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 Electrical, HVAC, plumbing, and sprinkler contractors shall provide whatever materials, offsets, labor etc. is required to resolve the conflict.

I. Advise the Architect of any modifications required to suit the equipment furnished. Costs for modifications due to equipment substitution will be borne by the contractor.

J. 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.

K. 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.

L. Coordinate trenching, excavating, bedding, backfilling of buried systems with requirements of this specification.

M. Coordinate wall openings, rough-in locations, and conduit rough-in locations to accommodate Work of Specification Sections 28 46 00 and 28 46 21.

N. Coordinate all equipment with building control work.

O. The Contractor shall coordinate with the Architectural plans and Project structure when locating equipment and devices and routing conduit and cabling.

P. The Contractor shall coordinate with the General Contractor and provide slab plans marked up with all penetrations required for electrical, fire alarm and low voltage systems. Sizes of penetrations shall be indicated on the plans and penetration locations shall be dimensioned from major building lines. The Contractor shall submit these slab plans to the Architect for review.

Q. The Contractor shall coordinate conduit and cabling routing and equipment and device locations with all other trades to ensure all Code required clearances are maintained and equipment and devices remain accessible after the work of all trades is complete.

R. The Contractor shall consult the approved shop drawings of all other trades and crafts to ensure coordination with final locations of cabinetry, counters, appliances, equipment, structural members, etc. Conflicts are to be resolved with the Architect and General Contractor prior to rough-in. The Contractor shall not be paid for relocation work (including cutting, patching, and finishing) required due to a lack of coordination prior to installation.

S. Prior to the start of Construction, coordinate locations and connection requirements for all line voltage power connections with the Electrical Contractor and Engineer.

1.18 PROJECT CLOSEOUT

A. Completion, submission and approval of the following is required for final project closeout:

1. Walk through the Project with the Owner and Architect to make note of deficiencies.

2. Execution of Owner’s, Architect's and Engineer’s final observation reports (punchlist).
3. Operating and Maintenance Instructions.
4. Operating and Maintenance Manual.
5. Equipment Cleaning.
6. Record Drawings and set of plans stamped approved by Fire Marshal.
7. Testing.
8. Commissioning.
9. Warranty.

B. See Division 01 for additional requirements for the fire alarm system.

C. See other Divisions 26, 27 and 28 Specification Sections for complete project requirements.

1.19 OPERATING AND MAINTENANCE INSTRUCTIONAL TRAINING

A. General: In addition to requirements of Division 01, following initial operation of the Fire Alarm systems and prior to acceptance by the Architect, perform the following services:

1. 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.
2. 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, lighting controls setpoint adjustment, safeties and alarms.
3. Furnish qualifications of Contractor's personnel in charge of the instruction; foreman position is minimum acceptable. Where system startup is performed by supplier’s or manufacturer’s personnel, those personnel should also provide training on that equipment.
4. During demonstrations and instructions include and reference information from maintenance manuals and contract drawings.
    a. Provide documentation of all instruction which includes:
        1) Date and time of instruction.
        2) Name, affiliation and qualifications of the instructor.

3) Name and affiliation of the attendees.

4) Topics, systems, and equipment covered.

5) Length of instruction.

5. Minimum duration of instruction periods:

a. Fire Alarm Systems 1 hour

1.20 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. The Job name and address.

2. Names, addresses and telephone numbers of the Contractor, sub-contractors and local companies responsible for maintenance of each system or piece of equipment.

3. Manufacturers, suppliers, contractor names, addresses and phone numbers.

4. Written guarantees.

5. Warranty service contractors' names, address and phone numbers (if different from above).

6. Copies of approved brochures and Shop Drawings as applicable for all submittal items.

7. Manufacturer’s printed operating procedures to include start-up and routine and normal operating instructions; and control, shutdown, and emergency instructions.

8. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; and adjusting instructions.

9. Part numbers of all replaceable items.

10. Operation sequences.

11. Record drawings corrected and completed.

12. Completed equipment start-up forms and checklists.

13. Final copy of testing reports.

B. Operation and Maintenance Data:

1. Include spare parts lists for all equipment as applicable.

2. Submit installation instructions, adjustment instructions, and spare parts lists 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.

C. Binders:

1. Furnish typewritten or printed index and tabbed dividers between Specification Sections and principal categories.

2. Bind each manual in a hard-backed loose-leaf binder.

3. Imprint on Cover:

a. Name of Project.

b. Owner.

c. Location of project.

d. Architect.

e. Contractor.

f. Year of Completion.

4. Imprint on backing:

a. Name of Project.

b. Year of completion.

D. PDFs:

1. Provide PDF with bookmarks for each Specification Section and Principal Category.

a. First Page: Name of Project, Owner, Location & Contracting Company.

b. Index Page: List of specification sections with contents by Tag or item.

c. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

E. Submittal:

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.

1.21 RECORD DRAWINGS

A. Prepare record documents in accordance with the requirements of Division 01 Specification Section "Contract Closeout."

B. Label each drawing as "Record Drawing" with Electrical Contractors' name and date.

C. During construction, maintain an accurate record set of the drawings of the installation on project site at all times; keep this set in a safe location, protected from the environment.

D. Submit one digital file with all drawings in PDF format.

E. Make all notes and revisions on PDF set in red.

F. In addition to the requirements specified in Division 01 and in other Division 26, 27 and 28 Specification Sections, indicate installed conditions (locations, sizes, burial depths, arrangements, etc) for:

1. Equipment locations (exposed and concealed) shown to scale and dimensioned from prominent building lines.

2. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.22 TESTING

A. Perform testing of fire alarm systems as described in this Specification and as required by applicable codes and ordinances.

B. Written verification of testing to be signed by Owner's Representative.

C. Perform testing of fire alarm systems as required by applicable codes and ordinances.

1.23 WARRANTY 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. The Contractor shall, without cost to the Owner, correct all defects and failures discovered within one year from date of final acceptance for all electrical, fire alarm and low voltage systems, except when in the opinion of the Architect a failure is due to neglect or carelessness of the Owner.

1. See individual Specification Sections for additional requirements.

C. 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.

D. The Contractor shall make all necessary adjustments during first year of operation.

E. The presence of any inspector or observer at any point during construction does not relieve the Contractor from responsibility for defects discovered after completion of the work.

F. Refer to Division 01, 26, 27 and 28 Specification Sections for additional Warranty requirements.

PART 2 PRODUCTS

2.1 FIRE ALARM SYSTEM:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. FACP and Equipment:

a. Edwards Systems Technology.

b. Notifier; a Honeywell Company.

c. Silent Knight; a GE-Honeywell Company.

d. Simplex Grinnell.

e. Any Alternate Manufacturers must be submitted during the Bid Process for review and approval by the Owner, Architect and Engineer. No Alternates will be accepted after Bid.

2. Wire and Cable:

a. Allied Wire & Cable, Inc

b. Comtran Corporation.

c. Genesis Cable Products; Honeywell International, Inc

d. Helix/HiTemp Cables, Inc.; a Draka USA Company.

e. Pyrotenax

f. Rockbestos-Suprenant Cable Corporation; a Marmon Group Company.

g. Superior Essex, Inc.

h. West Penn Wire/CDT; a division of Cable Design Technologies.

3. Audible and Visual Signals:

a. Edwards Systems Technology.

b. Gentex Corporation.

c. Silent Knight; a GE-Honeywell Company.

d. Simplex Grinnell.

e. System Sensor; a GE-Honeywell Company.

f. Any Alternate Manufacturers must be submitted during the Bid Process for review and approval by the Owner, Architect and Engineer. No Alternates will be accepted after Bid.

B. FIRE-ALARM WIRE AND CABLE

1. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

2. Signaling Line Circuits: Twisted, shielded pair, not less than No. 16 AWG or as recommended by system manufacturer].

a. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

3. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.

a. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.

b. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.

2.2 HANGERS AND SUPPORTS

A. See Specification Section 26 05 00.

2.3 GROUNDING AND BONDING

A. See Specification Section 26 05 26.

2.4 RACEWAY AND BOXES

A. See Specification Section 26 05 33.

2.5 IDENTIFICATION FOR ELECTRICAL SYSTEMS

A. See Specification Section 26 05 53.

PART 3 EXECUTION

3.1 DOCUMENTATION

A. Additional plan submittals to reviewing authority: If additional drawing submittals are required at any time during construction the Contractor shall submit drawings, review with authority, and pick up subsequent approved drawings. The Fire Alarm Contractor will revise and/or prepare drawings for submittal.

3.2 MOCK-UPS

A. The Contractor shall mock-up the new Shop Addition areas by marking the intended locations of all fire alarm systems equipment and devices.

B. Before starting installation of equipment and devices, the Contractor shall walk through all mocked-up areas with the Owner, Architect, and General Contractor to receive approval for all locations.

C. The Contractor shall relocate equipment and devices in the mock-ups per the Owner and Architect's instructions.

D. The Contractor shall relocate any equipment and devices installed prior to the approval of the mocked-up areas by the Architect and Owner at the Electrical Contractor's expense.

3.3 SURFACE PREPARATION

A. Examine areas and equipment for conditions that would affect performance of the Work. Proceed with installation only after unsatisfactory conditions have been addressed.

B. Degrease and clean surfaces of any matter that would affect the bond of paint, adhesives or firestopping material.

C. Remove incompatible materials affecting bond of paint, adhesives or firestopping.

D. Degrease and clean surfaces to receive adhesive for identification materials.

E. Obtain permission from Architect before drilling or cutting structural members.

F. For adhesive anchors, clean holes and prepare per manufacturer's instructions prior to installation.

3.4 INSTALLATION

A. The Contractor shall conceal all conduit, cabling and boxes in finished areas unless indicated otherwise or granted specific permission by the Architect. Install all conduit and cabling perpendicular to or parallel with building lines wherever possible.

B. In open ceiling areas, all cabling shall be installed in conduit. In front of house (public) areas, conduit shall be painted; color as selected by the Architect.

C. Coordinate the locations of equipment and devices with all other trades.

D. FIRE ALARM DEVICES:

1. Coordinate all locations with Architect and all other trades.

2. No fire alarm devices are to be located above any cove heaters. Any fire alarm devices so located shall be moved at the Contractor's expense.

3. Smoke or Heat Detector Spacing:

   a. Smooth ceiling spacing shall not exceed the rating of the device.

   b. Spacing of heat detectors shall be determined based on guidelines and recommendations in NFPA 72.

4. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.

5. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

6. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

7. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

8. Visible Alarm-Indicating Devices (where required): Install adjacent to each alarm horn and at least 6 inches (150 mm) below the ceiling.

9. Device Location-Indicating Lights: Locate in public area near device they monitor.

10. FACP: Surface mount with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

E. FIRE ALARM SYSTEM WIRING

1. Install wiring according to the following:
    a. Comply with NECA 1 and NFPA 72.
    b. TIA/EIA 568-A.
    c. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.
    d. Fire-Rated Cables: Use of two-hour, fire-rated fire-alarm cables, NFPA 70, Types MI and CI, is permitted where allowed by Code other than at open ceiling areas.
    e. Signaling Line Circuits: Power-limited fire-alarm cables shall not be installed in the same cable or pathway as signaling line circuits.
    f. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
    g. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
    h. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

F. HANGERS AND SUPPORTS
1. See Specification Section 26 05 00.

G. VIBRATION AND SEISMIC CONTROLS
1. See Specification Section 26 05 00.

H. GROUNDING AND BONDING SYSTEMS
1. See Specification Section 26 05 26.

2. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to the FACP.

I. RACEWAY AND BOXES

1. See Specification Section 26 05 33.

J. IDENTIFICATION FOR ELECTRICAL SYSTEMS

1. See Specification Section 26 05 53.

2. Install instructions frame in a location visible from the FACP.

K. Paint power-supply disconnect switch red and label "FIRE ALARM."

3.5 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, the 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 including paying other trades repair work under their scope that was disturbed.

3.6 FIELD QUALITY CONTROL

A. Initial Inspection: The Contractor shall inspect all equipment, devices, conductors, hangers, supports, cable, etc prior to installation to verify that they are: identified properly on the reel identification label, that it is of the proper gauge, that it contains the proper number of pairs, that there is no damage to the equipment/ devices, etc. Note any buckling of the jacket, which would indicate possible problems. Damaged cable, equipment, devices, etc or any component failing to meet specifications shall not be used in the installation.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

C. Perform the following field tests and inspections and prepare test reports:

1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.

2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters. All tests shall be conducted under the direct supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.

3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.

4. Testing: Follow procedure and record results complying with requirements in NFPA 72. Detectors that are outside their marked sensitivity range shall be replaced.

5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

3.7 CLEANING

A. Clean adjacent surfaces of fire stopping materials.

B. Clean interior and exterior of all equipment. Equipment shall be free of dirt, construction debris, corrosion, etc.

C. Adequate provisions shall be made during construction to eliminate dirt, debris or other material from entering and collecting inside of conduit and equipment. Any collection of material shall be thoroughly cleaned before owner occupancy.

D. Clean exterior of all exposed conduit.

3.8 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 fire alarm systems 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 fire alarm systems installations.

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.

3.9 SALVAGE

A. Remove excess conduit and conductors. Remove scrap 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.

3.10 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A . Excavating, backfilling, and compacting for utilities, including pipe, structures, and appurtenances.

B . Control of water in trenches.

C . Foundation stabilization for pipe and utility structures.

D . Pipe bedding for pipe and utility structures.

1.02 RELATED REQUIREMENTS:

A . Section 01 5713 - Temporary Erosion and Sedimentation Control

B . Section 33 4000 - Storm Drainage Utilities

1.03 REFERENCES

A . WSDOT Standard Specifications – Washington State Department of Transportation 2024 Standard Specifications for Road, Bridge, and Municipal Construction.

B . ASTM D422 – Method for Particle Size Analysis of Soils.

C . ANSI/ASTM D1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-pound Rammer and 18-inch Drop.

D . ASTM C94-86 – Ready-Mixed Concrete.

E . AASHTO T176 – Plastic Fines in Graded Aggregates and Soils by use of the Sand Equivalent Test.

F . ASTM D2922 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods - (Shallow Depth).

G . ASTM D3017 – Test Methods for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.04 UTILITIES AND STRUCTURES DEFINITIONS

A . Pothole: An exploratory excavation to uncover a buried utility and determine location, elevation, size, and type of material.

1.05 SUBMITTALS

A . General: Comply with Section 01 3000.

B . Quality Assurance/Control Submittals

1. Test Reports: Sieve analysis for each material.

2. Certification:
    a. WSDOT pit certification for each pit.
    b. Disposal site operator certification that disposal site complies with all local, state, and federal regulations.

1.06 QUALITY ASSURANCE

A . Qualifications
1. Surveyor: Land surveyor licensed in state of Washington with experience on similar projects.
2. Construction Crew Foreman: Minimum six years' working experience and four years' experience as foreman performing similar work.

B . Regulatory Requirements: All Work and material shall be in accordance with WSDOT Standard Specifications.

PART 2 - PRODUCTS

2.01 AGGREGATE MATERIALS

A . Bedding Material for Pipe: Conform to WSDOT Standard Specification Section 9-03.12(3), Gravel Backfill for Pipe Zone Bedding.

B . Foundation Material: In accordance with WSDOT Standard Specifications Section 9-03.17, Class A.

C . Drain Rock (for Subdrainage System): Gravel backfill for drains in accordance with WSDOT Standard Specification Section 9-03.12(4).

D . Structural Fill: Crushed, partially crushed, or naturally occurring granular material. Free from wood waste, organics, and other extraneous, or unsuitable material, in accordance with WSDOT Standards Specifications Section 9-03.14(1), Gravel Borrow. Restrict fines content to no more than 5 percent passing Number 200 sieve. On-site material is not suitable for use as structural fill.

2.02 UTILITIES AND STRUCTURES SOURCE QUALITY CONTROL

A . Tests and Inspection: Provide sieve analysis in accordance with ASTM D422 for each material type. Perform tests and analyses of aggregate material in accordance with WSDOT Standard Specifications. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.01 EXAMINATION

A . Site Verification of Conditions: Verify as follows:
1. Verify survey benchmark and intended elevations for the Work are as indicated.
2. Verify erosion control is in place and operating properly.

3. Verify locations and elevations of existing pipes and structures at points of connection and at crossings prior to beginning Work. Pothole, expose pipes, determine invert elevations, verify with design, and inform Engineer of deviations affecting design prior to mobilizing crews and beginning construction.
4. Verify location and elevation of proposed building plumbing stub out prior to beginning Work.

3.02 PREPARATION

A . Protection

1. The majority of underground utilities will not be located through “Dial Dig.” Contractor shall provide work through utility locate company or perform Work. Only gas lines will be located through “Dial Dig” 1-800-424-5555, 48 hours (two working days) prior to beginning construction. Employ and pay for a locator service to locate and mark utilities in addition to the "DIAL DIG" service.
2. Protect and maintain existing utilities which are to remain.
3. Identify existing structural foundations near excavations. Verify excavation will not undermine footings or supports and cause damage to structures.
4. Protect plant life, lawns, trees, and other features remaining as a portion of final landscaping or preserved for erosion control.
5. Protect benchmarks, existing structures, rockeries, sidewalks, railings, paving, and curbs.
6. Protect existing structures scheduled to be demolished but occupied by the Owner.
7. Protect pavement or paved areas intended to remain from damage.
8. Use all means necessary to prevent the erosion of freshly graded areas during construction or until such a time that permanent drainage and erosion control measures are fully operational.

3.03 CONSTRUCTION

A . Grade and Alignment

1. Identify and set required lines, levels, contours, and datum.
2. Stake alignment and grade and construct in locations shown on Drawings.
3. Establish extent of excavation by area and elevation.
4. Adjust alignment and grade to accommodate conflicts and field conditions. Obtain Engineer’s approval prior to adjustments.

B . Utilities and Structures, Shoring and Bracing of Excavation

1. Provide sheeting, shoring, and bracing in accordance with state and local codes.
2. Do not use horizontal strutting below pipe barrel.
3. Do not use pipe as support for trench bracing.
4. Do not remove shoring below top of pipe.
5. Backfill immediately following removal of shoring and bracing.

6. Support adjacent structures, including utilities and pipe chases, which may be damaged by excavation Work.

C . General Excavation

1. Perform excavation of every description and whatever substance encountered to depths, lines, and grades indicated.
2. Pile trench excavated material so surface water is prevented from flowing into excavation and there is minimum inconvenience to Owner's access to the buildings. Provide free access to fire hydrants, water valves, meters, and driveways, and leave clearance to enable free flow of stormwater in gutters, conduits, and natural water courses.
3. Remove and reconstruct utilities as required to perform Work.
4. Do not interfere with or excavate within pressure prism of foundations. Pressure prism is defined as a 1 horizontal to 1 vertical line projected from footing bottom.
5. Prevent movement of soil in areas supporting existing foundations, slabs, poles, underground utilities, trees, pipelines, or other structures.
6. Hand trim excavation and leave free of loose matter.
7. Correct unauthorized excavation at no cost to Owner.
8. Schedule Work to include backfilling trenches by the completion of each shift.

D . Trench Excavation

1. Unless otherwise indicated, open cut excavations.
2. Exercise caution in operating heavy equipment over pipelines. Do not damage existing improvements.
3. Immediately repair leaks or breaks caused by construction operations at no cost to Owner and in a manner acceptable to Engineer and utility owner.
4. Control side walls of excavation to minimize caving.
5. In the event the maximum allowable trench width is exceeded and depending on depth of trench, improve pipe bedding by utilizing concrete or other bedding materials as directed by Engineer.
6. Excavate trench bottom to lines and grades shown, with proper allowance for pipe thickness and pipe bedding. Do not permit material containing rocks or cobbles larger than 2 inches in maximum dimension within 6 inches of pipe. Remove material of this type from trench bottom and replace with foundation gravel.
7. Should excavation be carried below lines and grades as shown because of trenching operations, backfill such excavated space to proper elevation as directed by Engineer, at no cost to Owner.

E . Control of Water

1. Keep excavation free from water. Dewater as necessary.
2. Direct drainage away from excavation.
3. Grade top perimeter of excavation to prevent surface water from draining into excavation.

4. Direct runoff and water from dewatering into sedimentation filtration. Provide additional filtration necessary to prevent silt-laden water from leaving the site.

F . Pipe Bedding

1. Place bedding on approved trench bottom before pipe is installed. Spread smoothly to support pipe uniformly. Do not use blocking to adjust pipe to grade. Dig holes for bells as required to ensure uniform support along pipe barrel.
2. Compact bedding as follows: Compact bedding to at least 95 percent maximum density as determined by ASTM D1557 under buildings, structures, and 6 feet outside and within paved areas and sidewalks. Compact bedding in other areas to at least 90 percent maximum density as determined by ASTM D1557.

G . Backfilling and Compaction

1. Backfill to grades, contours, levels, and elevations shown on Contract Drawings with structural fill. On-site material may be suitable for use as backfill given that the material is properly moisture conditioned and meets gradation of structural fill in accordance with Section 31 2335.
2. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
3. Place and compact backfill materials in continuous layers not exceeding 8 inches in compacted thickness.
4. Employ a placement method which does not disturb or damage utilities in trenches.
5. Condition backfill within plus or minus 3 percent of its optimum moisture content so specified compaction can be attained readily. Material containing excessive moisture, beyond moisture content for specified density as determined by laboratory compaction tests, shall not be used for backfill.
6. Raise backfill around structures evenly.
7. Finish area to uniform contour to drain properly and grade entire surface to a neat-appearing surface.
8. Remove excavated on-site soil material and surplus fill material from the site to an approved contractor-provided off-site waste site.

H . Compaction

1. Under pavements, curbs, curbs and gutters, sidewalks, and other structural improvements: 95 percent, within 2 foot vertical of finish grade and 90 percent below this level in accordance with ASTM D1557.
2. Use hand-operated equipment within 6 feet of building walls.
3. Compact backfill material by towed or self-propelled mechanical compactors in uniform layers not exceeding 10 inches in loose depth.

I . Initial Backfill

1. After pipe has been laid properly and inspected, place and compact initial backfill around pipe to a minimum depth of 8 inches over top of pipe. Place initial backfill in lifts of not more than 10 inches in compacted thickness. Bring lifts together on both sides of pipe and carefully work backfill under pipe haunches by means of a shovel, vibration, or procedures approved by Engineer. Take necessary precautions to protect pipe from any damage or shifting.

2. Subsequent Backfill: Place and compact subsequent backfill material after initial backfill has been placed and approved by Engineer.
3. Perform compaction within 2 feet of existing or new structures by hand-operated vibratory compactors. Compact within 6 feet of wall to 95 percent maximum density as determined by ASTM D1557.
4. Reopen trenches where settlement occurs to depths necessary for compaction; refill and compact with surface restored to grade.
5. Water settling or water jetting will not be allowed.

3.04 RESTORATION

A . Restore disturbed pavement and improvements to remain in operation.

3.05 FIELD QUALITY CONTROL

A . Obtain required inspections, tests, approvals, and location recording prior to covering or enclosing Work.

B . Site Tests

1. Comply with Section 01 4000.
2. Compaction test performed by Owner.

C . Inspection

1. Comply with Section 01 4000.
2. After completion of trench and prior to placing pipe.
3. After completion of pipe and bedding and prior to backfilling.

3.06 PROTECTION

A . Protect bottom of excavations and soil adjacent to and beneath foundations from freezing.

B . Protect excavated material and excavating foundation (subgrade) from damage due to excess moisture.

C . Take necessary precautions to protect soil from excess moisture by such means necessary, including: Construct ditches and swales to intercept surface water; cover stockpiled material; cover exposed trenches; do not expose more area than can be worked and protected; and dewater by pumping.

3.07 CLEANUP

A . Dispose of all excavated surplus or unsuitable material at a Contractor-provided off-site location approved by the Owner.

B . Remove and dispose of abandoned pipe, broken pavement, and rubbish from Project site in accordance with laws, regulations, and ordinances of an approved off-site location provided by Contractor.

C . Dispose of waste, surplus, and unsuitable materials according to laws, regulations, and ordinances.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A . Pavement removal

B . Pavement patching

C . Soil sterilization

D . Asphalt concrete paving

E . Adjusting utilities to grade

1.02 RELATED REQUIREMENTS

A . Section 31 2335 - Excavating, Backfilling, and Compacting for Utilities and Structures

B . Section 32 1611 - Cement Concrete Sidewalk, Curbs, and Gutters

1.03 REFERENCE STANDARDS

A . WSDOT Standard Specifications – Washington State Department of Transportation 2024 Standard Specifications for Road, Bridge, and Municipal Construction.

B . ANSI/ASTM D 1557-91 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2,700 kN-m/m3).

C . ASTM D2922-91 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods - (Shallow Depth).

D . ASTM D3017-88 – Test Method for Moisture Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

E . ASTM D1556-90 – Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.

F . ASTM D2950 – Density of Bituminous Concrete in Place by Nuclear Method.

1.04 SUBMITTALS

A . Comply with Section 01 3000.

B . Product Data: Soil residual herbicide, including hazardous waste data sheet.

C . Quality Assurance/Control Submittals: Certificates - tack coat, asphalt concrete mix. Certificate stating material complies with specifications and documentation material is approved by WSDOT.

1.05 QUALITY ASSURANCE

A . Qualifications: Paving contractor and crew foreman shall have minimum 3 years' experience with paving projects of this type. Submit list of projects for 3 years' experience. Note date, owner, type, and size of overlay and location.

B . Pre-Installation Meeting:

1. Coordinate and attend meeting prior to paving and preparation.
2. Attendees to include paving contractor, Owner, and Architect.
3. Agenda to include sequencing of Work, schedule, and responsibilities.

1.06 ENVIRONMENTAL REQUIREMENTS

A . Comply with Section 5-04.3 of WSDOT Standard Specifications.

B . Minimum air temperature for placing asphalt paving 45 degrees F and rising.

C . Do not perform paving in rain.

1.07 SEQUENCING AND SCHEDULE

A . Coordinate closure of sidewalks with Owner. Minimize closure of sidewalks.

B . Maintain fire truck and emergency vehicle accesses.

PART 2 - PRODUCTS

2.01 SOIL RESIDUAL HERBICIDE

A . Comply with WSDOT Standard Specifications Section 5-04.3(5)D.

B . Use only products approved by Owner.

2.02 ASPHALT CONCRETE PAVEMENT

A . Driveways and Parking Lots: Hot Mix Asphalt (HMA): HMA Cl. 1/2-inch PG 64-22 as specified in Section 5-04 of WSDOT Standard Specifications and Amendments. Meet requirements for Asphalt Concrete Pavement (ACP). Class B modified asphalt pavement will be considered as a substitution.

2.03 CRUSHED SURFACING TOP COURSE (CSTC)

A . Conform to WSDOT Standard Specifications Section 9-03.9(3).

2.04 CRUSHED SURFACING BASE COURSE (CSBC)

A . Conform to WSDOT Standard Specifications Section 9-03.9(3).

2.05 TACK COAT

A . Cationic emulsified asphalt per WSDOT Standard Specifications Section 9-02.1(6).

PART 3 - EXECUTION

3.01 EXAMINATION

A . Verify compacted subgrade is dry and ready to support paving and imposed loads.

B . Verify base gradients and elevations are correct.

C . Verify subsurface Work is completed and no further excavation will be required within limits of Work.

D . Verify demolition Work within or adjacent to Work is complete.

E . Verify heavy construction traffic is as complete as possible and traffic remaining will not damage or degrade Work.

F . Verify fire department has been advised of restrictions to site access during Work.

G . Verify weather forecast during planned time of placement is within weather limitations.

H . Verify door locations and required clearances for swing out over walkways.

3.02 PREPARATION

A . Prepare and compact subgrade in accordance with Section 2-06 of WSDOT Standard Specifications.

B . Water and thoroughly mix subgrade until optimum moisture content is obtained when deficiency of moisture content exists. When excess moisture exists, rework and aerate subgrade until optimum moisture content is obtained.

C . Condition existing surface per WSDOT Standard Specifications Section 5-04.3(5).

D . Adjust top of structures, manhole covers, valve boxes, grates, cleanout covers to grade. Comply with WSDOT Standards for structures.

E . Areas receiving new paving section: Excavate, remove, and dispose of excess material. Fine grade to maintain drainage and prepare subgrade.

F . Apply herbicide to subgrade in new pavement and patching areas.

3.03 CONSTRUCTION

A . Base Courses:

1. Place per WSDOT Standard Specifications Section 4-04.3.
2. Spread aggregate over prepared substrate to a total compacted thickness as indicated on Drawings.

3. Place aggregate in maximum 6-inch layers and compact to 95 percent per ASTM D1557.
4. Level and contour surfaces to elevations and gradients indicated.
5. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
6. Add water as necessary to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
7. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

B . Soil Sterilization:

1. Apply Soil Residual Herbicide per WSDOT Standard Specifications Section 5-04.3(5)D.
2. Protect surrounding area from effects of soil sterilization.
3. Do not allow toxic material to run off onto adjacent vegetation or to storm system.

C . Spreading and Finishing:

1. Comply with WSDOT Standard Specification Section 5-04.3(9).
2. Maximum nominal compacted depth of any layer of any course: HMA Class 1/2-inch: 0.30 feet.

D . Joints: Comply with WSDOT Standard Specification Section 5-04.3(12). Provide full depth thickness at joint with adjacent paving. Saw cut exposed butt joint. Paint edge of joints with asphalt for tack coat.

E . Asphalt concrete pavement:

1. Construct according to requirements of WSDOT Standard Specifications Section 5-04. Where thickness of finished asphalt pavement will be 3 inches or less, place in one lift.
2. Apply tack to contact surfaces of curbs, catch basins, gutters, and cold pavement joints.
3. Perform hand tamping in areas not accessible to rolling equipment.
4. Ensure joints made during paving operations are straight, clean, vertical, and free of broken or loose material.
5. Seal all contact joints between asphalt pavement joints, curbs, walls, and drains with CSS-1.
6. Back tamp exposed edges to 45 degrees.
7. Establish smooth grades with minor cuts or fills. Maintain proper drainage and correct low spots.

F . Asphalt Concrete Pavement Patching:

1. Before patch is constructed, trim pavement cuts so marginal patch lines will form straight edges and vertical faces.
2. Prepare subgrade according to requirements of WSDOT Standard Specifications Section 2-06.
3. When roadway is needed for vehicular traffic and permanent pavement cannot be promptly placed or when weather and availability of materials does not allow for prompt pavement repair, place and maintain a 2-inch-thick CSBC and a 2-inch-thick MC 250

cold patch. Remove temporary base and asphalt when permanent pavement repair can be completed.

4. Adjust utility structures and castings to grade.
5. Place bases and asphalt pavement per this section.

3.04 TOLERANCES

A . At Abutting Existing Surfaces to be Matched: Within 1/8 inch.

B . Pavement Areas: Generally smooth, free of depressions exceeding 3/8 inch in 10 feet. Minor deviations may be allowed if approved by Owner.

3.05 PROTECTION

A . Do not allow vehicular traffic on newly paved areas until surface has cooled to atmospheric temperature.

B . Protect surrounding area from effects of soil sterilization. Do not allow toxic material to run off onto adjacent vegetation or to storm system.

3.06 FIELD QUALITY CONTROL

A . Site Tests: Following tests will be performed by Architect:

1. Subgrade density prior to paving, Reference Section 01 4000.
2. Asphalt density.
3. Compact asphalt paving per 2024 WSDOT Standard Specification, minimum 91 percent for Rice or 95 percent for Marshall Test.

3.07 CLEANING

A . Clean surfaces within five days of substantial completion.

B . Dispose of all surplus, unsuitable, or waste materials according to laws, regulations, and ordinances at an approved off-site waste site obtained by Contractor.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A . Cement concrete walkways and pedestrian areas, curbs, and wheelchair ramps.

B . Preparing subgrade to receive base course material for concrete walkways.

C . Base courses.

D . Cement concrete walkway paving joint.

E . Cement concrete walkway paving finishing.

F . Concrete vertical curb.

1.02 RELATED REQUIREMENTS:

A . Section 01 5713 - Temporary Erosion and Sedimentation Control

B . Section 31 2335 - Excavating, Backfilling, and Compacting for Utilities and Structures

C . Section 32 1216 - Asphalt Paving

1.03 REFERENCE STANDARDS

A . WSDOT Standard Specifications – Washington State Department of Transportation 2024 Standard Specifications for Road, Bridge, and Municipal Construction.

B . ACI 301 – Specifications for Structural Concrete for Building.

C . ASTM D422-90 – Method for Particle Size Analysis of Soils.

D . ANSI/ASTM D1557-91 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft-lb./ft^3.

E . ASTM D2922-91 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

F . ASTM D3017-88 – Test Method for Moisture Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

G . ASTM D1556-90 – Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

1.04 SUBMITTALS

A . Submit under provisions of Section 01 3000.

B . Product Data:

1. Admixtures

2. Portland cement
3. Curing compound

C . Quality Assurance/Control Submittals.

D . Design Data: Concrete mix design.

1.05 QUALITY ASSURANCE

A . Qualifications:

1. Crew Foreman: Minimum 6 years' working experience and 4 years' experience as foreman performing similar work.

B . Regulatory Requirements: Work and material shall be in accordance with WSDOT 2024 Standard Specifications.

C . The color within the concrete from separate pours shall remain consistent with minimum deviation in appearance from the concrete in approved concrete sample panels.

1.06 PROJECT/SITE CONDITIONS

A . Environmental Requirements: Comply with WSDOT Standard Specifications Section 5-05.

PART 2 - PRODUCTS

2.01 MATERIALS

A . Crushed Surfacing Base Course: Per Section 32 1216.

B . Crushed Surfacing Top Course: Per Section 32 1216.

C . Structural Fill: Per Section 31 2335.

D . Portland Cement: Type II conforming to the requirements of Section 9-01 of the WSDOT Standard Specifications.

E . Aggregates for Cement Concrete: In accordance with WSDOT Standard Specifications Section 9-03.

F . Curing material and add mixtures: In accordance with WSDOT Standard Specifications Section 9-23.

G . Joint Filler: In accordance with WSDOT Standard Specifications Section 9-04.1.
Color: Gray.

H . Joint Sealant: Sikaflex 1A, match color of concrete.

I . Reinforcing Steel: In accordance with WSDOT Standard Specifications Section 9-07.

J . Soil Residual Herbicide: Per Section 32 1216.

K . Welded Steel Wire Fabric: Plain type, ASTM A185, plain finish, size as shown on Drawings.

L . Concrete Boom Finish equipment and materials: Fiber or wire broom to meet requirements of a medium texture finish.

2.02 MIXES

A . Cement Concrete Mix: In accordance with WSDOT Standard Specifications Section 5-05.3(1). Three-day mix.

2.03 SOURCE QUALITY CONTROL

A . Submit proposed mix design for review prior to commencement of Work.

B . Tests and analysis of aggregate material will be performed in accordance with WSDOT Standard Specifications.

C . If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.01 EXAMINATION

A . Site Verification of Conditions:

1. Verify compacted subgrade is dry and ready to support paving and imposed loads and is approved by Owner.
2. Verify base gradients and elevations are correct.
3. Verify subsurface Work is completed and no further excavation will be required within limits of Work.
4. Verify demolition Work within or adjacent to the Work is complete.
5. Verify heavy construction traffic is as complete as possible and traffic remaining will not damage or degrade the Work.
6. Verify fire department and Owner have been advised of restrictions to site access during Work.
7. Verify weather forecast during planned time of placement is within weather limitations.

3.02 PREPARATION

A . Prepare and compact subgrade in accordance with Section 2-06 of the WSDOT Standard Specifications.

B . Water and thoroughly mix subgrade until optimum moisture content is obtained when deficiency of moisture content exists. When excess moisture exists, rework and aerate subgrade until optimum moisture content is obtained.

C . Adjust top of structures, manhole covers, valve boxes, grates, etc., to grade. Comply with WSDOT Standards.

3.03 CONSTRUCTION

A . Crushed Surfacing Top Course: Section 32 1216.

B . Soil Sterilization: Section 32 1216.

C . Base Course: Section 32 1216.

D . Structural Fill: Section 31 2335.

E . Concrete Paving: WSDOT Standard Specifications Section 5-05.

F . Forming:

1. Place and secure forms to correct location, dimension, and profile.
2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
3. Place joint fillers vertical in position in straight lines. Secure to formwork during concrete placement.

G . Placing Reinforcing:

1. Place reinforcement to achieve slab and curb alignment as detailed.
2. Extend temperature steel through expansion and contraction joints.
3. Place welded wire fabric centered in slab.
4. Provide support for reinforcing bar.

H . Construction Joints (Expansion Joints):

1. Place construction joints as needed. Minimize number of construction joints.
2. Incorporate construction joints into pattern of sidewalk or adjacent paving.
3. Fit construction joints with filler of required profile, set perpendicular to longitudinal axis of sidewalks and curbs, or as shown on Drawings.
4. Set joint fillers 3/8-inch below finish concrete surface. Fill top of joint with sealant. Place duct tape strip on top of joint filler as bond breaker prior to placing sealant.
5. Place joint filler between paving components and building or other appurtenances and to separate sidewalks from driveways and curb ramps.
6. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

I . Contraction Joints (Control Joints):

1. Joint Pattern and location: Place contraction joints as shown on Drawings.
2. Align curb and sidewalk joints.
3. Tooled “U” shaped joints with radius trowel. No smooth shoulders. Seal joint in accordance with WSDOT Standard Specifications Section 5-05.3(8)B.

J . Placing Concrete Curbs and Walks:

1. Place concrete per ACI 301.
2. Hot Weather Placement: Per ACI 301.
3. Cold Weather Placement: Per ACI 306.

4. Ensure reinforcement, inserts, embedded items, and formed joints are not disturbed during concrete placement.
5. Place concrete, screed, and wood float surfaces so smooth and uniform, free of open texturing and exposed aggregate.
6. Round all edges, including edges of expansion and contraction joints, with 1/2-inch radius edging tool.

K . Surface Finishing:

1. Finish: Float finish followed by medium broom textured finish. For medium broom finish, draw a fiber or wire broom across concrete surface, perpendicular to the line of traffic. Textured fine lines in the broom finish shall be straight and parallel to each other.
2. Joint edges: Radius and trowel. Broom out any smooth shoulders. Retool joints filled by cement slurry.
3. Joint pattern as shown on drawings.
4. Curbs: Medium broom.

L . Color: Natural concrete color.

M . Curing: WSDOT Standard Specifications Section 5-05.3(13). Use curing method that preserves surface finish.

3.04 FIELD QUALITY CONTROL

A . In accordance with Section 01 4000.

B . Site Tests:

1. Owner will perform compaction testing on subgrade and base course.
2. Owner will perform concrete testing.
3. If tests indicate work does not meet specified requirements, remove work, replace, and retest.

C . Inspection: Engineer will inspect subgrade prior to placing base, completed base course prior to placing concrete, and completed form work.

3.05 CLEANING

A . Clean surfaces within five days of substantial completion.

B . Dispose of all surplus, unsuitable, or waste materials according to laws, regulations, and ordinances at a site obtained by Contractor.

3.06 PROTECTION

A . Protect concrete from effects of adverse weather and traffic during curing.

B . Keep heavy equipment and vehicular traffic off new concrete until it has attained specified strength.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A . Preparation for painting pavements and curbs.

B . Painting parking stalls; marking fire lane, and crosswalks.

C . Signage for parking lots.

1.02 RELATED REQUIREMENTS:

A . Section 32 1216 - Asphalt Paving

B . Section 32 1611 - Cement Concrete Sidewalk, Curbs, and Gutters

1.03 REFERENCE STANDARDS

A . WSDOT Standard Specifications - Washington State Department of Transportation 2024 Standard Specifications for Road, Bridge, and Municipal Construction.

B . MUTCD – Latest edition of Manual on Uniform Traffic Control Devices for Streets and Highways, with latest revisions per WSDOT.

1.04 SUBMITTALS

A . Comply with Section 01 3300.

B . Product Data: Paints and colors.

1.05 REGULATORY REQUIREMENTS

A . Comply with WSDOT Standard Specifications.

1.06 ENVIRONMENTAL REQUIREMENTS

A . Pavement must be clean and dry.

B . Comply with manufacturer’s recommendations.

C . Do not perform pavement marking in the rain.

PART 2 - PRODUCTS

2.01 PAINT

A . Non-reflectorized traffic line paint for parking stalls and reflectorized traffic line paint for road striping per WSDOT Standard Specifications Section 8-22.2.

B . Color:

1. Parking Stalls: White
2. Crosswalks: White

2.02 SIGNS

A . Location and type as shown on drawings.

B . Comply with MUTCD.

PART 3 - EXECUTION

3.01 EXAMINATION

A . Verify paving and curbing is complete and surface is ready to receive striping.

B . Verify distance between curbs to ensure adequate width for the indicated number of stalls.

C . Verify weather forecast during planned time of placement is within weather limitations.

3.02 PREPARATION

A . Clean and prepare surface for receiving paint per WSDOT Standard Specification Section 8-22.3(2).

B . Lay out lines and symbols to spacing and locations shown on Drawings.

3.03 CONSTRUCTION

A . Painting: Per WSDOT Standard Specification Section 8-22.3(3).

B . Crosswalks and Traffic Arrows:

1. Painting per WSDOT Standard Specification Section 8-22.3(3).

3.04 PROTECTION

A . Protect painted surfaces until dry.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A . Pipe, fittings, and appurtenances.

B . Connection to existing water main.

1.02 RELATED REQUIREMENTS

A . Section 31 2000 - Earth Moving

B . Section 31 2335 - Excavating, Backfilling, and Compacting for Utilities and Structures

1.03 REFERENCE STANDARDS

A . City of Monroe Public Works, Design, Construction, and Operations standards, current edition.

B . WSDOT Standard Specifications - Washington State Department of Transportation 2024 Standard Specifications for Road, Bridge, and Municipal Construction.

C . ASTM A252 - Welded and Seamless Steel Pipe Piles.

D . AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

E . AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.

F . AWWA C111 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

G . AWWA C151 - Ductile-Iron Pipe.

H . AWWA C153 - Ductile-Iron Compact Fittings.

I . AWWA C509 - Resilient-Seated Gate Valves for Water and Sewerage Systems.

J . AWWA C550 - Protective Epoxy Interior Coatings for Valves and Hydrants.

K . AWWA C651 - Disinfecting Water Mains.

L . NFPA 24 - Installation of Private Fire Service Mains and their Appurtenances.

1.04 QUALITY ASSURANCE

A . Qualifications:

1. Surveyor: Land surveyor licensed in state of Washington, with experience surveying underground utilities.
2. Crew Foreman:

a. Minimum six years' working experience and four years' experience as foreman performing similar work.

3. Contractor performing underground work for Fire Protection Sprinkler System:

a. Licensed as a Level U or Level 3 Fire Protection Sprinkler System Contractor by the State of Washington.

b. Have at least one person on site during construction and testing of all fire protection sprinkler system elements with a Level U or Level 3 Certificate of Competency issued by the Washington State Patrol Fire Marshall's Office.

B . Pre-Installation Meetings:

1. Schedule, coordinate, attend, and lead pre-installation meeting per Section 01 3000.

2. Schedule and attend meeting prior to beginning work.

1.05 SUBMITTALS

A . Comply with Section 01 3300.

B . Fire Sprinkler Contractor Certification:

1. Copy of Certificate of Competency for person present on site for construction and testing of fire sprinkler elements.

2. Copy of Fire Protection Sprinkler System Contractor license.

C . Product Data: All products in this section.

D . Operation and maintenance data for valves.

E . Certification: Certification of accuracy for test gage.

F . Closeout Submittals: Record Drawings:

1. Record actual locations of piping mains, valves, connections, and invert elevations.

2. Record location of utilities and structures encountered and not shown or not in agreement with Drawings.

3. Record changes in soil conditions not noted on Drawings.

1.06 REGULATORY REQUIREMENTS

A . NFPA requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A . Handle pipe, fittings, and specials to ensure delivery to site and final installation in undamaged condition. Do not damage pipe coating and lining. Keep pipe clean. Load and unload pipe and fittings using hoists in a manner to avoid shock or damage. Do not drop, skid, or roll pipe against other pipe. Repair any part of damaged coating or lining. Separate rejected pipe immediately from undamaged pipe. Remove damaged pipe from site within 24 hours.

1.08 SEQUENCING AND SCHEDULING

A . Notify Architect 72 hours prior to making connections to existing mains.

B . Notify Owner of service shutdown. Provide notification at least 48 hours prior to discontinuation of service, including estimated duration of shutdown.

C . Advise City of Monroe Fire Marshall and Architect of proposed water shut off that will affect hydrants, fire sprinkler systems, alarm systems, and other services.

D . Maintain water systems in areas of site to be occupied and remain in operation by Owner during construction.

PART 2 - PRODUCTS

2.01 GENERAL

A . Comply with WSDOT Standard Specifications.

B . Comply with Reduction of Lead in Drinking Water Act.

2.02 PIPE AND FITTINGS

A . Ductile Iron Pipe: Centrifugal cast in 18-foot nominal lengths conforming to AWWA C151; cement-mortar lined conforming to AWWA C104; bituminous exterior coating conforming to AWWA C151; Standard Thickness Class 52.

B . Non-restrained Joints: Rubber gasket, push-on type (Tyton) or mechanical joint (MJ) conforming to AWWA C110, C111, or C153.

C . Restrained Joints: Star National No. S11 or approved equal. 350-psi working pressure. Use same joint restraint throughout project.

D . Pipe Fittings: Ductile iron short body, conform to AWWA C153, cement mortar lined per AWWA C104. Mechanical joint pressure rating 350 psi, flange joint pressure rating 250 psi.

E . Flanged Fittings: Conform to ANSI B16.1, Class 125 drilling pattern, gasket neoprene or chlorinated butyl.

2.03 TRANSITION, REDUCING, AND FLEXIBLE COUPLINGS

A . Determine existing pipe size and order transition coupling with proper dimensions.

B . Smith Blair, Romac 501, or Ford constructed with gray iron sleeves and ductile or malleable iron followers; ductile iron or electrogalvanized steel bolts and nuts; manufacturer’s standard factory finish.

2.04 POLYETHYLENE FILM

A . AWWA C105.

2.05 CONCRETE

A . Type III cement, minimum compressive strength of 3,000 psi. Design mix to achieve strength prior to pressure testing.

PART 3 - EXECUTION

3.01 EXAMINATION

A . Verify surfaces are ready to receive Work.

B . Verify grades are at subgrade elevation.

C . Verify erosion control is installed and functioning.

D . Verify field measurements are as shown on Drawings.

E . Verify location, size, and type of existing utilities at point of connection and at points of crossing other utilities. Pothole, expose pipes, determine invert elevations, verify with design, and inform Architect of deviations affecting design prior to mobilizing crews and beginning construction.

F . Verify and coordinate location and elevation of plumbing stubout and adjust locations to match.

3.02 PREPARATION

A . Protect surrounding Work from damage or disfiguration. Protect adjacent pavement remaining in service from damage.

B . Protect existing utilities from damage and disturbance. Provide shoring to support existing utilities and their support prism or remove and replace utilities where shoring is not practical. Removing and replacing utilities to be performed per utility owner’s standards.

C . Erect barriers and barricades to direct and protect adjacent traffic.

D . Maintain water service to existing buildings. Coordinate with Owner and Architect to determine time and duration of required water system shutdowns.

E . Field-locate and mark existing utilities, whether shown or not, prior to construction, avoid damage or disturbance. Protect, maintain, and repair, where damaged. For aid in utility location call 1-800-424-5555, 48 hours (two working days) prior to beginning construction. Dial Dig will only locate gas. Provide and pay for additional marking as required.

F . Field-stake alignment and grade.

3.03 EXECUTION

A . Excavation and Backfill: Comply with Section 31 2335. Provide extra width trench as necessary where deflecting pipe. Excavate to depths required to provide minimum cover as indicated on Drawings. Excavate deeper as required to accommodate changes in grade, vaults, connections, or to install pipe under existing pipelines or other utilities. Adjust pipe depth at connection to existing main. Adjust pipe profile to pass below conflicting utilities.

Provide minimum 12-inch clearance. Depth Adjustments: 2 feet or less at no adjustment in cost.

B . Installation of Pipe and Fittings:

1. Inspect pipe for structural defects and defects in coating and lining before it is placed in trench. Clean pipe fittings and valves of dirt and foreign material as they are placed. Plug open ends of pipe and fittings with temporary water-tight plug whenever Work is stopped or when water in trench threatens to enter pipe. Keep groundwater from entering pipe at all times. Lay and maintain pipe to required lines with fittings and valves at required locations and valve stems plumb. Lay pipe in accordance with manufacturer's instructions and to AWWA standards for type of pipe being installed. Construct pipelines to provide cover shown on Drawings. Slope need not be constant, but install pipelines so no high or low points exist in finished line except at locations of fire hydrants, blow offs, air/vacuum valves, or future pipe extensions.
2. Alignment of Pipe: At conflicts with other utilities, such as telephone and existing water mains, realign pipe subject to approval of Architect.
3. Cutting Pipe: Cut pipe smooth, even, and square. Remove chips and cuttings from interior of pipe. Bevel cut pipe ends to prevent damage to gaskets during installation.
4. Laying of Pipe on Curves: Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflecting joints. If pipe is shown curved on Drawings and no special fittings are shown, assume curves can be made by deflecting joints with standard lengths of pipe. Do not exceed 50 percent of manufacturer's printed recommended deflection at each pipe joint when pipe is laid on a horizontal or vertical curve. Where field conditions require deflection or curves not anticipated by Drawings, Architect will determine methods to be used. Additional payment will not be made for laying pipe on curves nor for field changes involving standard lengths of pipe deflected at joints. When rubber gasketed pipe is laid on a curve, join pipe in a straight alignment and deflect to the curved alignment. Make trenches wider on curves for this purpose.

C . Reaction Blocking (Thrust Blocking): Furnish and install cast-in-place concrete reaction blocking at plugs, caps, tees, bends deflecting more than 11 degrees, and where indicated on Drawings. Cast concrete directly against undisturbed trench wall. Place PE sheeting between pipe and concrete. Form blocking should not obstruct access to pipe joints or fittings. Size thrust block per detail on Drawing. Increase thrust blocking size for existing soils conditions as directed by Architect.

D . Restrained Joints: Provide restrained joints at fire hydrant laterals and other locations where shown on Drawings. Restrained joints may be used at vertical bends in lieu of gravity thrust block. Install lengths of restrained pipe from each side of fittings at vertical bends as indicated on Drawings or as determined by Architect. Minimum 45 feet of restrained joint pipe each side of restrained fitting. Install per manufacturers' recommendations.

E . Connection to Existing Water Mains:

1. Expose existing pipe and verify diameter and proper material type and sizes prior to beginning Work.
2. Comply with WSDOT requirements.
3. Connection to existing water mains shall be performed by Contractor.
4. Use prechlorinated pipe valves and fittings.

5. Do not connect new construction to existing water mains until the new system is pressure tested, disinfected, flushed, purity tested, and approved by Architect.

F . Flexible Couplings:

1. Install in accordance with manufacturer's instructions.
2. Wrap buried flexible couplings with two layers of PE film extending a minimum of 3 feet each side of center of flexible coupling; overlap joints in film minimum 6 inches.

G . Vertical Bends:

1. Fabricate vertical bends on water main 4 inches in diameter and larger with restrained joint ductile iron pipe.
2. Provide minimum 45 feet restrained joint pipe on each side of vertical bend.

3.04 PRESSURE TESTS

A . Comply with WSDOT requirements.

B . Notify Architect 48 hours prior to required inspection time.

C . Provide all test equipment and personnel to prepare for and perform test.

D . Test in accordance with Section 01 4000.

E . Pressure Tests: Backfill pipeline sufficiently to prevent movement of pipe under pressure. Place reaction blocking and allow concrete to cure and reach specified strength before testing. Repair damage due to failures at no cost to Owner.

F . Furnish pumps, test gages, plugs, saddles, corporation stops, miscellaneous hose, piping, and other equipment necessary to fill pipeline with water and complete hydrostatic test. Furnish 4.5-inch minimum diameter test gage having 0 to 300 psi range with 1/4 of 1 percent accuracy accompanied with certifications of accuracy from a laboratory approved by Architect. Fill water main only through a backflow prevention device supplied by Contractor.

G . Prior to testing, fill pipeline with water and allow to stand under pressure sufficient time to allow escape of air and, if applicable, allow pipe lining to absorb water.

H . Test pipelines and connecting piping in sections between temporary caps or valves by admitting water to the line gradually to full test pressure. Testing against closed valves will be permitted provided pressure differential across valve does not exceed rated working pressure of valve.

I . Hydrostatically test water mains and appurtenances 6 in diameter and larger at 200 psi. Apply test pressure at low end of section of water main being tested. Vent air in pipe prior to test.

J . Test by pressurizing main to required pressure, stop pump for 15 minutes, and then pressurize main to test pressure again. Observe section being tested to detect any visible leakage. Use clean container for holding water for pressurizing main being tested. Sterilize makeup water by adding chlorine to concentration of 50 mg/l. Accurately determine water quantity required to restore pressure by pumping through positive displacement water meter with a sweep unit hand registering 1 gallon per revolution. Use meter approved by WSDOT.

Test acceptability will be determined as follows: Comply with WSDOT standards. There shall not be an appreciable or abrupt loss in pressure during 15-minute test period.

K . Limit sections to be tested normally to 1,600 feet. Architect may require the first section of pipe, not less than 1,000 feet in length, be tested in order to qualify crew and material. Do not continue pipe laying more than an additional 1,000 feet until first section has been tested successfully.

L . Perform hydrostatic tests on every complete section of water main between valves, or as directed by Architect. Each valve side shall withstand same test pressure as pipe, with no active pressure in pipe section beyond closed valves. Make tests with hydrant auxiliary gate valves open and pressure against hydrant valve. After test is completed, each gate valve will be acceptable if there is no immediate loss of pressure on gage when pressure is applied to valve being checked. Verify pressure differential across valve does not exceed rated test pressure of valve.

M . When hydrants are included with section of main pipe to be tested, conduct testing in two separate tests as follows:

1. Test No. 1 - Water main gate valves and hydrant auxiliary gate valves closed, with hydrant operating stem valves and hose ports wide open.
2. Test No. 2 - Water main gate valves and hydrant operating stem valves tightly closed but hydrant auxiliary gate valves and hose ports wide open.

N . Correct visible leakage detected regardless of allowable leakage specified above. Should tested section fail to meet pressure test successfully as specified, locate and repair defects and retest pipeline at no cost to Owner.

O . Prior to notifying Architect to witness pressure test, have equipment set up completely, ready for operation, and have tested successfully to ensure pipe is in satisfactory condition.

3.05 DISINFECTION OF WATER MAINS

A . Before being placed in service, chlorinate and obtain a satisfactory bacteriological report for new water mains and repaired portions of, or extensions to, existing mains.

B . Flush pipe (including private fire lines not receiving sterilization) prior to being disinfected to remove solids or contaminated material that may have become lodged in pipe. If no hydrant is installed at end of main, provide a tap large enough to develop a velocity of at least 2.6 fps in main. Provide taps required for temporary or permanent release of air and chlorination or flushing purposes. Where dry calcium hypochlorite is used for disinfection of pipe, perform flushing after disinfection. Dispose of treated water flushed from mains and neutralize wastewater for protection of aquatic life in receiving water before disposal into any natural drainage channel. Dispose disinfecting solution during test to Architect’s and local authorities’ satisfaction. If approved by sewer system owner and Architect, disposal may be made to any available sanitary sewer provided rate of disposal will not overload sewer.

C . Sterilization: Comply with City of Monroe standards.

D . Preventing Reverse Flow: Do not make connections between existing distribution system and pipelines not disinfected and constructed under this Contract without a DSHS approved backflow preventer installed in connecting line.

E . Chlorinating Connections to Existing Water Mains: Follow chlorinating procedure as specified in AWWA C651. Swab closure fittings with a very strong chlorine solution (5 to 6 percent Cl).

3.06 FINAL FLUSHING AND TESTING OF MAINS

A . Following chlorination, flush treated water from newly laid pipe until replacement water throughout its length shows, upon test, absence of chlorine. In the event chlorine is normally used in supply source, then tests shall show a residual not in excess of that carried in system.

B . Dispose of chlorinated water per DOE and Department of Fish and Wildlife requirements. Neutralize water for protection of aquatic life in the receiving water before disposal into drainage system.

C . Locate a sample tap ahead of flushing hose for convenience and sanitary sampling.

D . Before placing lines into service, a satisfactory report shall be received from a certified test lab on samples collected from representative points in new system. Samples shall be collected and bacteriological tests obtained by the Contractor. Costs of water sample analysis shall be borne by Contractor as incidental Work to water main installations.

E . Should initial treatment result in an unsatisfactory bacteriological test, repeat original chlorination procedure until satisfactory results are obtained. Failure to obtain a satisfactory bacteriological test will be considered as failure to keep pipe clean during construction or to chlorinate the main as specified. Additional chlorination required to obtain satisfactory test result shall be completed at no additional cost to Owner.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A . Sanitary side sewers.

B . Sanitary sewer clean outs.

C . Connection to existing sanitary sewer system.

1.02 RELATED REQUIREMENTS

A . Section 01 5713 – Temporary Erosion and Sedimentation Control

B . Section 31 2000 – Earth Moving

C . Section 31 2335 – Excavating, Backfilling, and Compacting for Utilities and Structures

1.03 REFERENCE STANDARDS

A . WSDOT Standard Specifications – Washington State Department of Transportation 2024 Standard Specifications for Road, Bridge, and Municipal Construction.

B . WSDOT Standard Plans – Washington State Department of Transportation 2024 Standard Plans for Road, Bridge, and Municipal Construction.

C . City of Monroe Public Works, Design, Construction, and Operations standards, current edition.

D . ASTM D3034 – Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

E . AWWA C151 – Ductile-Iron Pipe.

F . AWWA C153 – Ductile-Iron Compact Fittings.

G . ASTM C564 – Specifications for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

1.04 DEFINITION

A . Side Sewer: That portion of a sewer line constructed from the main sanitary sewer line to 5 feet outside the building line.

1.05 SUBMITTALS

A . Comply with Section 01 3000.

B . Product Data: Manufacturers' literature and specifications for pipe, fittings, castings, and manholes.

C . Certification: Certification of accuracy for test gage.

D . Record Drawings:

1. Submit under provisions of Sections 01 7000 and 01 7800.
2. Accurately record actual locations of pipe runs and connections.
3. Provide field survey of all inverts and structure lid elevations.
4. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
5. Prepare record drawings in accordance with City of Monroe requirements.

1.06 QUALITY ASSURANCE

A . Qualifications:

1. Surveyor: Land surveyor licensed in state of Washington, with experience surveying underground utilities.
2. Crew Foreman: Minimum six years' working experience and four years' experience as foreman performing similar work.

B . Regulatory Requirements: Comply with City of Monroe requirements.

C . Pre-Installation Meetings: Schedule, coordinate, attend, and lead pre-installation meeting in accordance with Section 01 2000.

1.07 SEQUENCING AND SCHEDULING

A . Maintain sanitary sewer in areas of site to be occupied and remain in operation by Owner during construction.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

A . Handle pipe, fittings, and appurtenances in such a manner as to ensure delivery to the project site and final installation in a sound, undamaged condition. Keep the pipe clean. Load and unload pipe using hoists in a manner to avoid shock or damage, and under no circumstances shall they be dropped, skidded, or rolled against other pipe. Damaged items shall be rejected and removed from the site within 24 hours.

PART 2 - PRODUCTS

2.01 GENERAL

A . Comply with WSDOT Standard Specifications.

2.02 PRODUCTS

A . PVC Pipe:

1. Bell-and-spigot type with rubber gasket joints conforming to the requirements of Section 9-05.12(1) of the WSDOT Standard Specifications. Schedule: SDR 35 with rubber gasket joints conforming to ASTM 3212.
2. Lengths: Manufactured and provided in nominal lengths of not less than 10 feet or more than 20 feet. Use shorter pipe lengths to meet special conditions where shown on the Drawings or as approved.

3. Pipe Condition: New. No sun-yellowed pipe will be allowed.
4. Fittings: Compatible with the pipe, injection molded, gasket type, manufactured in accordance with ASTM D3034. Do not use solvent welded joints.

B . Ductile Iron Pipe: In accordance with Section 33 1000.

C . Transition Couplings:

1. Transition joints in non-pressure sewers between similar or dissimilar materials of equal or unequal size shall be made water and gas tight by means of an approved connector or adapter of the compression seal type.
2. The connector or adapter shall be manufactured of preformed elastomeric material conforming to the applicable sections of ASTM C425, C564, or Dl869.
3. Install as recommended and specified by the manufacturer.
4. PVC to concrete connection shall be an epoxy/sand sealer, cast in boot, manufactured saddle, or “donut” gasket.

D . Cleanouts:

1. In accordance with City of Monroe Standard Sewer Plan 603.
2. Casting:
   a. Load ratings: HS20.
   b. Locking type.
3. Ring and Cover: WSDOT Standard Plan B-30.70.03.

E . Tracer Wire and Tracer Tape: Tracer wire shall be TWHN or TWHH #10. Tape shall be sewer tracer tape or magnetic sewer tracer tape.

PART 3 - EXECUTION

3.01 EXAMINATION

A . Verify excavation is ready to receive Work and excavations, dimensions, and elevations as indicated on Drawings.

B . Verify existing utilities have been marked.

C . Verify erosion control is in place and operating properly.

D . Verify inverts at points of connection and verify minimum grade can be maintained. Pothole, expose pipes, determine invert elevations, verify with design, and inform the Architect of deviations affecting design prior to mobilizing crews and beginning construction.

E . Verify and coordinate location and elevation of plumbing stubout and adjust locations to match.

3.02 PREPARATION

A . Protect elements surrounding Work of this section from damage or disfiguration.

B . Protect existing utilities from damage and disturbance. Provide shoring to support existing utilities and their support prism or remove and replace utilities where shoring is not practical. Removing and replacing to be performed per utility Owner's standards.

C . Erect barriers and barricades to direct and protect adjacent traffic.

D . Maintain sewer service to existing buildings.

E . Field-locate and mark existing utilities, whether shown or not, prior to construction; avoid damage or disturbance. Protect, maintain, and repair where damaged. For aid in utility location, call 1-800-424-5555, 48 hours (two working days) prior to beginning construction. Dial Dig will only locate gas. Provide and pay for additional marking as required.

F . Field-stake alignment and grade.

3.03 INSTALLATION

A . Excavation, Foundation, and Bedding: In accordance with Section 31 2335.

B . Connections to Existing Manhole:

1. Ensure against unbalanced loading on manhole.
2. Keep manhole in operation at all times and take necessary precautions to prevent debris or other materials from entering sewer.
3. Repair manhole damage.

C . Pipe Installation:

1. Comply with WSDOT Standards.
2. Follow manufacturer's installation procedures.
3. Lay pipe to line and grade indicated on Drawings.
4. Maintain line and grade for straight sections with laser beam operated by qualified personnel. Check line and grade constantly. If they do not meet specified limits, stop work immediately and remedy the cause before proceeding.
5. All PVC and concrete pipe, including side sewer stubs, shall have tracer wire and sewer tracer tape. Tracer shall be 18 inches below ground level.

D . Cleanouts:

1. Construct plumb and level.
2. Adjust top to finish grade. Verify top of cleanout elevation.

E . Side Sewers:

1. Side sewer slope need not be constant but shall have a continuously descending grade of no less than 1 percent. No flat spots or sags.
2. Provide detection wire and tracer tape continuously along service from main to building.
3. Tracer wire shall be continuous, unbroken wire without joints. Bring wire to surface at cleanout and wrap around top of cleanout pipe three times.

F . Backfilling: In accordance with Section 31 2335.

3.04 TOLERANCES

A . Variance from established line and grade for gravity sewers shall not be greater than 1/32 of an inch per inch of pipe diameter and not to exceed 1/2 inch, provided that such variation does not result in a level or reverse sloping invert; provided also that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surface, does not exceed 1/64 of an inch per inch of pipe diameter or 1/2 inch maximum.

B . Allowable deviation shall not be accumulative.

3.05 FIELD QUALITY CONTROL

A . Comply with Section 01 4000.

B . Comply with City of Monroe and WSDOT requirements.

C . Tests:

1. Provide test equipment and personnel to prepare for and perform test.
2. Perform test after backfilling is complete.
3. Plug wyes, tees, and stubs with flexible jointed plugs or acceptable alternate. Fasten securely to withstand internal test pressure.
4. Prior to notifying Architect to witness pressure test, have equipment set up completely, ready for operation, and have tested successfully to ensure pipe is in satisfactory condition.
5. Low pressure air test in accordance with City of Monroe.
6. Television camera inspection in accordance with City of Monroe.

D . Inspection: Architect will observe the work at the following milestones: Completion of pipe, manholes, cleanouts, and bedding, and prior to backfilling.

3.06 CLEANING

A . Comply with WSDOT requirements.

B . Clean with jet or flushing ball and inspect for obstructions prior to testing.

C . Prevent debris and foreign matter from entering sewer system. Provide screen at downstream end of cleaning to trap debris. Remove and dispose of debris.

3.07 PROTECTION

A . Protect Work, pipe, and bedding from damage or displacement until backfilling operation is in progress.

B . Protect completed work from damage.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A . Storm Drains

B . Manholes, Catch Basins, and Cleanouts

1.02 RELATED REQUIREMENTS:

A . Section 01 5713 - Temporary Erosion and Sedimentation Control

B . Section 31 2335 - Excavating, Backfilling, and Compacting for Utilities and Structures

1.03 REFERENCES

A . WSDOT Standard Plans – Washington State Department of Transportation 2024 Standard Plans for Road, Bridge, and Municipal Construction.

B . WSDOT Standard Specifications – Washington State Department of Transportation 2024 Standard Specifications for Road, Bridge, and Municipal Construction.

C . City of Monroe Public Works, Design, Construction, and Operations standards, current edition.

1.04 QUALITY ASSURANCE

A . Qualifications: Crew Foreman: Minimum six years' working experience and four years' experience as foreman performing similar work.

B . Regulatory requirements:

1. City of Monroe Standards.
2. WSDOT Standards.

1.05 SUBMITTALS

A . Submit under provisions of Section 01 3000.

1. Product Data:
    a. Catalog cuts, shop drawings, and specifications for Modular Wetland.
    b. Catalog cuts and specifications for pipe, fittings, manholes, catch basins, yard drains, cleanouts, castings, and accessories.

B . Manufacturers' Installation Instructions: Indicate special procedures required to install products specified.

C . Record Documents: Submit under provisions of Section 01 7800. Record actual structure locations of pipe runs, connections, and invert elevations accurately. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

D . Closeout Submittals:

1. Accurately record actual locations of pipe runs, connections, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 SEQUENCING AND SCHEDULING

A . Maintain on-site storm drainage during construction.

B . Construct the erosion control facilities as shown in the Drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

A . Structural Fill: Section 31 2335.

B . Bedding: Section 31 2335.

C . Storm Drain Pipe: WSDOT Standard Specifications Section 9-05. Acceptable pipe materials as shown on the Drawings:

1. Ductile Iron Sewer Pipe in accordance with WSDOT Section 9-05.13.
2. Corrugated Polyethylene Storm Sewer Pipe in accordance with WSDOT Section 9-05.20.

D . Catch Basins, Inlets, and Yard Drains:

1. Type 1 Catch Basins: WSDOT Standard Plan B-5.20-01.
2. Load Ratings: HS20, AASHTO Section 3.7.

E . Metal Castings: Load ratings: HS20. Locking type.

F . Cleanouts: WSDOT Standard Plan B-85.40-00.

G . Frame and Grate: WSDOT Standard Plan B-30.10-01, B-30.20-02, B-30.50-01, and B-30.80-00. Comply with ADA requirements at pedestrian areas.

2.02 SOURCE QUALITY CONTROL

A . Tests and Inspections:

1. Tests and analyses of aggregate material will be performed in accordance with WSDOT Standard Specifications.
2. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.01 EXAMINATION

A . Site Verification of Conditions: Verify as follows:

1. Verify survey benchmark and intended elevations for the Work are as indicated.
2. Verify excavation is ready to receive Work and excavations, dimensions, and elevations are as indicated on Drawings.
3. Verify existing utilities have been marked.
4. Verify erosion control is in place and operating properly.
5. Verify inverts at points of connection. Pothole, expose pipes, determine invert elevations, verify with design, and inform Architect of deviations affecting design prior to mobilizing crews and beginning construction.
6. Verify vegetation to remain is protected and marked prominently.
7. Verify removal of abandoned utilities is complete.

3.02 PREPARATION

A . Protection:

1. Locate existing utilities; avoid damage or disturbance. For aid in utility location, call “Dial Dig 1-800-424-5555,” 48 hours (two working days) prior to beginning construction. Dial Dig will only locate Gas. Provide and pay for additional marking as required.
2. Protect and maintain existing utilities that are to remain.
3. Protect utilities to be abandoned until they have been abandoned.
4. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
5. Protect benchmarks, existing structures, sidewalks, railings, paving, and curbs.
6. Use all means necessary to prevent erosion of freshly graded areas during construction or until such time that permanent drainage and erosion control measures are fully operational.

B . Preparation:

1. Survey and stake limits. Slope stake toe and top of cuts and fills. Construct orange fence at construction limits.
2. Identify required lines, levels, contours, and datum. Should indicated figures conflict with actual conditions, notify Architect and await direction before proceeding.
3. Verify elevations where matching existing grade. Notify Architect where grading to match existing creates adverse effects, such as blocking grading, abrupt change in grade, or slopes steeper than allowed.

3.03 CONSTRUCTION

A . Excavation:

1. Comply with Section 31 2335.

2. Remove large stones or other hard matter that could damage piping or impede consistent backfilling or compaction.

B . Pipe:

1. Install in accordance with manufacturer's recommended procedures, ASTM Standards, and WSDOT Standard Specifications.
2. Maintain line and grade per Drawings.
3. Join pipe in accordance with manufacturer's recommended procedure and WSDOT Standard Specifications.
4. Comply with WSDOT Section 7-04.3.

C . Catch Basins and Storm Drain Manholes:

1. Comply with WSDOT Section 7-05.
2. Form bottom of excavation clean and smooth to correct elevation.
3. Place base sections on 12 inches minimum compacted thickness bedding. Smooth and level to ensure uniform contact and support. Where subgrade cannot be compacted due to excess moisture, provide lean concrete pad, minimum 12 inches thick.
4. Extend bedding to the limits of the excavation.
5. Compact bedding 95 percent of the maximum density. Verify alignment and elevation of entering pipes.
6. Construct structures plumb and level.
7. Make completed manhole rigid, true to dimensions, and water tight.
8. Backfill evenly around structure to prevent displacement and unequal stresses.
9. Wet lift holes and fill with mortar inside and out.
10. Smooth and point structure joints inside and out. Ensure watertightness.
11. Remove loops flush with the inside wall surface after the manhole has been completed for precast manhole elements where steel loops have been provided in lieu of lift holes.
12. Remove sharp cutoff protrusions. If concrete spalling occurs as a result of the loop removal, restore the spalled area to a uniform smooth surface with cement mortar.

D . Backfilling: Section 31 2335.

E . Roof Drain Connection:

1. Verify location and elevation of roof drains at connection point.
2. Field-adjust pipe route and elevation to connect with building roof drains and drain to storm drainage system.
3. Provide minimum 2-foot cover over pipe.
4. Maintain slope to drain. 2 percent slope preferred, 1 percent slope allowed where necessary to maintain minimum cover.
5. Make changes in pipe direction with 45-degree bend maximum. Minimum 2-foot straight section between bends.

F . Cleanouts:

1. Construct plumb and level.
2. Adjust top to finish grade. Verify top of cleanout elevation.

3.04 FIELD QUALITY CONTROL

A . In accordance with Section 01 4000: Low pressure air test in accordance with WSDOT Standard Specification Section 7-04.3(1)F.

B . Site Tests:

1. Perform compaction test.
2. If tests indicate Work does not meet specified requirements, recompact and retest.

C . Inspection: Owner will observe the Work at the following milestones: After completion of pipe, manholes, cleanouts, bedding, and before backfilling.

3.05 CLEANING

A . Prior to final acceptance, flush out accumulated construction debris and remove other foreign matter from storm drains. Do not allow flushed material to enter downstream system.

3.06 PROTECTION

A . Protect completed work from damage.

END OF SECTION